Article

A Panel Data Analysis of Economic Growth Determinants in 34 African Countries

Larissa Batrancea [1,*] , **Malar Mozhi Rathnaswamy** [2] **and Ioan Batrancea** [2]

[1]   Faculty of Business, Babes-Bolyai University, 7 Horea Street, 400174 Cluj-Napoca, Romania
[2]   Faculty of Economics and Business Administration, 58-60 Teodor Mihali Street, 400591 Cluj-Napoca,
    Romania; mozhi.rathnaswamy@econ.ubbcluj.ro (M.M.R.); ioan.batrancea@econ.ubbcluj.ro (I.B.)
*   Correspondence: larissa.batrancea@ubbcluj.ro

Abstract: The research study investigated the economic determinants of economic growth in 34 countries across Africa during a two-decade period (2001–2019). For this purpose, the sample included a wide range of economies, from low income to high income and from low human development to high human development, according to recent international rankings provided by the World Bank and the United Nations Development Programme. By means of a multimodal approach centered on panel data modelling, we showed that economic growth, proxied by the GDP growth rate, was substantially influenced by economic indicators such as imports, exports, gross capital formation, and gross domestic savings. We also showed that foreign direct investment inflows and outflows play an important role for capital and savings. Our empirical results offer insights on strategies that national authorities could implement to boost economic growth and development across the African continent.

Keywords: gross domestic product; import; exports; capital; foreign direct investment; savings

1. Introduction

The topic of economic growth has been extensively studied through data from developed, emerging and developing economies, since growth is a natural process that signals evolution. Moreover, achieving a stable level of economic growth is a desideratum that should be listed on the priority agendas of governments around the world. At the end of the day, growing economies generally register higher per capita income, numerous job opportunities due to increased competition among economic agents, higher levels of foreign direct investment, an overall improvement of living standards and citizens' wellbeing, among other benefits. Nevertheless, when the question of sustainability is also considered, achieving and maintaining economic growth becomes challenging (Higgins 2015).

From a theoretical standpoint, economic growth can be defined as a rise in the quantity and quality of goods and services produced and consumed within an economy over a period of time. Therefore, it is generally mirrored by an increase in the national gross domestic product (GDP) (Basani and Scarpetta 2001; Batrancea et al. 2020b, 2021; Helpman 2004).

There are four main production factors: land, labor, capital and technological progress (more recently added). Economic literature reports various theories and growth models that take into account different combinations of production factors (Keita 2018). For instance, based on the neoclassical growth theory, the Solow-Swan model states that growth depends on creating an efficient relationship between labor and capital, with technology playing a fundamental role in achieving this efficiency. In this sense, short-term economic growth is impacted by the population growth rate and the labor force but not by savings, while long-term economic growth is substantially shaped by technology. According to the endogenous growth theory, economic growth is driven mostly by internal factors rather than external ones. In this regard, government policies should support market competition, while private sector investment can boost technological progress. Moreover, based on the

Keynesian economic growth theory, the Harrod-Domar model stipulates that economic growth depends on savings and capital.

Within modern economies, any rise in the quantity and quality of goods and services that are produced and consumed is usually facilitated by an increase in the quantity and quality of production factors, entrepreneurial spirit, substantial investment, governmental support granted to business endeavors (Batrancea et al. 2019, 2020a; Batrancea et al. 2012; Batrancea and Nichita 2015), political stability and rule of law, social cohesion, etc. Therefore, the phenomenon of economic growth falls under the influence of many factors.

The present study aimed to examine economic determinants of growth in a sample of 34 countries from the African continent. Namely, we selected economic variables elicited in the literature that are said to trigger direct changes in the amount and quality of goods and services produced and consumed: imports, exports, foreign direct investment inflows and outflows, gross domestic savings, and gross capital formation (Adams 2009; Bermejo Carbonell and Werner 2018; Dinh et al. 2019; Esfahani 1991; Gochero and Boopen 2020; Hoang et al. 2010; Li and Liu 2005; Ribaj and Mexhuani 2021). For the purpose of this study, economic growth was proxied by gross domestic product growth rate. All variables were retrieved from the World Bank database.

We postulated that the phenomenon of economic growth would be significantly influenced by the chosen economic indicators. In addition, we also scrutinized the degree to which some of these economic indicators yielded changes in domestic savings and capital formation.

We targeted a heterogeneous country sample, which comprised economies from low to high income and from low human development to high human development, as rated by official international rankings. Hence, we considered countries belonging to all four types of economies in terms of income: low income (e.g., Burkina Faso, Sudan); lower-middle income (e.g., Angola, Cape Verde); upper-middle-income (e.g., Libya, Namibia); high-income (e.g., Mauritius, Seychelles). With respect to human development, our country sample included all levels, ranging from low human development to very high human development. Moreover, based on GDP values, the sample covered four of the most important economic markets in Africa (Algeria, Angola, Morocco, Nigeria).

In terms of time frame, we chose a period of nearly two decades, from 2001 until 2019, in order to capture a major economic downturn (i.e., 2008 global financial crisis) and the latest advancements of African economic markets.

Our study favored a multimodal analysis approach since the statistical package we used (EViews version 11) offered the possibility of running descriptive statistics, correlation analyses and panel data modelling (with cross-section fixed and random effects vs. generalized method of moments) on the variables of interest. Due to this approach, we reported strong empirical estimations related to economic growth, savings and capital.

The novelty of our research stems from the fact that we examined some of the most relevant factors that can boost economic growth in the context of a large sample of 34 African economies across the last two decades. Interest in the evolution of African markets is on the rise considering the growth potential of these countries, which host 17% of the world population (i.e., a considerable part of the labor factor)[1] and possess a wealth of natural resources[2]. As a case in point, in the period 1950–2020, the working age population in Africa increased by almost 500% (African Development Bank 2021; Amaeshi et al. 2018; Binns et al. 2018).

The remainder of this article proceeds in the following way. Section 2 delves into relevant studies that discuss economic growth and its factors of influence. Section 3 details the country sample, period of analysis and economic variables. Section 4 reports the empirical results, while Section 5 discusses the most important findings. Section 6 includes concluding remarks and policy implications along with study limitations and future research directions.

2. Literature Review

The following paragraphs will report on the latest research concerning economic growth and its determinants in the context of the African continent.

As previously mentioned, research studies on data from African countries have been increasingly stirring the interest of academics, professionals, and international organizations due to the economic growth potential of these nations. Consequently, numerous studies have investigated this phenomenon of economic growth through data from countries in Africa (Bhorat and Tarp 2016; Chitonge 2015; Cramer et al. 2020; Heshmati 2018; Hillbom and Green 2019; Langdon et al. 2018; Mills et al. 2017; Nnadozie and Jerome 2019; Noman et al. 2019; Noman and Stiglitz 2015; Radelet 2010; Raudino 2016; Seck 2015; Signé 2020).

Alok Sharma, a British politician, stated the following about economic growth: "Infrastructure is the backbone of economic growth. It improves access to basic services such as clean water and electricity, creates jobs and boosts business". For the majority of developing nations, national infrastructure can be developed and/or improved with the help of foreign direct investment (FDI) inflows, since such capital resources are generally doubled by an inflow of new technologies, materials, production, and management. For that matter, FDI is among the most important determinants of economic growth in Africa and is regarded as a fundamental strategy by governing authorities. Nevertheless, concerns have been raised by the dilemma regarding the type of influence exerted by FDI inflows on a country's economic growth (i.e., positive vs. negative).

In essence, the relationship between FDI and economic growth is rather complex and has been tackled by numerous studies in the literature (Balcilar et al. 2018; de Mello 2007; Gui-Diby 2014; Hansen and Rand 2006; Jenkins and Edwards 2006; Kukeli 2007; Koomsonet-Abekah and Nwaba 2018; Ndambiri et al. 2012; Olofin et al. 2019). For instance, by using data from 28 African countries for the period 2004–2014, Munemo (2018) showed that FDI had a positive impact on entrepreneurship and the development of national markets. Awolusi et al. (2017) investigated data from five African countries during the period 1980–2014 and reported that the impact of FDI was either limited or negligible.

In the opinion of Demirhan and Masca (2008), who examined data from 38 developing economies regarding the determinants of FDI inflows, growing economies are more prone to attracting foreign capital than large economies. The rationale is quite straightforward. In order to be incentivized and to commit their financial resources to one national economy and not another, foreign investors are given more opportunities, facilities and fiscal advantages (i.e., tax exemptions for a specific period) for their economic activities (Batrancea et al. 2018; Nichita et al. 2019). Through such competitive strategies, developing economies manage to attract foreign capital that generates job opportunities for national labor markets, contractual agreements with local suppliers, infrastructure development, and technological advancement.

Using macroeconomic data from Nigeria for the period 1970–2006, Oladipo (2010) reported a significantly positive long-term relationship between savings and economic growth. In addition, foreign direct investment was also identified as a significant predictor.

Using data from South Africa for the period 1995–2011, Gossel and Biekpe (2014) investigated the relationship between trade, capital inflows, and economic growth. According to their results, the growth in the economy of South Africa was generated by trade and fixed investment. In addition, the level of economic growth was significantly more dependent on exports than on imports, as expected.

Calderón et al. (2020) focused on studying the impact of trade integration on economic growth and the sources of economic growth, namely capital accumulation and total factor productivity growth. Empirical results estimated on 174 countries (including 45 Sub-Saharan nations) during the period 1970–2014 showed that economic growth was positively influenced by trade integration, as expected. Along the same trading lines, Kassim (2015) delves into how trade liberalization affects the growth of imports and exports in Sub-Saharan countries. Using 1975–2014 time-series data for Botswana, Malefane (2020) showed

that trade openness proxies (i.e., total trade to GDP, exports to GDP, trade openness index) fostered economic growth in the short and long run. The impact of trade openness proxied by the ratio of imports to GDP did not reach significance.

Chirwa and Odhiambo (2019) scrutinized economic growth under the potential impact of numerous macroeconomic variables, such as: investment, population growth, foreign aid, real exchange rate, trade openness, government consumption, and inflation. Using data from Zambia for the time spam 1970–2015, which was analyzed with lag distributed autoregressive models and Granger causality tests, the authors concluded that the phenomenon of economic growth was influenced both in the short run and in the long run by the aforementioned macroeconomic indicators.

Amusa (2014) focused on the South African economy during the period 1953–2008 to elicit the degree to which economic growth was shaped by variables such as household savings, government savings, and corporate savings. Econometric results showed that only corporate savings had a significant impact both in the short run and the long run. Namely, the level of economic growth augmented as the level of corporate savings increased. With data from the same country and almost the same period (i.e., 1950–2005), Odhiambo (2009) examined the link between savings and economic growth. Results indicated that the variables of interest established a bi-directional link in the short run and a unidirectional link in the long run, with economic growth being the predictor.

Adam et al. (2017) aimed to elicit the causal relationship between domestic savings and economic growth using data from 10 Sub-Saharan countries: Benin, Burkina Faso, Gambia, Ghana, Kenya, Madagascar, Malawi, Mali, Senegal, and South Africa. Empirical results estimated for the period 1964–2013 indicated that savings were a significant determinant of economic growth for only two countries, namely Mali and South Africa.

Ribaj and Mexhuani (2021) analyzed the impact of savings on economic growth in Kosovo during the period 2010–2017. With the help of financial data retrieved from 10 commercial banks, the authors reported that savings exerted a positive impact on the level of economic growth.

3. Materials and Methods

The data were retrieved from the World Bank database and were analyzed with the statistical software EViews 11.

The sample included 34 countries from various regions across the African continent, as follows: Angola, Algeria, Burkina Faso, Cameroon, Cape Verde, Central African Republic (CAR), Chad, Comoros, Burundi, Congo Democratic Republic, Eritrea, Ethiopia, Gambia, Ghana, Kenya, Liberia, Libya, Lesotho, Madagascar, Malawi, Mauritania, Mauritius, Morocco, Namibia, Nigeria, Rwanda, Senegal, Seychelles, Sierra Leone, Somalia, South Sudan, Sudan, Tunisia, and Uganda.

According to the 2019 World Bank[3] classification by income, our country sample included all four types of economies: low income economies (e.g., Burkina Faso, Eritrea, Sudan); lower-middle income economies (e.g., Angola, Algeria, Cape Verde); upper-middle-income economies (i.e., Libya, Namibia); high-income economies (e.g., Mauritius, Seychelles). Moreover, in terms of human development (United Nations Development Programme 2020), the sample featured countries with: very high human development (Mauritius); high human development (e.g., Algeria, Seychelles, Libya, Tunisia); medium human development (e.g., Cape Verde, Ghana, Morocco); low human development (e.g., Lesotho, Mauritania, Nigeria, Sierra Leone). In terms of the largest economies in 2019 by GDP value, our sample included four of the most important economic markets: Nigeria, Algeria, Angola, and Morocco.

The period of analysis covered 19 years, ranging from 2001 up to 2019. We particularly chose this time frame in order to cover the impact of the 2008 global financial crisis and to examine the most recent advancements of these African nations.

The variables of interest we selected for the study were the following:

- Gross domestic product growth rate (*GDP*), indicating in percentage points the annual growth of a national economy, as compared to the previous year. GDP comprises the gross value added and created by all resident producers of a national economy and product taxes, from which one subtracts any subsidies not reflected by the value of products;
- Gross domestic savings (*SAVINGS*), expressed as a percentage of GDP. It indicates annual savings within a national economy;
- Gross capital formation (*CAPITAL*), expressed as a percentage of GDP. It is determined by subtracting from GDP the value of final consumption expenditure;
- Imports of goods and services (*IMPORTS*), expressed as a percentage of GDP. It indicates the value of goods and services received by one country from the rest of the countries in the world;
- Exports of goods and services (*EXPORTS*), expressed as a percentage of GDP. It indicates the value of goods and services provided by one country to the rest of the countries in the world;
- Foreign direct investment—net inflows (*FDI_INF*), expressed as a percentage of GDP. It indicates the value of new investment inflows minus disinvestment in the national economy from foreign investors;
- Foreign direct investment—net outflows (*FDI_OUTF*), expressed as a percentage of GDP. It indicates the value of net investment outflows from the national economy to the rest of the countries in the world.

In order to answer our research question, we formulated the following hypotheses:

Hypothesis 1 (H1). *There is a significant relationship between gross domestic product growth rate (GDP) and imports, foreign direct investment inflows, foreign direct investment outflows, domestic savings, and capital formation.*

Hypothesis 2 (H2). *There is a significant relationship between gross domestic product growth rate (GDP) and exports, foreign direct investment inflows, foreign direct investment outflows, domestic savings, and capital formation.*

Hypothesis 3 (H3). *There is a significant relationship between domestic savings and imports, exports, foreign direct investment inflows, and foreign direct investment outflows.*

Hypothesis 4 (H4). *There is a significant relationship between domestic capital and imports, exports, foreign direct investment inflows, and foreign direct investment outflows.*

4. Results

This section will report the different types of analyses conducted on the variables of interest in order to examine the determinants of economic growth for our sample of African countries: gross domestic product, gross domestic savings, gross capital formation, imports, exports, foreign direct investment inflows, and foreign direct investment outflows.

The first round of analyses conducted by us included descriptive statistics (Table 1). According to the standard deviation values, the variables registering the largest volatility were imports and savings, while the variables with the smallest volatility were foreign direct investment outflows and GDP. In terms of skewness, six variables were right skewed and one variable was left skewed. Since kurtosis values for all the variables of interest exceeded the threshold of three, we could conclude that variables had a leptokurtic distribution. By means of the Jarque-Bera test, we investigated whether the data were normally distributed. Test results indicated that our variables were non-normally distributed at the 1% level of significance.

Table 1. Descriptive statistics.

	GDP	*SAVINGS*	*CAPITAL*	*IMPORTS*	*EXPORTS*	*FDI_INF*	*FDI_OUTF*
Mean	4.3880	10.1262	22.6341	43.2300	30.2883	4.3110	0.8212
Median	4.4700	12.4577	22.0519	35.5377	26.1182	2.5101	0.0848
Maximum	123.1396	67.7111	60.1562	236.3910	107.9944	103.3374	75.9995
Minimum	−62.0759	−141.9739	0.0000	8.9960	4.4288	−11.6248	−32.2327
Std. Dev.	7.7284	23.5938	9.5255	26.6207	18.6581	8.6459	6.0523
Skewness	4.1021	−2.0161	0.5442	2.7093	1.2186	6.9208	7.3041
Kurtosis	107.5453	12.1636	3.7710	15.0138	4.6605	64.5022	77.3435
Jarque-Bera	278,133.2 ***	2422.223 ***	43.0713 ***	4335.080 ***	217.0610 ***	99,849.60 ***	115,285.6 ***
Observations	607	580	581	599	599	603	482

Note: *** indicates significance at the 1% level.

The second round of analyses were focused on testing the correlations between the predictors in order to check for multicollinearity issues. The Pearson correlation coefficients are presented in Table 2.

Table 2. Correlation matrix.

	GDP	*SAVINGS*	*CAPITAL*	*IMPORTS*	*EXPORTS*	*FDI_INF*	*FDI_OUTF*
GDP	1						
SAVINGS	0.033	1					
CAPITAL	0.062	0.358	1				
IMPORTS	−0.019	−0.596 *	0.242	1			
EXPORTS	0.014	0.182	0.374	0.631 **	1		
FDI_INF	−0.014	−0.249	0.119	0.371	0.193	1	
FDI_OUTF	−0.022	−0.370	−0.040	0.379	0.118	0.524 *	1

Note: *, ** indicate significance at the 10% and 5% levels, respectively.

As can be seen from Table 2, all correlations registered low to moderate levels. Therefore, we concluded that multicollinearity would not pose any problems for the econometric estimations and conclusions derived from these estimations.

The third round of analyses focused on econometric estimations, for which we advanced the following econometric models:

$$GDP = \beta_1 + \beta_2 IMPORTS + \beta_3 FDI\_INF + \beta_4 FDI\_OUTF + \beta_5 SAVINGS + \beta_6 CAPITAL + \delta_i + \theta_t + \varepsilon_{it}$$

$$GDP = \beta_1 + \beta_2 EXPORTS + \beta_3 FDI\_INF + \beta_4 FDI\_OUTF + \beta_5 SAVINGS + \beta_6 CAPITAL + \delta_i + \theta_t + \varepsilon_{it}$$

$$SAVINGS = \beta_1 + \beta_2 IMPORTS + \beta_3 EXPORTS + \beta_4 FDI\_INF + \beta_5 FDI\_OUTF + \delta_i + \theta_t + \varepsilon_{it}$$

$$CAPITAL = \beta_1 + \beta_2 IMPORTS + \beta_3 EXPORTS + \beta_4 FDI\_INF + \beta_5 FDI\_OUTF + \delta_i + \theta_t + \varepsilon_{it}$$

where:

- β_1 indicates the intercept;
- $\beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ indicate the coefficients of the predictors;
- *GDP, SAVINGS, CAPITAL, IMPORTS, EXPORTS, FDI_INF, FDI_OUTF* indicate the variables of interest;
- i indicates the country;
- t indicates the period analyzed (i.e., 2001–2019);
- δ_i indicates the fixed effects that take into account country-specific factors;
- θ_t indicates the fixed effects that take into account common shocks (i.e., the 2008 global financial crisis);
- ε_{it} indicates the error term.

At this stage of the analyses, we ran the Redundant Fixed Effects test, which confirmed that panel modelling would be the most adequate approach to examine our data. Four

econometric models were tested with both cross-section effects and the generalized method of moments (GMM), for comparison purposes.

We used the Hausman test to indicate whether cross-section fixed effects or cross-section random effects would be the most suitable for our econometric models (Table 3). In case the null hypothesis was rejected ($p > 0.05$), we concluded that a random effects model would favor the econometric estimation (models three and four). Otherwise, we would run the econometric model with cross-section fixed effects (models one and two). In addition, since common shocks tend to influence dependent variables, we estimated our econometric models with and without time fixed effects.

Table 3. Econometric models with cross-section fixed and random effects.

	VIF	Model 1		VIF	Model 2		VIF	Model 3	VIF	Model 4
		GDP $= \beta_1 + \beta_2 IMPORTS$ $+ \beta_3 FDI\_INF$ $+ \beta_4 FDI\_OUTF$ $+ \beta_5 SAVINGS$ $+ \beta_6 CAPITAL + \delta_i$ $+ \theta_t + \varepsilon_{it}$			GDP $= \beta_1 + \beta_2 EXPORTS$ $+ \beta_3 FDI\_INF$ $+ \beta_4 FDI\_OUTF$ $+ \beta_5 SAVINGS$ $+ \beta_6 CAPITAL + \delta_i + \theta_t$ $+ \varepsilon_{it}$			$SAVINGS$ $= \beta_1$ $+ \beta_2 IMPORTS$ $+ \beta_3 EXPORTS$ $+ \beta_4 FDI\_INF$ $+ \beta_5 FDI\_OUTF$ $+ \delta_i + \theta_t + \varepsilon_{it}$		$CAPITAL$ $= \beta_1$ $+ \beta_2 IMPORTS$ $+ \beta_3 EXPORTS$ $+ \beta_4 FDI\_INF$ $+ \beta_5 FDI\_OUTF$ $+ \delta_i + \theta_t + \varepsilon_{it}$
Constant	-	−0.1978 (−0.1477)	0.3590 (0.2435)	-	−0.6146 (−0.4688)	−0.0262 (−0.0182)	-	20.4462 *** (12.6074)	-	17.9806 *** (11.1881)
$IMPORTS$	2.5895	0.0746 *** (3.0240)	0.0484 ** (2.0872)	-	-	-	2.0142	−0.9171 *** (−42.1674)	2.0156	0.0767 *** (3.7021)
$EXPORTS$	-	-	-	1.2222	0.1018 *** (4.2442)	0.0707 *** (2.9699)	1.7086	0.9721 *** (26.1539)	1.7117	0.0382 (1.0731)
FDI_INF	1.4659	0.0428 (1.2580)	0.0377 (1.0897)	1.4673	0.0449 (1.3034)	0.0409 (1.1563)	1.4490	0.0802 ** (2.1898)	1.4478	0.1227 *** (3.5279)
FDI_OUTF	1.5205	−0.0389 (−0.7345)	−0.0570 (−1.0409)	1.5177	−0.0491 (−0.9426)	−0.0653 (−1.1977)	1.4927	−0.1222 ** (−2.2476)	1.4917	−0.1325 *** (−2.5714)
$SAVINGS$	2.7108	0.0234 (0.4328)	−0.0009 (−0.0162)	1.3925	−0.0472 (−0.9659)	−0.0469 (−0.9315)		-		-
$CAPITAL$	1.8388	0.0374 (0.7087)	0.0766 (1.3767)	1.3304	0.0914 ** (2.0165)	0.1101 ** (2.1491)		-		-
Chi-square statistic	24.0353			29.6646			8.0228		5.2045	
Probability	0.0002			0.0000			0.0907		0.2670	
Cross-section effects		Fixed	Fixed		Fixed	Fixed		Random		Random
Time fixed effects		No	Yes		No	Yes		No		No
R^2		0.2033	0.2812		0.2188	0.2888		0.8093		0.0704
Adjusted R^2		0.1379	0.1868		0.1546	0.1953		0.8076		0.0620
F-statistic		3.1074	2.9793		3.4096	3.0913		472.1359		8.4027
Prob. > *F*		0.0000	0.0000		0.0000	0.0000		0.0000		0.0000
Observations		449	449		449	449		450		450

Note: Robust *t*-statistics are indicated in parentheses; **, *** denote statistical significance at the 5% and 1% levels. The probability of fixed effects not existing is denoted by Prob. > *F*. The White cross-section standard errors & covariance test rejected the null hypothesis of heteroscedasticity.

The variance inflation factor (VIF) estimates the degree to which the variance of a regression coefficient is inflated because of multicollinearity. Generally, when VIF values are between 5 and 10 it means that a high correlation might be present. Moreover, if VIF exceeds the threshold of 10, multicollinearity poses a real problem. As Table 3 shows, since VIF values for the independent variables across all models were below three, we concluded that there was a low risk of multicollinearity.

According to the first econometric model without time fixed effects, 13.79% of the variance in *GDP* was explained by the model ($F = 3.11$, $p < 0.001$). The only variable that reached significance was *IMPORTS*, which positively shaped *GDP*. Namely, when the predictor augmented by one unit, *GDP* would follow the same trend with 0.07 units. After running the model in the presence of time fixed effects, the portion of explained variance increased to 18.68% ($F = 2.98$, $p < 0.001$). Again, the variable *IMPORTS* was the only to generate a significant change in *GDP*: should the predictor increase by one unit, *GDP* would also increase by 0.05 units.

For the second econometric model estimated without time fixed effects, the portion of explained variance in *GDP* was 15.46% ($F = 3.41$, $p < 0.001$). In this case, the variables *EXPORTS* and *CAPITAL* had a relevant impact. That is, if *EXPORTS* rose by one unit, *GDP* would augment by 0.1 units. Moreover, a one-unit increase in *CAPITAL* would be followed by a 0.1-unit increase in *GDP*. The other variables did not reach significance.

The presence of the time fixed effects made the second model explain 19.53% of the *GDP* variance ($F = 3.09$, $p < 0.001$). In this context, *EXPORTS* and *CAPITAL* remained relevant predictors. Namely, a one-unit rise in *EXPORTS* would be mirrored by a 0.07-unit increase in *GDP*. Similarly, should *CAPITAL* improve by one unit, *GDP* would rise by 0.11 units.

For the third econometric model including cross-section random effects, the portion of predicted variance in *SAVINGS* was 80.76%, with $F = 472.14$, $p < 0.001$. All predictors proved to be significant at the 5% and 1% levels. *IMPORTS* and foreign direct investment outflows had a negative effect, while *EXPORTS* and foreign direct investment inflows exerted a positive effect. In this sense, when *IMPORTS* rose by one unit, *SAVINGS* would mitigate by 0.92 units. Should *EXPORTS* augment by one unit, gross domestic savings would also increase by 0.97 units. A one-unit increase in *FDI_INF* and *FDI_OUTF* would be followed by an increase of 0.08 units and a decrease of 0.12 units in *SAVINGS*, respectively.

According to the fourth econometric model with cross-section random effects, 6.20% of the variance in *CAPITAL* was explained ($F = 8.4$, $p < 0.001$). The predictors with a major impact on the dependent variable were *IMPORTS*, *FDI_INF*, and *FDI_OUTF*. The first two predictors exerted a positive influence, while the latter had a negative influence. Hence, a one-unit increase in *IMPORTS* and *FDI_INF* would be followed by an increase in *CAPITAL* of 0.08 units and 0.12 units, respectively. Should *FDI_OUTF* augment by one unit, *CAPITAL* would mitigate by 0.13 units. *EXPORTS* did not have a significant impact on the evolution of *CAPITAL*.

Both the third and the fourth models were estimated without time fixed effects. In their cases, we did not report the versions with time fixed effects since none of the predictors reached significance.

Hence, the first research hypothesis was confirmed by models one and two, while the second research hypothesis was confirmed by models three and four.

Table 4 displays the results of the unit root testing for the proxy of economic growth.

Table 4. Panel unit root test.

Series: GDP					Series: D(GDP)				
Method	Statistic	Probability *	Cross-Sections	Obs.	Method	Statistic	Probability *	Cross-Sections	Obs.
Null: unit root					Null: unit root				
Levin, Lin & Chu t	−12.0693	0.0000	33	563	Levin, Lin & Chu t	−25.8675	0.0000	33	522
Null: unit root					Null: unit root				
Im, Pesaran and Shin W-statistic	−10.9688	0.0000	33	563	Im, Pesaran and Shin W-statistic	−24.5623	0.0000	33	522
ADF—Fisher Chi-square	251.381	0.0000	33	563	ADF—Fisher Chi-square	560.595	0.0000	33	522
PP-Fisher chi-square	516.628	0.0000	33	574	PP—Fisher Chi-square	1873.564	0.0000	33	541

* Probabilities for Fisher tests were computed with an asymptotic chi-square distribution. All other tests assumed asymptotic normality.

Table 4 shows that the null hypothesis of the unit root was rejected at level and at first difference since $p < 0.05$. Therefore, the series had no unit root. Moreover, the Hadri test for stationarity (Table 5) confirmed the results and showed that the series was nonstationary.

Table 5. Hadri test for stationarity.

Method	Null Hypothesis: Stationarity; GDP; At Level		Null Hypothesis: Stationarity; D(GDP); At First Difference	
	Statistic	**Probability**	**Statistic**	**Probability**
Hadri Z-statistic	5.8122	0.0000	10.2880	0.0000
Heteroscedastic consistent Z-statistic	5.2288	0.0000	6.2580	0.0000
	Intermediate results on GDP		Intermediate results on D(GDP)	
	Cross section	**Variance HAC**	**Cross section**	**Variance HAC**
	Angola	61.7223	Angola	7.9846
	Algeria	4.6678	Algeria	2.9073
	Burkina Faso	2.2438	Burkina Faso	6.0300
	Cabo Verde	24.3382	Cabo Verde	2.1204
	Chad	124.9480	Chad	6.4503
	Cameroon	1.3181	Cameroon	0.2267
	Burundi	9.0696	Burundi	4.3654
	CAR	84.7997	CAR	10.7680
	Comoros	0.9868	Comoros	0.1740
	Congo Dem. Rep.	8.6089	Congo Dem. Rep.	4.8255
	Eritrea	24.0033	Eritrea	24.6238
	Ethiopia	13.2426	Ethiopia	1.7460
	Gambia	4.1131	Gambia	4.9768
	Ghana	9.8686	Ghana	2.5382
	Kenya	3.7208	Kenya	0.6771
	Liberia	79.5562	Liberia	15.2889
	Lesotho	6.9445	Lesotho	0.9289
	Libya	53.8847	Libya	130.6358
	Malawi	12.5929	Malawi	6.3624
	Madagascar	11.5469	Madagascar	3.1106
	Mauritania	20.4101	Mauritania	4.1008
	Mauritius	0.2393	Mauritius	0.3498
	Morocco	2.3888	Morocco	1.4141
	Namibia	14.4949	Namibia	7.2745
	Nigeria	24.2792	Nigeria	2.9728
	Rwanda	1.6322	Rwanda	1.5714
	Senegal	5.1869	Senegal	2.4629
	Seychelles	19.8889	Seychelles	2.4942
	Sierra Leone	40.3632	Sierra Leone	17.6634
	Somalia	dropped	Somalia	dropped
	South Sudan	57.2335	South Sudan	132.0136
	Sudan	31.2162	Sudan	7.5469
	Tunisia	5.5471	Tunisia	0.3992
	Uganda	5.8558	Uganda	0.7931

We also used the generalized method of moments (GMM) to estimate effects across our panel data (Table 6). The benefits of the GMM approach are at least threefold. In the first place, it makes use of both the cross-sectional and time dimensions of empirical data. Second, it controls for country fixed effects. Last but not least, GMM controls for the endogeneity of regressors.

The first econometric model indicated that the independent variables that reached significance were *IMPORTS* and *SAVINGS*, with both having a positive influence on *GDP*. Namely, when *IMPORTS* augmented by one unit, *GDP* would follow the same trend with 0.09 units. At the same time, if *SAVINGS* improved by one unit, economic growth would also increase by 0.04 units.

Table 6. Econometric models with the GMM estimator.

	Model 1	Model 2	Model 3	Model 4
	GDP $= \beta_1 + \beta_2 IMPORTS$ $+\beta_3 FDI\_INF$ $+\beta_4 FDI\_OUTF$ $+\beta_5 SAVINGS$ $+\beta_6 CAPITAL + \delta_i + \theta_t$ $+\varepsilon_{it}$	GDP $= \beta_1 + \beta_2 EXPORTS$ $+\beta_3 FDI\_INF$ $+\beta_4 FDI\_OUTF$ $+\beta_5 SAVINGS$ $+\beta_6 CAPITAL + \delta_i + \theta_t$ $+\varepsilon_{it}$	$SAVINGS$ $= \beta_1 + \beta_2 IMPORTS$ $+\beta_3 EXPORTS$ $+\beta_4 FDI\_INF$ $+\beta_5 FDI\_OUTF + \delta_i + \theta_t$ $+\varepsilon_{it}$	$CAPITAL$ $= \beta_1 + \beta_2 IMPORTS$ $+\beta_3 EXPORTS$ $+\beta_4 FDI\_INF$ $+\beta_5 FDI\_OUTF + \delta_i + \theta_t$ $+\varepsilon_{it}$
IMPORTS	0.0899 *** (8.5045)	-	−0.9090 *** (−99.1925)	0.2266 *** (10.0325)
EXPORTS	-	0.1007 *** (8.6707)	0.8552 *** (100.4261)	−0.2973 *** (−36.5457)
FDI_INF	0.0200 (0.5061)	0.0166 (0.4926)	0.0069 (0.3338)	0.1839 *** (17.2075)
FDI_OUTF	0.0619 (1.5457)	0.0542 (1.5036)	−0.0699 *** (−9.2276)	−0.0437 (−1.3209)
SAVINGS	0.0411 ** (2.3825)	−0.0423 *** (−4.7887)	-	-
CAPITAL	0.0006 (0.0115)	0.0668 (1.3852)	-	-
White period instrument weighting matrix	Yes	Yes	Yes	Yes
White period standard errors & covariance (d.f. corrected)	Yes	Yes	Yes	Yes
J-statistic	22.4025	22.3918	22.3370	26.4646
Prob(*J*-statistic)	0.4361	0.4367	0.4999	0.2794
Observations	385	385	386	385

Note: Robust *t*-statistics are indicated in parentheses; **, *** denote statistical significance at the 5% and 1% levels. The White cross-section standard errors & covariance test rejected the null hypothesis of heteroscedasticity. The Arellano-Bond test satisfied the validity of the instruments in the GMM estimator. Moreover, since the Hansen *J*-statistic of over-identifying restrictions is not significant ($p > 0.05$), the null hypothesis of valid instruments cannot be rejected. Therefore, the proposed models are valid.

In terms of the second econometric model investigating economic growth, *EXPORTS* and *SAVINGS* proved to be the relevant predictors. This time, when *EXPORTS* rose by one unit, *GDP* would augment by 0.1 units. Again, should *SAVINGS* improve by one unit, *GDP* would mitigate by 0.04 units.

The third econometric model showed that three of the four predictors proved to be significant. *IMPORTS* and *FDI_OUTF* had a negative effect, while *EXPORTS* exerted a positive effect. In this sense, when *IMPORTS* rose by one unit, *SAVINGS* would mitigate by 0.91 units. Should *EXPORTS* augment by one unit, gross domestic savings would also increase by 0.86 units. Moreover, a one-unit increase in *FDI_OUTF* would be followed by a decrease of 0.07 units in *SAVINGS*.

According to the fourth econometric model, the predictors with a considerable impact on the dependent variable were *IMPORTS*, *EXPORTS* and *FDI_INF*. Hence, a one-unit increase in *IMPORTS* and *FDI_INF* would be followed by an increase in *CAPITAL* of 0.22 units and 0.18 units, respectively. Should *EXPORTS* augment by one unit, *CAPITAL* would mitigate by 0.3 units.

5. Discussion

Econometric estimations conducted with both cross-section effects and the generalized method of moments elicited relevant results that confirmed our research hypotheses.

With regards to the *cross-section effects* estimations, the first econometric model examining the proxy of economic growth (i.e., GDP growth rate) showed that imports had a significant influence, as expected. Namely, imported goods and services that were traded within national economies could indicate a steady domestic demand and a growing economy. The net inflows and outflows of foreign direct investment did not generate a notable change in economic growth. In addition, the control variables such as gross domestic savings and gross capital formation did not reach significance either.

The second econometric model revealed another relevant result, namely that exports established a positive relationship with economic growth, according to our expectations. The predictor gross capital formation was also positively related. The impact of exports could mean that the African countries studied managed to increase their production output in various industry sectors and were also able to augment the number of people employed to support this output.

By comparing the first two econometric models, we noticed that the effect of exports exceeded the effect of imports, which is desirable for any economy. Especially in the case of developing African nations (the majority of our sample), economic growth can be considerably boosted via incentivizing and diversifying exports: namely, naturally abundant resources such as cocoa, coffee, diamonds, minerals, oil, precious metals, and timber (UNCTAD 2018). As a side note, we deem that a future investigation into the impact of net exports would be equally beneficial and relevant.

The other two econometric models focused on how gross domestic savings and gross capital formation would evolve under the impact of trade-related indicators, and FDI inflows and outflows.

With regards to savings, the negative influence of imports is in line with economic theory. That is, supplying citizens' needs with goods and services produced in other countries/regions/continents leads to higher sales prices (incorporating custom duties), which hinder citizens' saving capacity. The relevant impact of exports is straightforward: since prices for exported goods and services were higher than the ones set for the national market, exporting companies were able to increase the level of their sales revenue and ultimately their company savings.

In terms of gross capital formation, the positive impact of imports could be explained as follows: integrating additional goods and services within national economies is often based on also incorporating new technology, know-how, production facilities, and materials; in other words, capital. Consequently, such changes are reflected by an increase in capital formation. Results mirror the economic reality since numerous African countries (including the ones from our sample) rely heavily on imports for technological progress and materials in various fields such as communication, healthcare, nutrition, and transportation (Abrego et al. 2020; Haile et al. 2017; Zahonogo 2016).

According to our expectations, FDI inflows had a positive relationship with savings and capital, while FDI outflows had a negative relationship with both indicators.

The estimated impact of economic predictors obtained with the generalized method of moments was almost similar to the impact obtained via cross-section fixed and random effects. With respect to the evolution of economic growth, the impact of savings became relevant under the GMM approach. Moreover, exports of goods and services exerted a significant effect on the evolution of gross capital formation.

6. Conclusions

The findings of our study, conducted on 34 countries from the African continent with the help of panel data analysis, entail several policy implications for national authorities in Africa. First, national authorities and regional organizations are called to create more stable and efficient business environments in which companies are able to serve both national markets and international ones through exports. As mentioned before, due to their considerable natural resource endowment and strongly growing labor force, African countries can become more present on international markets by supplying valuable raw materials, fuel, and mining products. According to our estimations, exports had a highly significant effect on GDP growth rate, savings, and capital, as compared to imports. In this context, since there is strength in numbers, national governments from various countries across the continent should strive to close trade deals with regional authorities from other continents, similar to the ones established between the European Commission and the Economic Community of West African States (ECOWAS) or the Southern African Development Community (SADC). Second, authorities are called to facilitate FDI inflows,

which impact directly on the levels of savings and capital, and indirectly on the evolution of economic growth. The reason is obvious, considering the reliance of most African countries on imported goods and services (e.g., food and beverages; medicine and medical equipment; motor vehicles) for key areas within the economy. Last but not least, since FDI net outflows have a negative effect on savings and capital, efforts should be made to stimulate local investors to support development projects across the continent, instead of focusing on overseas markets.

With reference to the extant literature on the determinants of economic growth, our results entail similarities but also differences. In line with Gossel and Biekpe (2014), Oladipo (2010), Adam et al. (2017), and Ribaj and Mexhuani (2021), we also showed that economic growth was driven by exports, imports, and domestic savings. Unlike Anoruo and Ahmad (2002), and Odhiambo (2009), who found a bi-directional relationship between economic growth and savings, we did not explore the possibility of mutual causal impacts.

The present study has certain limitations, like any other empirical endeavor. First, the sample included only 34 countries across Africa. Future studies might consider including a bigger number of countries in order to test their research hypotheses. Second, our study did include a limited number of variables related to economic growth and factors of influence. Upcoming research might expand the set of indicators to explore the effects of other variables on African countries and countries from other continents. For that matter, comparisons between similar samples from various continents would lead to interesting insights. Third, the period of analysis covered nearly 20 years. Future investigations could expand the time frame to several decades in order to elicit other interesting insights on the evolution of economic growth.

All in all, it is true that countries in Africa have faced various challenges in their endeavors to secure economic growth, related to the following aspects: infrastructure (air, inland, and maritime transport); education and professional qualification of labor force; living conditions and the wellbeing of citizens; healthcare systems; fragmented investment policies; political instability and weak rule of law; security and life expectancy; governing systems prone to corruption, etc.

Nevertheless, during the last two decades, efforts have been made by governing authorities, international organizations, the business sector, and citizens alike to mitigate such shortcomings. As a consequence, business conditions have considerably improved and national economies have increased their productions of goods and services (African Development Bank 2021; African Development Bank et al. 2015; Signé and Johnson 2018). These positive changes registered by African countries embody altogether the words expressed by the South African leader Nelson Mandela, who stated that "when people are determined they can overcome anything". The African continent in general and African countries in particular possess innumerable natural and human resources that will facilitate economic growth in the upcoming years.

Abbreviations

The following abbreviations were used in the manuscript:

CAPITAL	Gross capital formation
CAR	Central African Republic
ECOWAS	Economic Community of West African States
EXPORTS	Exports of goods and services
FDI	Foreign direct investment
FDI_INF	Foreign direct investment, net inflows
FDI_OUTF	Foreign direct investment, net outflows
GDP	Gross domestic product
GMM	Generalized method of moments
IMPORTS	Imports of goods and services
SADC	Southern African Development Community
SAVINGS	Gross domestic savings
VIF	Variance inflation factor

Notes

1   https://www.ey.com/en_gl/tax/why-africa-is-becoming-a-bigger-player-in-the-global-economy (accessed on 10 March 2021).
2   https://www.worldbank.org/en/region/afr/overview (accessed on 10 March 2021).
3   https://datahelpdesk.worldbank.org/knowledgebase/articles/906519 (accessed on 20 February 2021).

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