Do Sovereign Credit Ratings Matter for Foreign Direct Investment: Evidence from Sub-Sahara African Countries

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ABSTRACT

This study examines the impact of sovereign credit ratings (SCR) on foreign direct investment (FDI) inflow of 20 SSA countries. In achieving this, the study uses the fixed effect model, fixed effect instrumental variable regression, and the bootstrap panel granger causality test proposed by Emirmahmutoglu and Kose (2011). There are three main important findings from this empirical study: (1) sovereign credit ratings have a significant and positive impact on FDI inflows in the region; this result is robust to sub-regional analysis, the instrumental regression model and an alternative measure of credit rating, (2) the impact of SCR on FDI increases after the global financial crises (GFC), and (3) there is a unidirectional causality running from SCR to FDI in SSA. In increasing foreign investors' appetite, this study recommends that SSA countries get rated, and the ones rated should put in place appropriate policies to get better ratings.

JEL classification: F30; G15; F23

Keywords: Foreign direct investment, Sovereign credit ratings, Global financial crises Bootstrap panel Granger causality test, and Sub-Sahara African Countries

1.0 Introduction

FDI is a type of cross-border investment that gives investors a significant degree of control over the administration of a company resident in another country. The seminal theoretical work of Dunning and Lundan (2008) explains why multinational enterprises (MNEs) invest abroad using the "OLI" framework. This theory suggests that MNEs invest abroad if ownership advantages ("O"), such as property rights and trademarks, are combined with locational advantages ("L"), such as market potential or low production cost, and possible advantage from internationalization ("I") of manufacturing process in other countries. The trade impact of FDI depends on whether the multinational enterprise's objective is to gain access to the consumer

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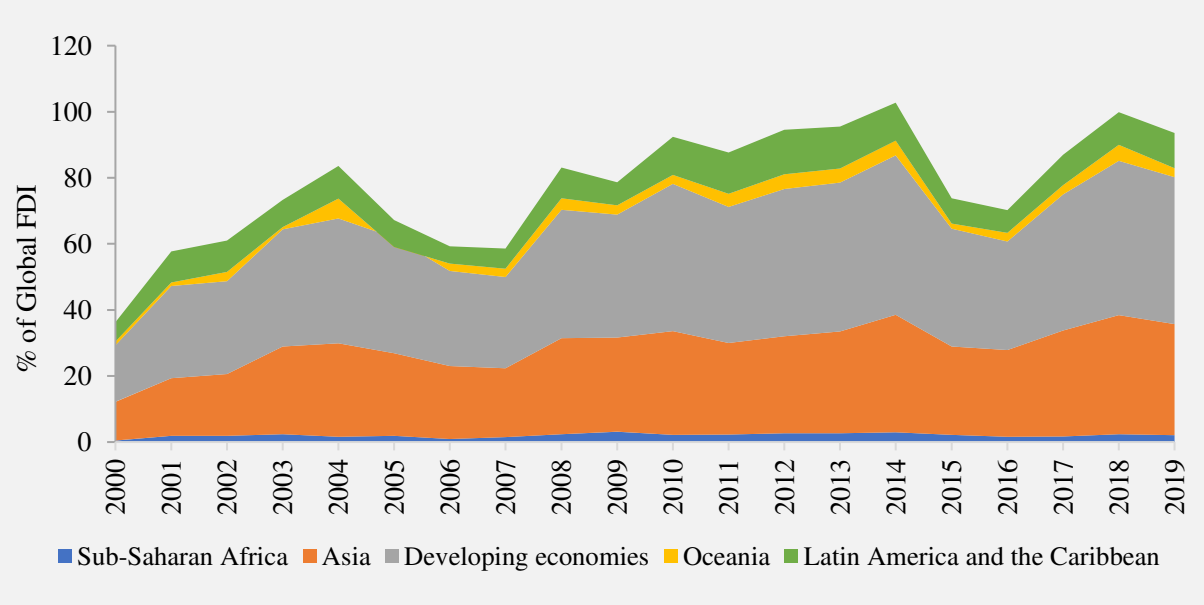
markets, natural resources, or exploit the host country's strategic assets such as research and development skills and the locational comparative advantages.

The need for FDI as an important source of external finance is driven by the high level of poverty in many SSA countries[2]. This suggests a lack of domestic savings mobilization potential for investment. Furthermore, in reducing the savings-investment gap[3], many countries have put in place FDI-friendly policies[4] to enhance the appetite of foreign investors and promote growth. However, despite these policies and reforms, the region's share of FDI as a percentage of global FDI remains the lowest, as the continent continue to lag behind other developing regions. For instance, as indicated in Figure 1, the share of SSA's FDI flow is approximately 2.1 percent in 2019 compared to 0.47 percent in 2000 (UNCTAD, 2020).

Figure 1: Distribution of Global FDI



Source: UNCTAD database 2020

Although a vast number of empirical research on the drivers of FDI have been undertaken, there is no consensus on the key determinant of FDI. The first strand of literature holds that a recipient country's ability to mobilize savings, increase capital allocation efficiency, and hence

[2]Using the $1.90 as a benchmark, the World Bank (2019) stipulate that the number of extremely poor population as at 2018 is 403.4 million, and this represents about 49 percent of the population

[3]Between 2010 and 2018, the average savings-investment gap in SSA was about -1.51 percent of GDP (World Bank 2019).

[4]In 2017, at least 126 investment policy measures and reforms were adopted by about 65 economies around the world, including the simplification of investment procedures, creation of new special economic zones (SEZs), liberalization of domestic markets, and the privatization of state-owned assets (For a complete description of these measures, see the 2018 World Investment Report).

attract FDI flows is determined by its level of financial development (Desbordes and Wei, 2017; Nkoa, 2018; Kaur et al., 2013). The second strand of literature argues that the larger the recipient country's total income and potential for development and trade openness, the greater the amount of FDI it can attract. For instance, studies like Jaiblai and Shenai (2019), Kumari and Sharma (2017), Druppers (2017) conclude that trade openness and market size are important critical drivers of foreign investment. The third strand of literature argues that countries with robust institutions create healthy competition for domestic and foreign companies, which significantly influences FDI (Paul and Jadhav, 2019; Turedi, 2018).

There is no empirical literature on the impact of sovereign credit ratings on FDI inflow to Africa, to the best of the authors' knowledge. The closest attempt is that of Cai et al. (2018), Chen et al. (2013), and De et al. (2021). These studies were done for emerging, Organisation for Economic Co-operation and Development (OECD) and frontier economies, excluding many African countries. Scholars such as Barron and Ni (2008) and Nieuwerburgh and Veldkamp (2009) suggest that third-party sovereign credit ratings are a valuable source of information for cross-border investors because they minimize information asymmetry in global financial markets. This study is novel in a number of ways: (i) the study seeks to examine the effect of sovereign credit ratings (Standard & Poor and Fitch) on FDI in SSA, (ii) identify the direction of causality between FDI and sovereign credit ratings using the Emirmahmutoglu and Kose (2011) causality test, (iii) evaluate whether the impact of credit ratings on FDI in the region has changed after the financial crisis, and (iv) assess whether there are regional differences on the impact of sovereign credit rating on FDI.

Undertaking this study for the region is vital for the following reasons: (1) given the importance of FDI as an alternative source of financing development, understanding whether sovereign credit ratings influence the appetite of multinational corporations to SSA countries is crucial, (2) one of the biggest challenges facing African economies is how to finance economic development, the study is important for the region as it seeks to analyse how countries with high credit rating can access long term development funding, and (3) Given that credit rating agencies (CRAs) have been heavily chastised for their failure to predict systemic and market risk during the global financial crises (GFC), an empirical study of this nature is critical for policymakers, as it would show whether investors' reliance on sovereign credit ratings has changed over time.

This study empirically examines the impact of SCR on FDI in SSA. This study is summarized as follows: (1) Sovereign credit rating is a critical driver of FDI in SSA, (2) after global financial crises, the influence of SCR on FDI increases, and (3) there is one-way causation running from SCR to FDI in the region.

The remainder of this document is organized as follows: Section 2 presents the theoretical relationship between SCR and FDI. The methodology and estimating methodologies are explained in Section 3. Section 4 presents and discusses the empirical estimation, while section 5 concludes and provides important policy implications.

2.0 Theoretical linkage between sovereign credit rating and FDI

Sovereign credit ratings are leading qualitative indicators which show the likelihood of a default by the rated sovereign. The ratings summarise a country's willingness and ability to pay back its debt obligation both in interest and principal on time. According to Afonso and Gomes (2007) and Pretorius and Botha (2016), the importance of sovereign credit rating can be summarized in two ways. First, credit ratings are a major driver of a sovereign's interest rates or borrowing costs in the international financial market. This means that a lower sovereign rating signifies a higher cost of borrowing in the global financial market. Second, the sovereign credit ratings are crucial for investors' access into a market, as it gives a potential investor an idea of the risk level of the host economy. Similarly, Pavlova and Rigobon (2008) and Hartmann et al. (2004) argue that sovereign credit changes may influence physical investment through its impact on cost of capital. A flight-to-safety will induce foreign investors to shift away capital from a riskier environment to the safest possible market. According to Reinhart and Rogoff (2004), capital flows from rich countries to poor countries is determined by the creditworthiness of the sovereign. When the rating of a sovereign is downgraded (and higher country risk), investors may move capital from high-risk countries with volatile economic conditions, political disorder to less risky markets. Therefore, it is anticipated that sovereign credit downgrade may increase net capital outflow, which raises the cost of capital and risk-free rate (Sandleris, 2008).

3.0 Data and methodology

3.1 Data

The analysis of this study leans on an unbalanced panel dataset of 20 countries (see Appendix 1 for full details of the countries) in SSA, with annual data over the period of 2007-2019. The choice of countries and period were dictated by the availability of data. Furthermore, the

regional analysis (see Appendix 1 for a list of countries in each region) was conducted to examine if there are regional differences on the impact of SCRs. Fitch, Standard & Poor's, and Moody's are the three biggest credit rating agencies, with a combined market share of around 95% in the provision of sovereign credit ratings (Alessi et al., 2013). However, due to missing observations for many SSA countries for Moody's rating, this study relies only on credit rating information from Fitch and Standard and Poor[5]. In the analysis of this study, we follow Cai et al. (2018), Chen et al. (2013), and De et al. (2021) by transforming the ratings into numerical scores, as detailed in Appendix 2. The sovereign rating grades range from AAA to D, with AAA being the highest and D being the lowest. We assign numerical values on a linear scale for each of the rating grades of the three agencies, ranging from 20 for AAA to 0 for D. We then calculate average ratings for both S&P and Fitch to get a proxy for the overall sovereign credit rating[6]. For our main empirical research, we used foreign currency debt scores, and for robustness tests, we used local currency debt ratings.

In the analysis of this study, we follow Nunnenkamp (2004) by using the inward FDI stock. Using FDI stock also reduces endogeneity biases that may exist in the model. The FDI data is transformed into a log to ensure that we have an approximately normal distribution. Natural resources availability is measured by total natural resource rents (% of GDP). Studies such as Asongu et al. (2018) have also used it in their FDI model. Money supply (% of GDP) is used as a measure of financial development. Desbordes and Wei, (2017), Nkoa (2018) also used it in their FDI model. We also included macroeconomic stability variable; this is measured by an annual change in GDP deflator. Nsiah and Wu (2014), among others, have used the same variable. We adapt the study of Garretsen and Peeters (2009) by including the log of population; this is a measure of market size and effective demand. We also introduced trade openness variable in the model, following Kumari and Sharma (2017)'s argument that countries with open economy attract more FDI inflows. Trade openness is measured by the sum of export and import divided by the gross domestic product. We followed Jaiblai and Shenai (2019) by including infrastructure in the model. Infrastructure is measured by mobile cellular subscriptions (per 100 people).

[5]In avoiding problem associated with overlapping data, this study used only the most recent credit rating data for country who experience several rating changes in a year.
[6]In situation where there is a missing observation for any country within the sample, we use the only available credit rating information.

3.1.1 Descriptive statistics of the variables

Table 1 provides descriptive statistics of the variables and the sources of the data**.** It is observed that FDI inflow to the selected SSA countries between 2007 and 2019 ranged from $88.2 million to $179.6 billion, with an average of $18.2 billion and a standard deviation of $33.1 billion. The average value of the credit ratings (Fitch, S&P and overall index) is 6; this indicates the presence of credit risks in SSA. The maximum credit rating value for Fitch, S&P, and the overall index is 13, 15, and 13 respectively. Mozambique and Zambia have a minimum credit rating of zero for Fitch, S&P and the overall rating. In addition to the descriptive statistics, the pairwise correlation of independent variables presented in Appendix 3 indicates a potential absence of multicollinearity.

Table 1: Summary statistics of the variables

VARIABLES	N	mean	SD	Min	Max	Data Source
Fitch SCR	295	6.061	3.248	0	13	Fitch SCR
S&P SCR	295	6.122	3.830	0	15	S&P SCR
Overall SCR	295	6.092	2.249	0	13	Fitch and S&P SCR
Inward FDI stock ($'Million)	295	18,282	33,051	88.23	179,565	UNCTAD
Financial Development	288	35.95	20.09	11.45	104.6	W/B, WDI
Population (Million)	295	28.56	38.59	0.45	201.00	W/B, WDI
Natural Resources (% of GDP)	274	9.794	9.817	0.379	54.92	W/B, WDI
Infrastructure	286	68.56	42.48	2.254	173.8	W/B, WDI
Inflation	295	6.891	10.21	-29.69	83.85	W/B, WDI

NB: United Nations Conference on Trade and Development (UNCTAD), World Bank World Development Indicator (W/B, WDI), Fitch Sovereign Credit Rating, Standard and Poor Sovereign Credit Rating (S&P SCR).

3.2 Methodology

In setting up the empirical model of this study, we follow other empirical studies such as Cai et al. (2018) and Chen et al. (2013) by using a fixed-effect model. The model is specified as follow:

$$FDI_{i,t} = \beta_0 + \beta_1 SCR_{i,t} + \beta_2 X_{i,t} + \tau_t + \varphi_i + \mu_{i,t} \quad (1)$$

Where β_0 is the constant, φ_i is the time-invariant country-specific effect, τ_t is time fixed effect and $\mu_{i,t}$ is the error term, $lnFDI$ measured by log of FDI stock inflow is an NT $\times$ 1 vector of a cross-sectional unit stacked by period. Sovereign credit rating (SCR_{it}) is the main variable of interest. In this study, we used Fitch, S&P and the overall index. In mitigating the problem of multicollinearity which may arise from high correlation among the credit rating data (see

Appendix 3), we use a separate model for each of the rating data. $X_{i,t}$ is a vector of control variables which include population, trade openness, financial sector development, inflation, natural resource availability, and infrastructure level.

For the robustness check of our empirical estimation, we augment the baseline model presented in equation 1 by addressing endogeneity. The fixed-effect instrumental variable (FE-IV) is motivated by the possible simultaneity bias between FDI and sovereign credit ratings. The choice of our instrumental variable (lag of sovereign credit rating) is informed by two conditions: instrument relevant condition (see equation 2.0) and exogeneity condition of the instrument (see equation 2.1). This study assumes that the lag of sovereign credit ratings influences sovereign credit ratings through the first-stage estimations. The model is expressed thus as:

$$cov\left(SCR_{i,t-n}, SCR_{i,t}\right) \neq 0 \tag{2.0}$$

$$cov\left(SCR_{i,t-n}, \varepsilon_{i,t}\right) = 0 \tag{2.1}$$

The general equation used for OLS estimation:

$$FDI_{i,t} = \emptyset + \alpha_1 SCR_{i,t} + X^*_{i,t}\gamma + \tau_t + \varphi_i + v_{i,t} \tag{3.0}$$

$$SCR_{i,t} = \beta_0 + \beta_1 SCR_{i,t-1} + \beta_3 X_{i,t} + \tau_t + \varphi_i + \mu_{i,t} \tag{3.1}$$

Equation (3.1) is the first stage of the FE-2SLS model and equation (3.0) is the second stage. In this study, the probability value of the F-test in equation (3.1) is used as an instrument relevance test, and the Durbin-Hausman test is used to determine endogeneity.

3.2.1 Cross-sectional Dependence and Slope Homogeneity Test

Studies such as Cai (2018) have argued that addressing cross-country dependence (CD) is crucial due to the potential cross-country spillover on the effect of sovereign credit ratings on FDI. Herzer and Vollmer (2012) also posit that cross-sectional dependence may lead to spurious regression if the error (ε_{it}) are dependent across units. Similarly, other studies like Herzer and Donaubauer (2018) and Bayar and Gavriletea (2018) suggest that ignoring cross-country heterogeneity may lead to bias estimates of the empirical results. In testing whether cross-sectional dependence exist in the model presented in equation (3.0), we used three different CD test: the Q distribution (T- asymptotically distributed) test developed by Frees (1995), the chi-squared distributed test proposed by Friedman (1937), and the recently developed standard normal distribution test by Pesaran (2004). The specification of the CD test is defined as:

$$CD = \sqrt{\frac{2T}{N(N-1)}}\left(\sum_{i=1}^{N-1}\sum_{j=i+1}^{N}\widehat{\rho_{ij}}\right) \quad (4)$$

$$\widehat{\rho_{ij}} = \widehat{\rho_{ji}} = \frac{\sum_{t=1}^{T}\varepsilon_{it}\varepsilon_{it}}{(\sum_{t=1}^{T}\varepsilon_{it}^2)^{1/2}(\sum_{t=1}^{T}\varepsilon_{jt}^2)^{1/2}} \quad (5)$$

Equation (5) presents the pairwise correlation estimates of the model's residuals (ε_{it}). The CD test is examined under the null hypothesis of no cross-sectional dependence. For slope homoegeniety test, we follow Pesaran and Yamagata (2008) by specifying the following model:

$$\dot{\Delta} = \sqrt{N}\left(\frac{N^{-1}S - \dot{k}}{\sqrt{2k}}\right) \quad (6)$$

$$\dot{\Delta}_{adj} = \sqrt{N}\left(\frac{N^{-1}S - E(\acute{z}_{iT})}{\sqrt{Var(\acute{z}_{iT})}}\right) \quad (7)$$

$$E(\acute{z}_{iT}) = k, \quad Var(\acute{z}_{iT}) = \frac{2k(T-k-1)}{T+1}$$

Where k is the number of regressors, and S is the Swamy (1970) test statistics. This is used in testing for slope homogeneity.

3.2.2 Bootstrap Panel Granger causality test

In analysing the direction of causality between FDI and sovereign credit ratings. This study uses the panel Granger causality developed by Emirmahmutoglu and Kose (2011). This test extends the Toda and Yamamoto (1995) lag-augmented vector autoregression (LA-VAR). The test also addresses potential heterogeneity and cross-sectional dependence that may exist in the model. In examining the granger causality in heterogeneous mixed panels, we considered the level VAR model with $L_i + dmax_i$ as specified below:

$$y_{i,t} = \delta_{1i} + \sum_{j=1}^{L_i+dmax_i}\alpha_{1i,jy_{i,t-j}} + \sum_{j=1}^{L_i+dmax_i}\beta_{1i,jx_{i,t-j}} + \varepsilon_{1i,t} \quad (8)$$

$$x_{i,t} = \delta_{2i} + \sum_{j=1}^{L_i+dmax_i}\alpha_{2i,jy_{i,t-j}} + \sum_{j=1}^{L_i+dmax_i}\beta_{2i,jx_{i,t-j}} + \varepsilon_{2i,t} \quad (9)$$

Where i denotes the individual cross-sectional units, t is the time dimension, $\varepsilon_{1i,t}$ and $\varepsilon_{2i,t}$ are the error terms, L_i is the lag structure that may vary across the cross-sectional units[7], the $dmax_i$ is the maximum integration order for each cross-sectional unit (i), which is determined using

[7] The Akaike information criteria (AIC) is used to determine the optimal lag length

the Augmented Dickey-Fuller test. For the Granger causality in the system, the null and alternative hypotheses are specified as follows:

$$H_0:\ \beta_{i,j} = 0\ \ \forall_i = 1, \ldots\ldots N \tag{10}$$

$$H_1:\ \beta_{i,j} = 0\ \ \forall_i = 1, \ldots\ldots N_1; \tag{11}$$

$$\beta_{i,j} \neq 0\ \ \forall_i = N_1 + 1, \ldots\ldots\ldots N$$

The null hypothesis stipulates that for all i in equation (8), $x_{i,t}$ does not Granger cause $y_{i,t}$ and $y_{i,t}$ does not granger cause $x_{i,t}$ for all i in equation in equation (9). The individual Wald statistics is used to compute the p-values for each country in the Emirmahmutoglu and Kose (2011) causality test. The specification of the Fisher test λ is also obtained as follows:

$$\lambda = -2\sum_{i=1}^{N} In(p_i) \tag{12}$$

The test statistics has a chi-square distribution with 2N degree of freedom; it is only valid if N is fixed and $T \to \infty$. Since the distribution of the Fisher test statistic is not valid when the model suffers from cross-sectional dependency, the test utilizes the bootstrap methodology for cross-sectional dependent panels.

4.0 Empirical Results and Discussion

4.1 Baseline Results

The baseline results on the impact of sovereign credit rating on FDI in SSA is presented in Table 2. The empirical results provide evidence for the positive effect of host countries' credit ratings on FDI flows to SSA. This is shown by the positive sign and significance of Fitch, S&P and the overall credit rating index. The positive relationship signifies that sovereign with high credit ratings attract more inflow of FDI. This finding is in tandem with the empirical outcome Cai et al. (2018), Chen et al. (2013), and De et al. (2021) that argue that countries with sound macroeconomic environment attract a significant foreign investment. Kiff et al. (2010) also conclude that a higher credit rating assists sovereigns in attracting more investments since the credit rating indicates the country's overall investment climate.

The control variables are generally having the expected signs and are statistically significant. The study finds that the coefficient of population measured as effective demand has a positive and statistically significant impact on FDI inflow. This result is consistent with the empirical outcomes of Kumari and Sharma (2017) and Asongu (2013) conclusion that larger regions

attract FDI significantly due to higher propensity to consume, elevated aggregate consumer demand, and abundance of labour supply, which in turn results to cheap labour. The coefficient of natural resource has a significant and positive relationship with inward FDI. This indicates that multinational corporations are attracted by the natural resources availability in host countries. Studies like Lu et al. (2020) and Bokpin et al. (2015) also found similar results. The statistically significant and positive relationship between the financial development measure and FDI inflow corroborate with the argument of Desbordes and Wei (2017), Nkoa (2018), Kaur et al. (2013) that the degree of financial development determines its ability to attract FDI flows. The negative sign of inflation measured by macroeconomic stability suggests that a higher level of inflation is a recipe for macroeconomic instability, thus reducing FDI flow to the region. Studies such as Rodríguez-Pose and Cols (2017) and Nsiah and Wu (2014) found similar results.

Furthermore, the coefficients of trade openness suggest that foreign investment are more likely to flow to countries with a high degree of trade openness (i.e., stable foreign exchange regimes, lower investment barriers, and larger trade flows). Additionally, a more open economy attracts more FDI due to the higher transaction costs associate with trade protections (Druppers, 2017; Kumari and Sharma, 2017). The positive and significant impact of infrastructure is also in tandem with the findings of Jaiblai and Shenai (2019) that the level of a country's infrastructure determines the quantity of FDI it can attract. The empirical result is also robust to the fixed effect instrumental model, which addresses the problem of endogeneity that may arise from reverse causality from FDI to sovereign credit ratings and a possible correlation between SCRs and the residuals.

4.2: Robustness check – Impact of local denominated SCR on FDI in SSA

As earlier mentioned in this study that local currency debt will be used as an alternative measure of credit rating for robustness check. Our empirical findings, as shown in Appendix 4, denote that the impact of sovereign credit ratings on FDI inflows does not depend on the type of credit rating (foreign or local debt score). The coefficient of Fitch, S&P and the overall index are positively signed and significant. This stipulates that SSA countries' foreign currency does not significantly differ from the local currency rating[8]. Cai et al. (2018) also found similar results for OECD countries. The estimates of the control variables conform with the estimates presented in Table 2.

[8]When an obligor's capacity to meet its debt obligation in its local currency differs from obligations denominated in a foreign currency, the obligor's foreign currency credit rating would differs from its local currency credit rating.

Table 2: Impact of Sovereign Credit Ratings on FDI in Sub-Sahara Africa

	Fixed Effect Model			Fixed Effect Instrumental Model		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Fitch SCR	S&P SCR	Overall SCR	Fitch SCR	S&P SCR	Overall SCR
Sovereign Credit Ratings	0.0644***	0.0330***	0.0604***	0.0933***	0.0398**	0.0714***
	(0.0212)	(0.0122)	(0.0181)	(0.0353)	(0.0161)	(0.0235)
Inflation	-0.00107	-0.00215	-0.00166	-0.000321	-0.00132	-0.000922
	(0.00211)	(0.00209)	(0.00207)	(0.00209)	(0.00204)	(0.00204)
Natural Resource	0.0230***	0.0234***	0.0231***	0.0235***	0.0236***	0.0236***
	(0.00475)	(0.00476)	(0.00473)	(0.00477)	(0.00474)	(0.00474)
Financial Development	0.00724*	0.00749*	0.00710*	0.00678*	0.00804**	0.00740*
	(0.00396)	(0.00397)	(0.00395)	(0.00408)	(0.00400)	(0.00401)
Trade Openness	0.00324***	0.00329***	0.00338***	0.00371***	0.00384***	0.00391***
	(0.00107)	(0.00107)	(0.00106)	(0.00109)	(0.00109)	(0.00109)
Infrastructure	0.00264***	0.00278***	0.00255***	0.00218**	0.00232**	0.00209**
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Population	5.298***	5.184***	5.278***	5.459***	5.266***	5.393***
	(0.333)	(0.329)	(0.330)	(0.363)	(0.340)	(0.347)
Constant	-78.83***	-76.81***	-78.47***	-81.59***	-78.20***	-80.41***
	(5.388)	(5.298)	(5.319)	(5.921)	(5.489)	(5.623)
R-squared	0.843	0.842	0.844	0.3748	0.4741	0.4616
Prob > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Endogeneity Test	-	-	-	0.0759	0.1952	0.0542
Instrument relevance	-	-	-	0.0000	0.0000	0.0000
Observations	268	268	268	248	248	248
Number of Countries	20	20	20	20	20	20

Standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%. All regressions are estimated using fixed-effect and fixed-effect instrumental regression estimators. The random effect estimates and Hausman test are available on request. Fitch SCR and S&P SCR represent Fitch sovereign credit rating and Standard and Poor credit rating, while the overall is the average of both Fitch and Standard and Poor. The endogeneity test suggests that the lag of sovereign credit ratings is endogenous in all the models except column 5. Instrument relevance is the probability value of the F-test in the reduced model.

4.3: GFC Effect - Impact of SCR on FDI in Sub-Sahara Africa

Despite the importance of sovereign credit ratings for investors' access to markets, there has been some question about their reliability in recent years. More specifically, some scholars have heavily criticized the role of credit rating agencies (CRAs). They interrogated their capacity to foresee systemic market risk, which lead to economic downturns. This study examines whether the impact of ratings on FDI has changed between the pre- and post-financial crisis periods. In controlling for the impact of the crises, equation 1 is extended to include a dummy variable that takes the value of zero in the year before the crises, and one in the period the countries experience the crises. Furthermore, an interaction term of the crises dummy with the sovereign credit rating is included in the model. The sum of the coefficients of the main variable (SCR) and interaction term coefficient is used to calculate the entire effect of the crisis. The t-statistic of the total effect is computed using the standard error of this linear combination.

From the empirical results in Table 3, the effect of sovereign credit ratings on FDI in the pre-crises period is positive and insignificant for S&P and the overall index. However, the effect of Fitch credit rating on FDI is significant before the crises. Furthermore, the total impact of ratings on FDI after the GFC crisis is positive and statistically significant, though Fitch rating impact is insignificant. We can conclude that investor's dependence on sovereign credit ratings has evolved over time. This finding is in tandem with the empirical outcome of Violante (2016), who argue that SCR increases FDI post-financial crises. However, our empirical result is not in tandem with the initial hypothesis of Reinhart (2002) and Cantor and Packer (1994), who argued that credit rating is less important after a crisis. This result is also robust to the fixed-effect instrumental regression model, which addresses endogeneity in the model.

4.4: The impact of regional sovereign rating on FDI flows

After examining the effect of sovereign credit ratings on FDI in SSA as a group, this section further examines whether there is a regional difference in terms of the impact of SCR. This is to assess whether SCR's impact on FDI is sensitive to regional classification. The results, as shown in Table 4 suggest that the impact of sovereign credit on FDI is not subject to regional classification. SCRs have a positive and statistically significant impact on FDI across all the sub-regions in SSA.

Table 3: GFC Effect - Impact of Sovereign Credit Rating on FDI in Sub-Sahara Africa

	Fixed Effect Model			Fixed Effect Instrumental Model		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Fitch SCR	S&P SCR	Overall SCR	Fitch SCR	S&P SCR	Overall SCR
GFC Crises Dummy	0.161	0.119	0.156	0.382***	0.0822	0.0257
	(0.108)	(0.104)	(0.201)	(0.134)	(0.315)	(1.029)
Sovereign Credit rating	0.0459*	0.0296	0.0555	0.127**	0.0275	0.0498
	(0.0277)	(0.0194)	(0.0359)	(0.0583)	(0.0503)	(0.159)
Post GFC rating interaction	-0.00810	0.00402	-0.00381	-0.0422*	0.0146	0.0242
	(0.0176)	(0.0144)	(0.0340)	(0.0225)	(0.0511)	(0.177)
Population	5.591***	5.686***	5.716***	5.761***	5.786***	5.924***
	(0.390)	(0.385)	(0.393)	(0.418)	(0.398)	(0.515)
Inflation	-0.00399	-0.00440*	-0.00393	-0.00301	-0.00336	-0.00276
	(0.00259)	(0.00250)	(0.00253)	(0.00253)	(0.00243)	(0.00278)
Natural Resource	0.0253***	0.0251***	0.0252***	0.0248***	0.0245***	0.0252***
	(0.00496)	(0.00493)	(0.00489)	(0.00492)	(0.00500)	(0.00485)
Financial Development	0.00250	0.00106	0.00172	0.00175	0.00171	0.00247
	(0.00455)	(0.00453)	(0.00448)	(0.00460)	(0.00474)	(0.00454)
Trade Openness	0.00365***	0.00401***	0.00389***	0.00449***	0.00477***	0.00461***
	(0.00111)	(0.00113)	(0.00111)	(0.00113)	(0.00121)	(0.00113)
Infrastructure	0.00266**	0.00230**	0.00226**	0.00251**	0.00204*	0.00177
	(0.00109)	(0.00109)	(0.00111)	(0.00111)	(0.00111)	(0.00143)
Total effect of SCR	0.0378	0.0336*	0.0517*	0.0848	0.0421*	0.0740**
	(1.4300)	(2.7300)	(3.000)	(4.060)	(4.950)	6.38
R-squared	0.845	0.847	0.847	0.845	0.737	0.848
Prob > χ^2	122.72	124.56	124.94	113.58	115659	190283
Endogeneity Test				0.1668	0.2819	0.0816
Instrument relevance				0.0000	0.0000	0.0000
Number of Countries	20	20	20	20	20	20

Standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%. All regressions are estimated using fixed-effect and fixed-effect instrumental regression estimators. The random effect estimates and Hausman test are available on request. Fitch SCR and S&P SCR represent Fitch sovereign credit rating and Standard and Poor credit rating, while the overall is the average of both Fitch and Standard and Poor. The endogeneity test suggests that sovereign credit ratings is endogenous in column 6. Instrument relevance is the probability value of the F-test in the reduced model.

4.5: Bootstrap Granger Causality Results of Sovereign Credit Ratings and FDI in SSA

In analysing the causal relationship between SCR and FDI in SSA, we followed other studies like Espoir et al. (2021) and Akyuz et al. (2020) by testing for slope homogeneity and cross-sectional dependence of the cross-sectional units. This study uses three different tests ($CD_{pesaran}, CD_{Frees}, CD_{Friedman}$) to determine the presence of cross-sectional dependence in the model. The three tests were performed on the residuals of the baselined fixed-effect model presented in Table 2. The results, as shown in Table 5 suggest that the p-value of the three tests is not significant, signifying the absence of cross-sectional dependence in our empirical model. In addition to the cross-sectional dependence test, this study also tests for slope homogeneity of the model. The p-value of $\dot{\Delta}$ and $\dot{\Delta}_{adj}$ indicate rejection of the null hypothesis. This suggest that a panel causality which doesn't account for individual characteristics of the country within the panel may be misleading. Hence, this study uses the bootstrap Granger causality, which considers cross-sectional dependence and cross-country heterogeneity. We utilized the augmented Dickey-Fuller (ADF) unit root test developed by Dickey and Fuller (1981) to determine the highest order of integration of SCR and FDI for each country in the sample before applying the causality test. According to the ADF test with intercept presented in Table 6, only Ghana, Kenya, Congo republic, Uganda and Zambia were stationary at level; other countries are stationary at first difference.

The bootstrap panel Granger causality test, presented in Table 7, suggests no causality running from FDI to sovereign credit rating since the fisher test statistic is insignificant. Moreover, the individual country causality suggests rejection of null hypothesis for three countries: Nigeria, Zambia and Kenya. In addition to this, our empirical results indicate a rejection of the null hypothesis that sovereign credit rating does not granger cause FDI at 10 percent level of significance. This denotes a unidirectional causality from SCR to FDI for a panel of 16 countries[9]. Furthermore, the null hypothesis for the individual countries was rejected for two countries: Nigeria and Ghana. This finding is in tandem with the argument of Cantor and Packer (1996) that a country's credit ratings is influenced by FDI determinant variables such as inflation, GDP growth, default history, and external debt. Hence, since sovereign rating criteria are the same as variables that determines foreign investment, credit ratings are the most important indicator of a country's investment environment.

[9] Four countries were excluded in the empirical estimations. This is because the SCR information do not significantly change, and this has significant impact on the regressions.

Table 4: Regional analysis on the impact of sovereign credit rating on FDI in Sub-Sahara Africa

	West Africa			East Africa			Central Africa			Southern Africa		
Variables	Fitch SCR	S&P SCR	Overall SCR	Fitch SCR	S&P SCR	Overall SCR	Fitch SCR	S&P SCR	Overall SCR	Fitch SCR	S&P SCR	Overall SCR
RD*SCR[a]	-0.0211	0.0185	0.0451	0.0902*	0.0374	0.0861**	0.0902*	0.0374	0.0861**	0.0551	-0.0024	0.0030
	(0.0991)	(0.0276)	(0.0499)	(0.0489)	(0.0270)	(0.0423)	(0.0489)	(0.0270)	(0.0423)	(0.0427)	(0.0273)	(0.0369)
SCR[b]	0.0658***	0.0284**	0.0540***	0.0375	0.0182	0.0308	0.0375	0.0182	0.0308	0.0423	0.0338**	0.0592**
	(0.0222)	(0.0141)	(0.0194)	(0.0257)	(0.0162)	(0.0231)	(0.0257)	(0.0162)	(0.0231)	(0.0272)	(0.0147)	(0.0234)
Population	5.304***	5.217***	5.313***	5.072***	5.007***	4.967***	5.072***	5.007***	4.967***	5.406***	5.178***	5.284***
	(0.335)	(0.333)	(0.332)	(0.353)	(0.352)	(0.361)	(0.353)	(0.352)	(0.361)	(0.343)	(0.338)	(0.340)
Inflation	-0.0010	-0.0023	-0.0019	-0.0008	-0.0023	-0.0018	-0.0008	-0.0023	-0.0018	-0.0014	-0.0022	-0.0017
	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)	(0.0021)
NR[c]	0.0230***	0.0236***	0.0234***	0.0227***	0.0238***	0.0234***	0.0227***	0.0238***	0.0234***	0.0231***	0.0234***	0.0231***
	(0.0048)	(0.0048)	(0.0047)	(0.0047)	(0.0047)	(0.0047)	(0.0047)	(0.0048)	(0.0047)	(0.0047)	(0.0048)	(0.0047)
Financial Devt.	0.0071*	0.0071*	0.0068*	0.0083**	0.0088**	0.0091**	0.0083**	0.0088**	0.0091**	0.0064	0.0075*	0.0071*
	(0.0041)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0040)	(0.0041)	(0.0040)	(0.0040)	(0.0040)	(0.0040)
Trade openness	0.0033***	0.0033***	0.0034***	0.0031***	0.0030***	0.0030***	0.0031***	0.0030***	0.0030***	0.0033***	0.0033***	0.0034***
	(0.00107)	(0.00108)	(0.00107)	(0.00106)	(0.00109)	(0.00107)	(0.00106)	(0.00109)	(0.00107)	(0.0011)	(0.0011)	(0.0012)
Infrastructure	0.0026***	0.0027***	0.0025***	0.0030***	0.0030***	0.0030***	0.0030***	0.0030***	0.0030***	0.0024**	0.0028***	0.0025***
	(0.0001)	(0.0001)	(0.000950)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Total effect of SCR	0.0447**	0.0469**	0.0991**	0.1277***	0.0556**	0.1169***	0.1277***	0.0556**	0.1169**	0.0974***	0.0314**	0.0622***
	(4.620)	(3.890)	(4.620)	(6.360)	(4.650)	(7.730)	(6.360)	(4.650)	(6.369)	(5.460)	(3.660)	(5.570)
No. of Countries	6	6	6	4	4	4	3	3	3	7	7	7

Standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%. All regressions are estimated using a fixed-effect estimator. The random effect estimates and Hausman test are available on request. Fitch SCR and S&P SCR represent Fitch sovereign credit rating and Standard and Poor credit rating, while the overall is the average of both Fitch and Standard and Poor. a: RD is regional dummy, b: Sovereign credit rating, c: NR is natural resources. The total effect of SCR for each region is measured as the sum of the coefficient of SCR and the interaction term. The standard error of this linear combination is calculated to compute the t-statistic of the total effect.

Table 5: Cross-sectional dependence and Homogeneity test

	Fitch SCR Model		S&P SCR Model		SCR Model	
Test	Statistic	P-value	Statistic	P-value	Statistic	P-value
$CD_{pesaran}$	1.215	0.2244	1.546	0.1222	1.316	0.1881
CD_{Frees}	3.156	0.8391	2.549	0.8391	3.013	0.8391
$CD_{Friedman}$	2.000	1.0000	2.000	1.000	2.000	1.000
$\dot{\Delta}$	3.334***	0.000	3.209***	0.001	3.178***	0.001
$\dot{\Delta}_{adj}$	5.818***	0.000	5.601***	0.000	5.545***	0.000

*** denotes significance at 1 %. The test was conducted for each of the results presented in table 2. The null hypothesis of

Table 6: Augmented Dickey-Fuller test results (With Intercept)

Countries	Sovereign Credit Rating[a]		Foreign Direct Investment		$dmax_i$
	Levels	First Difference	Levels	First Difference	
Angola	0.4879	0.0000[a]	0.3178	0.0000[a]	1
Benin	0.3205	0.0000[a]	0.0382[b]	-	1
Botswana	0.0104[b]	-	0.1736	0.0000[a]	1
Cape Verde	0.2272	0.0000[a]	0.2604	0.0000[a]	1
Gabon	0.3446	0.0000[a]	0.2812	0.0000[a]	1
Ghana	0.0701	-	0.0354[b]	-	0
Kenya	0.0435	-	0.0490[b]	-	0
Lesotho	0.5231	0.0000[a]	0.0059	-	1
Mozambique	0.1505	0.0000[a]	0.0080[a]	-	1
Namibia	0.6163	0.0000[a]	0.2667	0.0000[a]	1
Nigeria	0.2347	0.0000[a]	0.0326[b]	-	1
Republic of Congo	0.0451[b]	-	0.0686[c]	-	0
Rwanda	0.0006[a]	-	0.1439	0.0000[a]	1
South Africa	0.2395	0.0000[a]	0.4231	0.0000[a]	1
Uganda	0.0104[b]	-	0.0766[c]	-	0
Zambia	0.0036[a]	-	0.0011[a]	-	0

Note(s): The values presented in the table are MacKinnon's (1996) one-sided p-values, a, b and c indicate statistical significance at the 1%, 5% and 10% levels, respectively. a: We used the average credit ratings of Fitch and S&P

Table 7: Bootstrap Granger Causality Results of Sovereign Credit Ratings and FDI in SSA

	H0: FDI does not Granger cause Sovereign Credit rating			H0: Sovereign Credit rating does not Granger cause FDI		
Countries	Lags	Wald	P-value	Lags	Wald	P-value
Angola	1	0.031	0.860	1	0.025	0.875
Benin	1	0.008	0.930	1	0.000	1.000
Botswana	1	0.001	0.975	1	0.022	0.881
Cape Verde	1	0.016	0.901	1	0.001	0.976
Gabon	1	0.059	0.807	1	0.003	0.959
Ghana	5	3.260	0.660	8	52.385	0.000[a]
Kenya	8	27.846	0.001[a]	8	8.178	0.416
Lesotho	1	0.000	0.994	1	0.069	0.792
Mozambique	5	1.526	0.910	5	1.321	0.933
Namibia	1	0.004	0.952	1	0.029	0.865
Nigeria	8	30.767	0.000[a]	8	72.549	0.000[a]
Republic of Congo	1	0.234	0.629	1	0.006	0.940
Rwanda	8	5.666	0.685	8	10.308	0.244
South Africa	1	0.043	0.836	1	0.048	0.826
Uganda	5	0.500	0.992	5	3.021	0.697
Zambia	5	19.236	0.002[a]	5	4.379	0.496
Fisher Test Statistic (γ)		49.769			99.310[c]	

Note(s): The appropriate lag length is chosen based on the Schwarz information criterion, a, b and c indicate statistical significance at the 1%, 5% and 10% levels, respectively, bootstrap p-values are obtained from 10,000 replications

5.0 Summary and Conclusion

CRAs are projected to play a more prominent role in corporate and sovereign credit risk management in the new financial architecture. Their importance has lately been bolstered by the Basel Committee on Banking Supervision's (BCBS) reform of capital criteria for banks, which culminated in Basel II. Ratings are crucial for economies whose access to capital is limited, as they give investors a good idea of where their money is safe and where it is not. This study examines the importance of sovereign credit rating in attracting FDI inflow for a panel of 20 SSA countries. The study leans on an unbalanced panel from 2007 to 2019. In achieving this, three models were employed: (1) fixed-effect model to address possible heterogeneity in the model, (2) since there may be reverse causality from FDI to SCR, the study addresses any endogeneity bias by using the fixed-effect instrumental regression model. (3) in assessing the causal relationship between FDI and SCR, we further use the Emirmahmutoglu

and Kose (2011) panel granger causality; this causality test can address both heterogeneity and cross-sectional dependence in the panel.

The empirical findings from this study are as follows: (1) sovereign credit ratings (Fitch, S&P and overall) have a significant and positive impact on FDI inflows in the region. This result is robust to sub-regional analysis, the instrumental regression model and alternative credit rating measure (the local sovereign credit rating), (2) After controlling for the impact of the global financial crises, our results indicates that investors reliance on credit rating as a gauge for investment decision increases after the global financial crises compared to the period without the crises, and (3) The panel causality test indicates a unidirectional causality from SCR to FDI. However, there is unidirectional causality from FDI to SCR for Zambia and Kenya. Only Nigeria recorded a bidirectional causality.

The empirical results of this study have produced important policy implications for SSA governments. The region has a market of about one billion consumers, but this alone is not enough to attract the attention of potential investors. For this region to reach its full potential, significant quality and quantity of investment are needed. The importance of sovereign credit rating in the symbiotic relationship between foreign investors and African markets should be a major priority of the African government. It is pertinent for SSA countries to get rated, and the ones rated should put in place appropriate policies and measures to get better ratings. Persistent monitoring of the credit status of member countries should be a major priority of regional development organizations such as the African Union (AU), the Southern African Development Community (SADC), Economic Community of Central African States (ECCA), Economic Community of West African States (ECOWAS), and East African Community (EAC).

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Appendix 1: United Nation Regional Classification

Central Africa	East Africa	Southern Africa	West Africa
Cameroon	Ethiopia	Angola	Benin
Democratic Republic of the Congo	Kenya	Botswana	Cape Verde
Gabon	Rwanda	Lesotho	Côte d'Ivoire
Republic of Congo	Uganda	Mozambique	Ghana
		Namibia	Nigeria
		South Africa	Senegal
		Zambia	

Countries by rating category

Low rated Countries	**High rated Countries**
Angola	Côte d'Ivoire
Botswana	Kenya
Cameroon	Namibia
Cape Verde	Nigeria
Republic of Congo	Rwanda
Ethiopia	South Africa
Gabon	Uganda
Ghana	
Lesotho	
Mozambique	
Democratic Republic of the Congo	
Senegal	
Zambia	

Source: Authors' compilation from Fitch and S&P. High rated countries are countries with rating above the region average, while low rating category are countries with ratings below the average in 2019.

Appendix 2: Rating Scores for Sovereign Rating Grades

Interpretation	Moody's	Standard and Poor	Fitch	Numerical Value
Investment-grade ratings				
Highest credit quality	Aaa	AAA	AAA	20
High credit quality	Aa1	AA+	AA+	19
	Aa2	AA	AA	18
	Aa3	AA-	AA-	17
Strong payment capacity	A1	A+	A+	16
	A2	A	A	15
	A3	A-	A-	14
Adequate payment capacity	Baa1	BBB+	BBB+	13
	Baa2	BBB	BBB	12
	Baa3	BBB-	BBB-	11
Speculative-grade ratings				
Speculative credit risk developing, due to economic changes	Ba1	BB+	BB+	10
	Ba2	BB	BB	9
	Ba3	BB-	BB-	8
Highly speculative, Credit risk present, With limited margin safety	B1	B+	B+	7
	B2	B	B	6
	B3	B-	B-	5
High default risk	Caa1	CCC+	CCC+	4
	Caa2	CCC	CCC	3
	Caa3	CCC-	CCC-	2
Default-grade rating				
Near or in bankruptcy	Ca	CC	CC	1
Or default	C/D	SD	D	0

Source: This table describes the construction of sovereign credit scores. The sovereign rating grades range from the highest AAA to the lowest D, and the outlook grades are from positive to negative. We assign numerical values for each rating grade, which vary from 20 for AAA to 0 for D.

Appendix 3: Correlation Matrix of the variables

	Fitch SCR	S&P SCR	Overall SCR	FDI	FD	Population	Natural Res	Infrastructure	Inflation
Fitch SCR	1								
S&P SCR	-0.201	1							
Overall SCR	0.552	0.706	1						
FDI	0.347	0.360	0.558	1					
FD	0.336	0.169	0.387	0.167	1				
Population	0.123	0.182	0.244	0.639	-0.362	1			
Natural Res	-0.0307	0.0170	-0.00774	0.360	-0.376	0.177	1		
Infrastructure	0.0875	0.203	0.236	0.357	0.287	-0.171	0.0808	1	
Inflation	0.0345	-0.00240	0.0229	0.137	-0.123	0.214	0.155	-0.143	1

Source: Authors' computation from UNCTAD, World Bank World Development Indicator, Fitch Sovereign Credit Rating, Standard and Poor Sovereign Credit Rating (S&P SCR).

Appendix 4: Robustness Check - Impact of Local Sovereign Credit Rating on FDI in Sub-Sahara Africa

	Fixed Effect Model			Fixed Effect Instrumental Model		
	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Fitch SCR	S&P SCR	Overall SCR	Fitch SCR	S&P SCR	Overall SCR
Sovereign Credit Ratings	0.0393**	0.0465***	0.0671***	0.0576**	0.0531***	0.0777***
	(0.0170)	(0.0123)	(0.0172)	(0.0256)	(0.0162)	(0.0219)
Population	5.226***	5.076***	5.202***	5.342***	5.149***	5.309***
	(0.334)	(0.322)	(0.323)	(0.355)	(0.327)	(0.335)
Inflation	-0.00130	-0.00221	-0.00149	-0.000527	-0.00131	-0.000750
	(0.00212)	(0.00206)	(0.00206)	(0.00209)	(0.00200)	(0.00203)
Natural Resource	0.0236***	0.0221***	0.0225***	0.0242***	0.0221***	0.0228***
	(0.00478)	(0.00471)	(0.00470)	(0.00480)	(0.00470)	(0.00471)
Financial Development	0.00851**	0.00630	0.00710*	0.00885**	0.00670*	0.00737*
	(0.00398)	(0.00394)	(0.00391)	(0.00404)	(0.00397)	(0.00398)
Trade openness	0.00332***	0.00318***	0.00341***	0.00383***	0.00373***	0.00393***
	(0.00108)	(0.00105)	(0.00106)	(0.00111)	(0.00107)	(0.00108)
Infrastructure	0.00292***	0.00323***	0.00298***	0.00256***	0.00284***	0.00261***
	(0.000944)	(0.000920)	(0.000920)	(0.000945)	(0.000906)	(0.000917)
Constant	-77.60***	-75.11***	-77.34***	-79.60***	-76.36***	-79.14***
	(5.398)	(5.180)	(5.209)	(5.774)	(5.259)	(5.416)
R-squared	0.840	0.846	0.847	0.8343	0.8431	0.8405
Prob > χ^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Endogeneity Test	-	-	-	0.0575	0.3265	0.0504
Instrument relevance	-	-	-	0.0000	0.0000	0.0000
Observations	268	268	268	248	248	248
Number of countries	20	20	20	20	20	20

Standard errors in parentheses, *** denotes significance at 1 %, ** at 5 % and * at 10%. All regressions are estimated using fixed-effect and fixed-effect instrumental regression estimators. The random effect estimates and Hausman test are available on request. Fitch SCR and S&P SCR represent Fitch local sovereign credit rating and local Standard and Poor credit rating, while the overall is the average of both Fitch and Standard and Poor. The endogeneity test suggests that sovereign credit ratings lag is endogenous in all the models except for column 4. Instrument relevance is the probability value of the F-test in the reduced model.