The Role of Property Rights in the Relationship between Openness to International Capital Flows and Economic Growth in Sub-Saharan Africa Countries: An Estimate from Non-Stationary Panel Data

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Abstract

This paper attempts to verify, on the one hand, if the quality of property rights is an essential condition to the contribution of the openness to international capital flows to economic growth in sub-Saharan Africa countries, and on the other hand, if this contribution depends on their natural resources endowment. We used three econometric methods inherent to non-stationary panel data (Mean Group, Pooled Mean Group, and Dynamic Fixed Effects) and a sample of 36 sub-Saharan Africa countries, subdivided into countries rich in natural resources and countries poor in natural resources, over the period 1996-2013. The results obtained allowed us to highlight that, the property rights in sub-Saharan Africa countries are of paramount importance in the effective contribution of international capital flows to economic growth, whatever the endowment in natural resources.

Keywords: *Economic growth, Openness to capital flows, Property rights quality, Non-stationary panel procedure.*

1. Introduction

Background

From the 1980s, financial liberalization[1], suggested by McKinnon (1973) and Shaw (1973) in the 1970s in order to propel growth in developing countries undergoing financial repression, was accompanied by the opening of the capital account, both in industrialized economies and in the majority of developing economies, according to the will of the Bretton Woods[2] institutions and the U.S. Treasury (Giraud, 2001; Bénassy-Quéré and Salins, 2005). This development strategy suggested by these institutions, aimed at increasing the opportunities of capital necessary for investment, still remained low despite the domestic financial liberalization policies. In this context, the lifting of restrictions on the movement of capital between the nations of the world is known by various names, such as financial openness, financial globalization, and international financial liberalization. These names are equivalent and refer to the growing interconnection that financial flows operate. Since then, the exchange of capital between countries that open their capital accounts is booming.

The international mobility of capital within the framework of financial globalization is necessary to economies in order to make good use of advantages that global economy offers and assure the propulsion of economic growth. Indeed, according to neoclassical theory, it may temporarily affect economic growth through two channels. First, the flows of capital from capital-rich to capital-poor countries make lower interest rates and investment increases and stimulates growth in recipient countries, and secondly, it suggests that financial openness reduces risk premiums due to better risk sharing (Bekaert et al, 2011). According to some economists (Quinn, 1997; Bekaert et al, 2001a, 2001b; Fuchs-Schundeln and Funke, 2001; Edison et al, 2002a, 2002b; McLean and Shrestha, 2002; Arteta et al, 2001; Tornell et al, 2003a, 2003b), financial openness is necessary for economies as it is supposed to have a positive impact on economic growth through its direct and indirect different transmission channels like the example of the increase in savings that induces an increase in investment by lowering the cost of capital. Also, according to McLean and Shrestha (2002), financial openness by allowing the removal of obstacles to the free movement of capital, beyond the borders of countries, should lead to an increase in foreign direct investments and promoting technology transfer. In this regard, Prasad et al (2007) argue that the net flows of financial capital should flow from rich countries to poor countries, that is to say that they should leave countries where physical capital is greater than the supply of labour force (i.e., where yields are lower) to countries with relatively little capital with untapped investment opportunities.

The advantage is that international capital flows benefit poor countries by providing financial resources they can invest in physical capital, in the form of equipment, tools and infrastructure in the perspective of increasing the levels of employment and of income.

Moreover, near these benefits of openness to international capital flows, a certain number of adverse effects may arise and severely affect host economies. These undesirable effects go from contagion phenomenon to macroeconomic instability. We have, in terms of contagion effect, the example of the crisis of the Thai baht collapse in 1997 which quickly reached its neighbours because they shared trade and financial linkages. Also, we have the recent subprime crisis that erupted in the United States of America in 2007 and touched much of the world due to the global financial interconnection. In terms of macroeconomic instability, note that, according to Reinhart and Reinhart (2008), large inflows of foreign capital are associated in advanced economies with highly volatile macroeconomic outcomes for income growth, inflation and external accounts. In the context of emerging economies, they are associated with a higher likelihood of economic crises. In contrast, in developing countries, they are associated with pro-cyclical fiscal policies.

However, in a general context, most of the empirical analyses on the growth effect of openness to capital flows have led to ambiguous results. This lack of a consensus in the results is also observed in analyses with only sub-Saharan African countries data. We note, in fact, in terms of positive growth effects, the studies of Seetanah and Khadaroo (2007), Esso (2010); and in terms of non-significant growth effects, the studies of Rivera-Batiz (2001), Kose et al (2009a, 2009b, 2009c), Ahmed et al (2007), and Ousséini et al(2011).

In addition, a foray into the literature in order to understand the phenomenon of the attraction of foreign capital in sub-Saharan Africa (SSA) countries allowed us to detect the existence of a positive relationship between good institutions and the influx of international capital (Asiedu, 2006; Asiedu and Lien, 2011). Also, a good natural resource endowment is a major advantage in attracting foreign capital in SSA (Asiedu, 2006; Ahmed et al, 2007). But unlike countries with high natural resource endowment, those with low natural resource endowment have only, as advantage to attract foreign capital, the quality of their institutions (Asiedu, 2006). In contrast, according to Asiedu (2006), higher volumes of international capital do not necessarily lead to higher economic growth. This evidence reinforces the observation made by Gourinchas and Jeanne (2007) in Madagascar that received nearly 6% of foreign capital inflows as part of GDP over the 1980-2000 period and achieved a decline of 1.3% of its GDP growth rate per year, contrasted with South Korea which received almost no net flow of foreign capital over the same period and achieved an average GDP growth of 5.4% per year.

In view of the foregoing, and seeing that significant volumes of international capital is not synonymous with a high economic growth in sub-Saharan Africa, we believe that the quality of institutions could be a prerequisite for openness to international capital flows policies so that they have a beneficial effect on economic growth. Thus, in this study, we will analyse the interaction between the quality of institutions, especially property rights, international capital, and economic growth in the context of sub-Saharan Africa. We particularly use the indicator of property rights at the expense of other institutional quality indicators to the extent that property rights affect more the situation of international capital, from their entry to their implementation in host economies. Note that property rights define the rules protecting private agents against the risks of expropriation vis-a-

vis the state and other private agents, rules guaranteeing the performance of contracts between economic agents and the rules that govern the resolution of conflicts related to the execution of such contracts. Indeed, private capital in sub-Saharan Africa is generally composed of foreign direct investment and multinational firms, only efficient policies for the protection of private property is able to afford the foreign capital suppliers to increase the productivity of their funds.

Moreover, given that natural resource endowments play for much in the attraction of international capital and seeing that the likelihood of a respect toward private property rights remains the artificial advantage that each country can afford to expand and make prosper foreign capital, the basic sample for this study will be split due to the natural resource endowment (NR). This division will allow us to better understand the contribution of property rights.

Note that the role of institutions in the contribution of financial openness to economic growth has been the subject of various studies in the economic literature. But very few of them have considered only the variable of private property rights and much less take into account the great differences that exist between the different individuals of their samples. To our knowledge, no such study has yet concerned sub-Saharan Africa countries. Thus, this study provides an empirical contribution to economic research by investigating whether the contribution of foreign capital to economic growth in SSA countries is conditioned by the quality of private property rights regardless of differences in natural resource endowments. Moreover, unlike previous studies, we built a financial openness variable that combines both equity flows and debt flows. In addition, our study uses more efficient panel estimation methods than traditional panel methods (fixed effects and General Methods of Moments) insofar as they introduce heterogeneity in estimating the coefficients.

Research issue

Capital account openness policies for most of the countries aspiring to integrate into global finance have to be based on a strict enforcement of property rights. The enforcement of property rights shows itself as safe guarantee for a better return on foreign capital in host countries. The reinforcement of property rights affects, not only the attraction of foreign capital, the efficiency of the use of resources, and the level and the type of investment, but also the allocation of risks, income distribution, and the drop in conflicts. Given the foregoing, the main question that concerns us is whether the quality of property rights is a prerequisite to capital flows openness in SSA so that it can exert a beneficial effect on economic growth regardless of the natural resource endowment.

Objectives

Main objective

The main objective of this study is to check, on the one hand, if the quality of property rights in SSA countries influences the process of the openness to international capital

flows in its contribution to economic growth, and on the other hand, if this contribution depends on the natural resource endowment.

Specific objectives

Estimate the effect of the openness to international capital flows on economic growth within a global sample of SSA countries, and then, in the case of two sub-samples of this global sample, split into countries rich in NR and countries poor in NR.

Estimate, simultaneously, the effect of property rights and the one of the openness to international capital flows on economic growth in the case of the global sample of SSA countries, and in the case of its two sub-samples split into countries rich in NR and countries poor in NR.

Assumptions

The main objective is supported by the following assumptions:

- The openness to international capital flows has a positive effect on economic growth in SSA countries, whatever the natural resource endowment.

- The presence of property rights in regressions leads to a more significant contribution of international capital flows to economic growth in SSA countries, whatever their natural resource endowment.

2. Literature review

In this section, we present, at first, the foundations, the transmission channels, and the growth effects of the openness of capital account; and then we present an overview of the institutions and their influence on financial capital liberalization.

The opening of capital account: Foundations, transmission channels, and effects on growth

Foundations

Contrary to closed economies where domestic investment is financed by domestic savings, in the case of an open economy, domestic investment can be financed by foreign savings. According to Prasad et al (2007), standard economic theory teaches that financial capital should, in net terms, flow from rich to poor countries. That is to say, it should elapse from countries that have more physical capital per worker and where capital income is low to those with relatively little capital and where there are greater opportunities for unexploited investment. Thus, the principle is that the movement of capital should make the poorest countries more at ease by giving them access to more financial resources they can invest in physical capital such as equipment, machinery, and infrastructure.

In a brief statement, Lecaillon (1990) gave an overview of the validity of international capital flows. His presentation considers that the world is made of two countries, A and B, each developing in autarky. And the economy of each of these countries is in a state of equilibrium with the same steady growth rate, but country B having a higher propensity to save than country A. As a result, the per capita capital and per capita product are higher in B than in A. But, since B uses more capital per worker than A, the marginal product of capital and the remuneration interest rate on this capital are in principle lower in B, according to the principle of the neoclassical growth theory. If the two countries are interfering in logic of openness, the capital in search of better yields will move from B to A, savings of B will finance the investment of A. In the long term, the per capita capital in both countries to some extent will equalize, although the propensities to save are different. During the transition phase to a new steady state, the country where the capital was initially rare will grow more rapidly, while country B will grow more slowly. As a result, the opening of economies to the outside should cause a reduction of the differences between international capital per capita and per capita product. But this does not mean that growth rates vary continuously, after the reallocation of international

savings, the growth rate of equilibrium in the two countries will again become equal to the growth rate of efficient labour supply.

Insofar as capital moves from capital-rich economies to capital-poor economies, there is good reason to believe that countries are importers of capital at the beginning of their development and then become exporters. According to the theory of the stages of the balance of payments, first, the country borrows and its foreign debt accumulates; second, it releases a trade surplus, but remains net debtor because this surplus is not sufficient to pay the interest on the debt. In the third step, the current account balance is in surplus, which allows to reduce the debt while in the fourth, the international position is reversed in the sense that the country becomes net creditor; and from there, they can begin to consume the income from outside investments in the fifth step, which means that its trade balance is in deficit. Finally, in the sixth step, the country remains creditor, but the trade deficit exceeds the surplus of its services so that the current account becomes, in its turn, in deficit.

According to Henry and Sasson (2008), the centre point on the liberalization of the capital account is that it moves from developing countries from a stable state in which the ratios of capital to effective labour are lower (and the rates of return on capital is higher) than in developed countries, to a stable state in which the ratios of capital to effective labour and the rates of return equalize with those of the developed world. Because capital and labour are complements in production, the marginal product of labour (and hence the real wage) increases as countries open up and the process of capital deepening is established.

Transmission channels

Transmission channels of the opening of the capital account are the potential positive and negative effects through which this latter is said to act on the growth of economies. These channels can be direct or indirect.

Positive effects

In a financially integrated world, capital can move freely from countries with excess funds to countries where the marginal product of capital is high. In this context, both institutions and foreign economic agents may provide capital to developing countries if they believe that they will grow faster than developed countries, which will increase domestic savings. The consequence will be that countries can smooth consumption and make finance investments by foreign capital (Schmukler, 2003). However, the effects of capital flows on financial development take place to the extent that new sources of funds and capital are available. The presence of new sources of funds means that borrowers depend, not only on domestic funds, but they can also borrow from foreign countries wishing to invest in domestic assets. Available capital from new sources means that market discipline is now more powerful, both at macroeconomic and financial sector level, since local and foreign investors impose market discipline on private and public borrowers.

The volatility of returns on financial assets warns investors on investments in one type of financial asset. Thus, financial internationalization offers the opportunity to

acquire various assets from different origins. Indeed, the liberalization of financial markets improves the allocation of risk; hence the increase in risk sharing contingencies between domestic and foreign investors can allow diversification of risks, which incites companies to increase their total investment. International financial liberalization is likely to increase the productivity of an economy by influencing its ability to pursue a policy agenda. Indeed, the discipline imposed by financial openness could lead to a revision of the structure of domestic investment of a country in favour of a reallocation of capital to more productive activities in response to changes in macroeconomic policies (Kose et al, 2003). The increase in capital flows improves the liquidity of the local stock market, which is likely to reduce the risk premium while lowering, in the same framework, the cost of raising the necessary capital for investment.

According to Alaya (2006), FDI[3] can contribute greatly to an increase of knowledge in the host country, not only by providing new equipment and new production processes, but also by providing new management skills in improving the level of qualifications that can be broadcast locally (disembodied technical change). Improvement in qualifications can take place through formal training of workers or "learning-by-doing" in foreign subsidiaries. Indeed, FDI, by improving the stock of knowledge of the host country, will also have a short-run and long-run effect on the host economy, and increase the rate of long-run growth. This process of knowledge dissemination also occurs through foreign financial institutions in the sense that they bring back to domestic financial markets best practices, that is to say, the expertise acquired during their past experiences. Moreover, these foreign financial institutions promote the improvement of domestic prudential supervision (Goldberg, 2004; Mishkin, 2003). The entry of foreign banks in the context of financial globalization promotes the transfer of prudential rules and greater capitalization, which has the effect of improving the performance of the domestic financial system.

Negative effects

Financial openness may, unfortunately, expose economies to unfortunate events that can harm economic growth. Although capital inflows through the opening of the capital account are likely to raise domestic investment, its impact in the context of long-run growth may show some limits if such inflows are used to finance speculative domestic investment or of low qualities, such as investments in real estate (Agenor, 2001a, 2001b). Indeed, capital inflows can lead to excessive expansion of aggregate demand, which is a macroeconomic overheating. This expansion will tend to result in inflationary pressures, an appreciation of the real exchange rate and a worsening of current account deficits and episodes of fast and furious contagion (López-Mejía, 1999; Kaminsky et al, 2003).

According to Hernández and Schmidt-Hebbel (2001), with the internationalization of banking and financial integration, the credit markets become segmented since foreign banks tend to focus their business on the largest and most creditworthy companies while abandoning the riskier projects and less creditworthy firms to be financed locally. Furthermore, international financial integration can contribute to economic instability, because foreign capital, although relatively cheaper, is also highly volatile: credit booms, bubbles in asset prices, and excess borrowing can emerge and lead to a crisis.

Note that, according to comparative advantages, the increase in financial integration may lead to increasing specialization that makes countries that have opened their capital

account more vulnerable to specific shocks of industry. Financial integration can worsen the risks associated with impudent fiscal policies. In this respect, access to global capital markets may cause excessive debt arising from unproductive public spending. Thus, the existence of large amounts of short-run debts denominated in hard currency makes countries vulnerable to external shocks or to changes in investors' behaviours (Kose et al, 2003; Razin and Rose, 1994).

López-Mejía (1999) argues that, capital inflows affect the financial system that ensures its intermediation. They also have two important effects on the domestic banking system. First, under an exchange rate system linked to a currency of reference, the quasi-fiscal deficit—which includes financial transactions carried out by central banks and other public financial institutions playing a similar role to that of taxes and subsidies—increases under the effect of a sterilization policy advocating the sale of domestic high-yield bonds and buying currencies at lower interest rates. Secondly, the financial system may become more vulnerable as a result of an increase in lending, which emphasizes the maturity mismatch between assets and bank liabilities and reduces the quality of loans. According to him, capital inflows have all led to an increase in bank lending and the vulnerability of the financial sector has generally been exacerbated by the rise in asset prices which, ultimately, proved short-lived.

The effects of financial openness on economic growth

Browsing the theoretical and empirical literature on the relationship between international capital flows and economic growth, we find that most of the studies do not lead to a consensus. Some studies have successfully demonstrated the growth effect of the international financial liberalization (in fact, as we noted above, proponents of capital account openness argue that openness to capital flows is an indispensable instrument for propelling economic growth).

Openness to capital flows: A factor of economic growth

The supporters of financial globalization argue that financial openness to capital flows has a significant effect on economic growth (Bekaert et al, 2005; Quinn and Toyoda, 2008).

Among the first studies on growth effects of openness to international capital flows, Borensztein et al (1995, 1998) test the effect of FDI flows on economic growth in a panel of 69 developing countries over the period 1970-1989. They find that FDI is an important vehicle for the transfer of technology and contributes relatively more to economic growth than domestic investment. According to them, the higher productivity of FDI holds only when the host economy has a minimum threshold stock of human capital. Also, foreign direct investment has the effect of increasing total investment in the economy. Similarly, De Mello (1999), assessing the impact of foreign direct investment on growth for a sample of OECD and non-OECD countries over the period 1970-1990, through time series methods and panel data, concluded that FDI stimulates economic growth through technological modernization and knowledge dissemination. Also, through a panel of 40 countries over the period 1966-1994, De Mello (1999) and Xu (2000) found that the transfer of technology provided by U.S.[4] multinationals contributes to productivity growth

in developing countries. In the same perspective, Mitton (2006), using a sample of 1,100 companies from 28 countries in order to assess the impact of stock market liberalization on firm-level performance, concludes that companies whose stocks are open to foreign investors experience greater economic growth and more investment.

Jyun-yi and Chih-Chiang (2008) examine the influence of the opening of the capital account through FDI on economic growth in 62 countries (developed and developing countries) over the period 1975-2000 with thresholds variable including initial GDP, human capital and the volume of commercial transactions. Using an instrumental variable estimation and a threshold regression approach, they find that FDI can promote growth only when host countries have achieved a certain level of development of initial GDP and human capital.

Openness to capital flows: Far from ensuring economic growth

In the literature, many studies have highlighted the negative effects of international capital flows on economic growth. In this, the financial openness resulting from the growth of foreign capital inflows in an economy is expected to produce a number of adverse macroeconomic effects such as rapid monetary expansion induced by the difficulty and cost of searching aggressive sterilization policies, the inflationary pressures induced by the effects of capital inflows on domestic spending, the appreciation of the real exchange rate and the widening of local current account deficits (Agenor, 2001a, 2001b). Early, just after the first decades of the paradigm of financial openness, the lack of a link between capital account openness levels and economic growth in advanced and emerging economies was highlighted by Alesina et al (1994) and Grilli and Milesi-Ferretti (1995).

Moreover, some authors,such as Abdellaoui and Grimal (2007), examining the impact of FDI on GDP growth and total factor productivity in Morocco and Tunisia over the period 1960-2003, in a framework of international financial openness, have come to the conclusion that the IDE does not seem to have significant effects on growth and technological diffusion. For them, the spill-over (dynamic benefits) technology and knowledge from the IDE does not really play its expected role in the extent that FDI remained concentrated much at the geographical and sectorial point of view and a significant part was assigned to conversion programmes of debt in investment and privatization policies. However, such investment could induce growth dynamic or spill-over effects. Beyond the negative impact or not conclusive of capital flows on growth, some empirical studies have shown a mixed impact of these flows on growth. This is the case in the study of Khaliq and Noy (2007), which examines the impact of FDI on economic growth using detailed data on FDI inflows in Indonesia during the period 1997-2006. Their results show that, at the aggregate level, FDI has a positive impact on economic growth. However, when considering different growth performance averages across different sectors, the beneficial impact of FDI is no more obvious. Indeed, when checking the different impacts across sectors, the results of the various estimates show that the composition of FDI set problems in terms of its effect on economic growth with very few sectors showing a positive impact of IDE and a sector showing a strong negative impact of FDI inflows (the mining and quarrying).

Institutions, capital account liberalization and economic growth: An overview

The economic literature presents a wide range of arguments on the influence of institutions in the relationship between financial openness and economic growth. It is along this line that institutional quality is presented as an important determinant of capital flows in host countries. It is the most important factor that explains why capital does not go from developed countries, where profitability is lower, to developing countries, where it is higher. The partial effect of financial openness on international capital inflows increases with the level of institutional quality. In other words, capital inflows in countries with good institutional quality have more financial openness than those with poor institutional quality (Alfaro et al, 2005; Olson, 1996; Okada, 2013).

Indeed, studies that are interested in the role of institutions in attracting foreign capital flows emphasize the importance of basic institutions, specifically the protection of property rights (Deléchat et al, 2010). Thus, low property rights due to poor quality institutions affect investment decisions of entrepreneurs. The risks of expropriation, armed conflicts, and malfunctioning legal systems, have all a potentially negative impact on investment returns. A study by Singh and Huang (2011), on a sample of 37 countries in sub-Saharan Africa between 1992 and 2006, underlines that stronger property rights should strengthen the effects of financial deepening on the reduction of income inequalities and poverty.

According to Eichengreen (2001), for example, if certain industries are protected by trade barriers, international capital could flow into these sectors to exploit the benefits of protection on domestic markets and result in loss of wellbeing and suboptimal growth. More recent studies have begun to examine the implications of financial globalization for broader public governance. There is evidence that poor public governance (as measured by severity of bureaucratic corruption or lack of government transparency) discourages FDI and portfolio investment flows. There is some evidence that firms in countries with weak governance begin their IPO in countries with a legal system much better with less corruption and more stringent disclosure requirements as an approach to "rent" good public governance to improve corporate governance. This form of financial openness may also have an impact on domestic companies that experience the benefits of better corporate governance (Kose et al,2009a, 2009b, 2009c).

The opening of the capital account can be tonic, but like any treatment, its potential for success cannot be separated from the context in which it is administered. Thus, corruption in capital importing countries affects both the volume and composition of their capital inflows. It particularly and substantially reduced foreign direct investment. Although corrupt countries receive less FDI than the less corrupt countries, they cannot face a similar disadvantage in obtaining bank loans. As a result, corruption in a capital importing country may tend to distort the composition of its capital inflows away from FDI and towards foreign bank loans (Klein, 2003; Wei, 2000).

The study of Rivera-Batiz (2001) establishes a negative connection between corruption and the national rate of return on capital. As a result, countries where corruption is endemic will suffer from low rates of return on capital before liberalization of international financial transactions. When liberalization occurs, capital flight bursts and there is a lower rate

of economic growth. On the other hand, in countries with low corruption, liberalization of the capital account has a positive impact on growth. Corruption is a serious problem in many African countries and many other parts of the world, it is a scourge of good institutions. It has a negative impact, not only on capital flows, but also on economic development in general. Corruption prevents the establishment and sustainability of strong institutions; it also discourages foreign investment in countries where it occurs. It is also a major challenge to promote capital flows to Africa (UNECA, 2006).

3. Methodology

This research will use the econometrics of non-stationary panel data on a global sample of 36 SSA countries that we will split into two samples according to the natural resource endowment, one made up of 16 SSA countries rich in natural resources, and the other is made up of 20 SSA countries poor in natural resources.

The model specification

To assess the effects of property rights in the relationship between openness to international capital flows and economic growth in the countries of sub-Saharan Africa, we inspired the model specified by Chinn and Ito (2002, 2006, 2007) in the context of an analysis of the long-run relationship between financial development, capital account openness, and the quality of institutions. Our model specified in this way is given as follows:

$$Y_{it} = \alpha + \beta_1 Ofc_{it} + \beta_2 Z_{it} + \beta_3 X_{it} + \eta_i + \upsilon_t + \varepsilon_{it} \quad (1)$$

where, Y is the total output or real GDP per capita; Ofc is the variable of financial openness approximated in the case of this study by the private financial flows; Z represents the variable of institutional quality approximated by the property rights; X is a set of control variables that may influence economic growth; η_i is the individual specific effect that can be fixed or random; υ_t is the temporal specific effect; and ε_{it} is the error term of the model. Theoretically, β_1, β_2 are supposed to have a positive sign.

We have also supposed, following the model of Chinn and Ito (2002, 2006, 2007), it is likely that property rights affect economic growth multiplicatively through their combined effects on foreign capital flows. Taking into account the interaction between openness to capital flows and property rights, allow us to obtain the following specification coming from model (1):

$$Y_{it} = \alpha + \beta_1 Ofc_{it} + \beta_2 Z_{it} + \beta_3 Ofc_{it} * Z_{it} + \beta_4 X_{it} + \eta_i + \upsilon_t + \varepsilon_{it} \quad (2)$$

Assuming an interaction between openness to international capital flows and the quality of property rights, this last one is supposed to act multiplicatively with openness to international capital on economic growth. In this way, we get a marginal effect as follows:

$$\frac{\partial Y}{\partial Ofc} = \beta_1 + \beta_3 Z$$

This equation shows that the marginal effect of *Ofc* (international capital flows) on *Y* (the growth rate of GDP per capita) depends on *Z*. So, one expects *Z* to improve the marginal effect of *Ofc*, which should express a coefficient $\beta_3 > 0$. In this case, three alternatives may arise:

- ✓ If β_1 and β_3 are all positives (respectively negatives), then *Ofc* has a positive effect (respectively negative) on *Y* and *Z* affect in best conditions (respectively make worse) this impact;
- ✓ If $\beta_1 > 0$ and $\beta_3 < 0$, then *Ofc* has a positive effect on *Y* but the *Z* reduce this positive impact;
- ✓ If $\beta_1 < 0$ and $\beta_3 > 0$, then *Ofc* has a negative effect on *Y* and the *Z* ease this negative impact.

With the condition of the coefficient $\beta_3 > 0$, we deduce a threshold level Z^s beyond which international capital act positively on economic growth. This threshold is determined as:

With: $\frac{\partial Y}{\partial Ofc} = \beta_1 + \beta_3 Z \geq 0$

We have: $\beta_1 + \beta_3 Z \geq 0$

And: $Z^s \geq -\frac{\beta_1}{\beta_3}$, the threshold beyond which the international capital would favourably act on long-run growth.

Our basic empirical model is displayed as follows, with the insertion of our independent variables.

$$Tcrrpt_{it} = \alpha_0 + \alpha_1 Ofc_{it} + \alpha_2 Dprop_{it} + \alpha_3 \text{T}ouc_{it} + \alpha_4 Tinfd_{it} + \alpha_5 Dcfap_{it} +$$

$$\alpha_6 Cisp_{it} + \alpha_7 Tsbs_{it} + \alpha_8 Log(Popt)_{\text{it}} + \alpha_9 Log(Pib-1)_{it} + \eta_i + v_t + \varepsilon_{it} \qquad (3)$$

Moreover, our model with interaction terms is displayed as follows:

$$Tcrrpt_{it} = \alpha_0 + \alpha_1 Ofc_{it} + \alpha_2 Dprop_{it} + \alpha_3 \text{T}ouc_{it} + \alpha_4 Tinfd_{it} + \alpha_5 Dcfap_{it} + \alpha_6 Cisp_{it} + \alpha_7 Tsbs_{it} + \alpha_8 Log(Popt)_{it} + \alpha_9 Log(Pib-1)_{it} + \alpha_{10} Ofc_{it} * Dprop_{it} + \eta_i + \nu_t + \varepsilon_{it} \quad (4)$$

Note that the control variables (standard growth variables) in our model are of major importance insofar as they can significantly affect growth. Indeed, these variables play both the role of economic growth determinants and of variables that interact with international financial openness variable in order to stimulate economic growth.

Variables and their sources

Study period and data sources

Our empirical analysis covers 36 sub-Saharan Africa (SSA) countries over the period 1996-2013. We have divided these countries into two sub-samples composed of SSA countries rich in natural resources and SSA countries poor in natural resources. The data of our growth and financial openness variables are drawn from the 2014 World Bank database. In contrast, those of our institutional quality variable, namely property rights, come from the 2014 Freedom House database.

Presentation of variables

Growth and growth control variables

Within the framework of our empirical equation, growth variable is noted down: Tcrrpt, and it represents the growth rate of real GDP per capita.

Moreover, as growth control variables, we have the variable *Touc*, which represents the degree of trade openness of the economy represented by the ratio (Exports + Imports / GDP). This variable captures the trade policy (Gbakou et al, 2008) and could positively influence the entry of foreign capital. The variable *Log* (*Pop*), which represents the size of the population, shows the evolution of the size of the potential market for foreign capital. Indeed, a large growing population is an attractive market for foreign capital; but as indicated by Mankiw et al (1992), this variable evolves in reverse with the rate of economic growth. The variable *Log* (*GDP* –1) is used insofar as it captures the size of the economy. The variable *Tsbs* represents the ratio of human capital stock proxied by the rate of secondary school enrolment as measured by the proportion of the school population in secondary school-age population to the same degree. Note that human

capital promotes the adoption and assimilation of new technologies and so the increase in productivity (Acemoglu and Zilibotti, 2001). *Dcfap* represents the ratio of the level of public expenditures, measured by the level of public consumption (final consumption of government, including current expenditures of goods and services purchase) to GDP. *Cisp* represents the ratio of domestic credit to the private sector to GDP. This variable captures the level of financial sector development. According to Banerjee and Newman (2004), the lack of financial development can enhance losses for poor countries that liberalize their trade because unproductive sectors will face difficulties in competition, while capital and labour used in these areas cannot be transferred easily to other sectors. *Tinfd* is the domestic inflation rate variable, and is measured by the rate of change in consumer prices. The inflation rate is likely to have an adverse effect on the economic growth of open economies, insofar as the real depreciation is more expensive (Romer, 1993).

Variable openness to international capital flows

Financial openness is approximated by several types of indicators in the literature. According to Kose et al (2010), the first empirical studies of capital account openness have used measures of legal restrictions (the capital controls) on cross-border capital flows. Thus, these studies used a binary measure (*de jure measures*) that takes the value zero in the absence of external restrictions on the movement of capital, and the value one when these ones exist. Otherwise, other studies use flows or stocks of capital (*de facto measures*) as the proxy of the degree of capital account liberalization. This type of indicator was used by Kraay (1998), Makrem (2009), and Lane and Milesi-Ferretti (2007). In our study, we use the private capital flows as the proxy for financial openness in sub-Saharan Africa.

Our financial openness variable, noted *Ofc*, is approximated by the sum of the ratios of equity flows and debt flows to GDP. Equity flows are represented by the sum of the flows of foreign direct investment[5] (inflows and outflows) and portfolio equity flows.[6] As for debt flows, they are composed of the sum of financing raised through bonds issuances[7], commercial bank and other lending.[8]

Property rights variable

The symbol *Dprop*, representing the institutional quality variable (the property rights component) is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the government. It measures the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. It also assesses the likelihood that private property will be expropriated and analyses the independence of the judicial authority, the existence of corruption within the judicial system, and the ability of individuals and businesses to enforce contracts. The index is measured as increasing between 0 and 100; a high value indicates good quality institutions.

Summary statistics of the data

Tables 1, 2 and 3 show a summary of the descriptive statistics of our samples.

Table1: The descriptive statistics of sub-Saharan Africa countries: The global sample

Variables	Mean	Standard deviation	Minimum value	Maximum value
Tcrrpt	2.2602	6.204005	-37.26443	65.77615
Ofc	7.530007	41.19084	-8.595695	603.7495
Touc	79.86143	39.15541	25.54262	275.2324
Dprop	37.85494	17.43694	5	75
Tinfd	108.8249	1095.828	-17.62744	24411.03
Dcfap	14.09711	6.521057	2.047121	40.06975
Cisp	20.13657	25.5465	0.6876862	167.536
Tsbs	35.84753	21.55727	5.15948	101.8941
Log(*Pop*)	15.81646	1.32414	12.92096	18.35988
Log(*Pib* – 1)	22.40572	1.163811	19.90568	26.47096

Source: Authors' calculations from Stata 10 software.

Table 2: The descriptive statistics of sub-Saharan Africa countries rich in natural resources

Variables	Mean	Standard deviation	Minimum value	Maximum value
Tcrrpt	2.82448	8.03069	-37.26443	65.77615
Ofc	6.070074	11.7992	-8.595695	145.202
Touc	84.12438	40.62196	25.71045	275.2324
Dprop	33.10764	16.62181	10	75
Tinfd	32.62977	249.9818	-8.97474	4145.107
Dcfap	13.1508	6.343975	2.736065	30.45
Cisp	19.60284	33.08384	0.6876862	167.536
Tsbs	36.41538	23.50906	5.15948	101.8941
Log(*Pop*)	15.87021	1.314611	13.0311	18.02784
Log(Pib – 1)	22.85507	1.22431	20.41521	26.47096

Source: Authors' calculations from Stata 10 software.

Table 3: The descriptive statistics of sub-Saharan Africa countries poor in natural resources

Variables	Mean	Standard deviation	Minimum value	Maximum value
Tcrrpt	1.808776	4.165302	-29.67355	12.42247
Ofc	8.477158	54.21799	-6.066814	603.7495
Touc	76.45108	37.65159	25.54262	209.8743
Dprop	41.65278	17.16231	5	75
Tinfd	169.781	1451.154	-17.62744	24411.03
Dcfap	14.85416	6.570448	2.047121	40.06975
Cisp	20.56356	17.34193	0.8152577	103.6323
Tsbs	35.39325	19.88028	6.61704	95.85146
Log(*Pop*)	15.77345	1.331975	12.92096	18.35988
Log(*Pib* – 1)	22.04624	0.975276	19.90568	24.02716

Source: Authors' calculations from Stata 10 software.

We note that there is a significant cross-border variation regarding most variables. For example, the average growth rate of real per capita income is around 2.26% in the global sample and 2.98% in SSA countries rich in NR; while it is only 1.81 % in SSA countries poor in NR, with standard deviations of 6.20, 8.03, and 4.17, respectively, in the global sample, SSA countries rich in NR, and SSA countries poor in NR. Its minimum and maximum values within the countries rich in NR are -37.26% in 2013 in Central Africa and 65.78% in 1997 in Equatorial-Guinea. In contrast, in countries poor in natural resources, its minimum value is of about -29.67% in 1998 in Guinea-Bissau and its maximum value is nearly 12.42%, and find itself in Ghana in 2011.

The average score of private property rights is about 38 in the overall sample, while it is only 33 in SSA countries rich in NR and 42 in SSA countries poor in NR, with a standard deviation almost identical of about 17. Its minimum and maximum values of 10 and 75 in SSA countries rich in NR find themselves, respectively, in Central Africa Republic in 2013 and Botswana in 2009; while they are five and 70 in SSA countries poor in NR, respectively, in Zimbabwe and Swaziland in 2009.

The openness to international private capital flows represents an average of 7.5% of GDP in the overall sample of SSA countries, with an average of 6% in countries rich in NR and nearly 8% in countries poor in NR, and standard deviations of 41, 11.80, and 54, respectively, in the overall sample, countries rich in NR, and those poor in NR. Their minimum and maximum values of -8.60 and 145.20 in countries rich in NR is, respectively, in Gabon in 1996 and in Mozambique in 2011, whereas they are -6.07 and 603.75, respectively, in Mali in 2009 and in Mauritius in 2013.

Empirical analysis

Multicollinearity analysis

Multicollinearity analysis is useful insofar as it allows verifying that a model does not incorporate explanatory series that are linked. Indeed, multicollinearity generates some statistical and numerical problems that are expressed by some potentially serious difficulties of regressions[9] (Erkel-Rousse, 1995). We start this analysis by verifying the coefficients of the variance of our explanatory variables from the BKW[10] test. Our results are presented in tables 4, 5, and 6.

Table 4: Results of the coefficient decomposition variance test of BKW : The global sample of sub-Saharan Africa countries

Eigen values	**27.27641**	**0.208407**	**0.002000**	**0.000821**	**0.000470**	**0.000172**	**6.02E-05**	**4.85E-05**	**5.19E-06**	**4.65E-08**
Condition number	**1.70E-09**	**2.23E-07**	**2.32E-05**	**5.66E-05**	**9.88E-05**	**0.000270**	**0.000772**	**0.000958**	**0.008961**	**1.000000**
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
C	0.999992	7.76E-06	2.62E-09	2.78E-08	7.08E-10	7.13E-10	6.84E-12	1.20E-11	1.50E-11	1.29E-17
OFC	0.006863	0.001136	0.013102	0.018432	0.000542	0.043580	0.043734	0.871703	0.000908	4.23E-11
DPROP	0.002682	0.056961	0.066655	0.489143	0.019224	0.342603	0.020295	0.000323	0.002113	2.07E-10
TOUVC	0.000832	0.304164	0.085229	0.199581	0.050048	0.137457	0.173738	0.011089	0.037863	3.85E-08
TINFD	0.006046	0.011043	0.003513	0.007622	0.003583	0.025222	2.31E-06	0.000172	0.009875	0.932922
DCFAP	0.017961	0.030523	0.942804	0.005117	0.002764	0.000687	6.53E-05	3.17E-05	4.67E-05	2.04E-11
CISP	0.199766	0.002557	0.026038	0.020214	0.491861	0.152077	0.100768	0.005879	0.000840	2.23E-09
TSBS	0.004748	0.136687	0.002451	0.034042	0.783011	0.009044	0.027973	0.000397	0.001648	1.37E-09
LOG(*POPT*)	0.002513	0.995270	0.000169	0.001927	7.71E-05	4.17E-05	6.60E-07	6.96E-07	7.70E-07	7.31E-13
LOG(*PIB* – 1)	0.426073	0.570690	0.000365	0.002719	8.96E-05	5.96E-05	1.27E-06	1.05E-06	1.46E-06	1.25E-12

Source:Authors' estimates from E views 7.1 software.

NB: The values associated with the different variables and the regression constant represent the proportions of the coefficient variance decomposition. Thus, two or more values (proportions of coefficient variance decomposition) greater than 0.5 and associated with a small condition number or index (i.e., smaller than 1/900) indicates the possibility of collinearity between the elements they are attached to.

Table 5: Results of the coefficient decomposition variance test of BKW : The sample of sub-Saharan Africa countries rich in natural resources

Eigen values	**146.4940**	**0.626947**	**0.008080**	**0.002866**	**0.001919**	**0.001230**	**0.000432**	**0.000106**	**1.49E-05**	**2.60E-06**
Condition number	**1.78E-08**	**4.15E-06**	**0.000322**	**0.000908**	**0.001356**	**0.002115**	**0.006016**	**0.024548**	**0.174192**	**1.000000**
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
C	0.999996	3.64E-06	1.44E-09	1.78E-08	7.14E-12	9.56E-10	2.89E-10	8.09E-13	7.41E-12	6.81E-15
OFC	0.070568	0.010239	0.016675	0.009407	0.881207	0.001041	0.010186	0.000644	3.40E-05	1.55E-08
DPROP	0.010337	0.232454	0.130492	0.349596	0.042268	0.083907	0.145375	0.004702	0.000870	5.75E-07
TOUVC	0.042954	0.431499	0.015698	0.192752	0.139269	0.004551	0.078924	0.064976	0.029341	3.63E-05
TINFD	0.001486	0.006884	0.032756	0.000254	0.007806	0.007093	2.80E-05	0.008647	0.029038	0.906007
DCFAP	0.003116	0.063821	0.929788	0.000313	0.001607	0.000681	0.000588	6.04E-05	2.58E-05	3.90E-08
CISP	0.415359	0.002012	0.013131	0.028068	0.012352	0.245374	0.197409	0.085429	0.000865	1.11E-07
TSBS	0.006796	0.132888	0.012516	0.058817	0.009382	0.753616	0.006409	0.017872	0.001703	6.06E-07
LOG(*POPT*)	0.000108	0.997286	3.64E-05	0.002394	3.77E-06	0.000146	2.55E-05	2.06E-07	7.04E-07	7.11E-10
LOG(*PIB* – 1)	0.545741	0.451635	0.000152	0.002295	5.89E-06	0.000138	3.15E-05	3.23E-07	1.04E-06	9.60E-10

Source: Authors' estimates from E views 7.1 software.

NB: Les The values associated with the different variables and the regression constant represent the proportions of the coefficient variance decomposition. Thus, two or more values (proportions of coefficient variance decomposition) greater than 0.5 and associated with a small condition number or index (i.e., smaller than 1/900) indicates the possibility of collinearity between the elements they are attached to.

Table 6: Results of the coefficient decomposition variance test of BKW : The sample of sub-Saharan Africa countries poor in natural resources

Eigen values	38.09116	0.272724	0.002196	0.000786	0.000725	0.000205	0.000141	1.92E-05	5.15E-06	2.54E-08
Condition number	**6.67E-10**	**9.31E-08**	**1.16E-05**	**3.23E-05**	**3.50E-05**	**0.000124**	**0.000181**	**0.001325**	**0.004933**	**1.000000**
Variables	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
C	0.999964	3.55E-05	4.41E-09	9.47E-11	1.76E-08	5.88E-10	9.09E-11	4.65E-12	1.10E-11	4.31E-18
OFC	0.000209	0.001677	0.010906	0.059027	0.018718	0.092299	0.042931	0.767608	0.006624	3.42E-11
DPROP	0.055016	0.035862	0.000188	0.001208	0.478896	0.281231	0.144457	0.000398	0.002745	6.55E-11
TOUVC	0.011652	0.100747	0.308049	0.045790	0.097200	0.006896	0.401992	0.004505	0.023167	1.15E-08
TINFD	0.005502	0.020469	0.030269	0.037424	0.022771	0.049586	0.004060	0.000795	0.012566	0.816557
DCFAP	0.001555	3.44E-06	0.972962	0.007276	0.016838	0.001089	0.000198	2.52E-05	5.25E-05	8.79E-12
CISP	0.164132	0.035662	0.016052	0.669146	0.001859	0.074744	0.037829	0.000192	0.000383	5.51E-10
TSBS	0.003921	0.047846	0.060200	0.721751	0.000845	0.119111	0.044895	1.38E-06	0.001429	6.13E-10
LOG(*POPT*)	0.203697	0.794995	0.000267	1.14E-06	0.000998	3.56E-05	5.84E-06	2.28E-07	4.74E-07	2.07E-13
LOG(*PIB* – 1)	0.647938	0.350576	0.000310	1.04E-06	0.001129	3.77E-05	7.93E-06	2.69E-07	6.77E-07	2.72E-13

Source: Authors' estimates from E views 7.1 software.

NB: The values associated with the different variables and the regression constant represent the proportions of the coefficient variance decomposition. Thus, two or more values (proportions of coefficient variance decomposition) greater than 0.5 and associated with a small condition number or index (i.e., smaller than 1/900) indicates the possibility of collinearity between the elements they are attached to.

We retain this analysis technique of the multicollinearity at the expense of the traditional method of verification of the correlation matrix to the extent that the realization of such a matrix does not include the study of a possible collinearity between explanatory variables and the regression constant. But the existence of such a relationship may distort the results. In addition, the criterion bound to the obtaining of one or more correlation coefficients greater than 0.5 value is sometimes found insufficient, a phenomenon of multicollinearity having been observed when the coefficients of correlation showed a value between 0.3 and 0.5 (De Bourmont, 2012).

To convince us of a real multicollinearity, we implement the test of coefficient variance decomposition proportion of Belsley et al (1980), which resolves the shortcomings mentioned above. The test results of Belsley et al (1980), presented in tables 4, 5, and 6, confirm the risk of multicollinearity between the variable *Log* (*Pib* – 1) and *Log* (*Popt*) in the global sample of SSA countries. In the sample of SSA countries rich in NR, the risk of multicollinearity is between the variable *Log* (*Pib* – 1) and the regression constant. In the sample of SSA countries poor in NR, the risk of multicollinearity is confirmed between variables *Cisp* and *Tsbs*, and then between the variable *Log* (*Pib* – 1) and the regression constant. Thus, we excluded the variable *Log* (*Pib* – 1) from all regressions and the variable *Tsbs* from regressions with the sample of SSA countries poor in NR.

Analysis of the individual and temporal specificities

In principle, we don't know whether our models effectively incorporate some temporal and individual fixed effects. In this way, before their regressions, we'll verify the existence or not of these different effects.

In the framework of the verification of the existence or not of temporal fixed effects, we used the test developed under "testparm"[11] command of Stata software. This test is based on the null hypothesis that all years' coefficients are jointly equal to zero. The results of this test, placed in appendix Table A-2, confirm the possibility of using time fixed effects only in regression equations with data from SSA countries poor in natural resources. The years 2007 and 2008 corresponding to the international financial crisis following the subprime crisis in the United States of America and that affected developed countries and by contagion effects those of sub-Saharan Africa could be used as dummy temporal variables.

Concerning the checking of the existence of individual fixed effects, we used the specific effects' existence test of Fisher whose null hypothesis is based on the homogeneity of individual effects. The calculated statistics reject the null hypothesis (see appendix Table A-3). In this way, the presence of individual fixed effects in our models is accepted.

Cross-sectional dependence analysis

Cross-sectional dependence can occur due to a variety of phenomena, such as common observed effects, omitted spatial spill-over effects, unobserved common effects or general

residual inter-dependence that could remain even when all observed and unobserved common effects are taken into account (Breitung and Pesaran, 2007). So the habit nowadays to carry out a research with panel data is to treat a possible presence of inter-dependence in the data involved. In this study, we base ourselves on the cross-sectional dependence test developed by Pesaran (2004) and Lagrange Multiplier test developed byBreusch-Pagan. We applied the test of Lagrange Multiplier to the data of SSA countries rich in natural resources insofar as the individual dimension and the temporal dimension of the sample are almost equal and the Pesaran test was applied to the data of the sample of SSA countries poor in natural resources due to its time dimensions lightly greater than the individual dimension. Indeed, the test of Pesaran (2004) in contrast to the LM test of Breusch-Pagan is suitable when the individual dimension is greater than the temporal dimension of the panels.Test results, placed in appendix Table A-4 reject the null hypothesis of cross-sectional independence in almost all our panels. Then the presence of a cross-sectional dependence is confirmed.

Unit root test

In literature, the second generation unit root tests (Bai and Ng, 2004; Smith et al, 2004; Moon and Perron, 2004; Choi, 2002; Pesaran, 2007) take cross-sectional dependence into account in panel data contrary to first generation unit root tests (Maddala and Wu, 1999; Levin et al, 2002; Im et al, 2003) that are based on the notion of independence between the individuals in panels. Indeed, as highlighted by Banerjee et al (2005), the first generation unit root tests in panel data can lead to spurious regressions due to the size of distortions if there are some significant degrees of cross-sectional dependence in the errors.

Insofar as we have demonstrated the presence of a cross-sectional dependence in our panels, we borrowed the second generation unit root test of Pesaran (2007) to determine the degree of integration of the series. This test is based on the increase of the usual ADF regression with a lagged inter-individual average and its first differenceto capture the resulting cross-sectional dependence through a model of one factor.

This test is based on the study of the raw series $x_{i,t}$ corrected from individual average $x_{i,t\text{-}1}$ and from first differences $\Delta x_{i,t\text{-}1}$. Pesaran (2003) obtains then a CADF model (Cross-sectionally Augmented Dickey-Fuller). The basic model is based on the test of Im et al (2003) and is written:

$$\Delta x_{i,t\text{-}1} = \alpha_i + \rho_i x_{i,t\text{-}1} + \varepsilon_{i,t} \tag{5}$$

where, $\varepsilon_{i,t} = \gamma_i \theta_t + u_{i,t}$, θ_t is a common factor and $u_{i,t}$ is a white noise.

The CADF model is then written in the absence of autocorrelation of $u_{i,t}$ terms:

$$\Delta x_{i,t} = \alpha_i + \rho_i x_{i,t} + c_i \overline{x}_{t-1} + d_i \Delta \overline{x}_{t-1} + \nu_{i,t} \tag{6}$$

The Pesaran (2003) statistic, CIPS (Cross-sectionally Augmented IPS) is then written:

$$CIPS(N,T) = \frac{1}{N} \sum_{i=1}^{N} t_i(N,T)$$

where, t_i represents the statistics from each CADF model administered to each individual of the panel.

The results of the stationarity test (documented in tables A-5, A-6, A-7, and A-8 in the appendix) show, in the case of the different samples, that all variables attain stationarity at first differences in the specification without trend (see appendix Table A-7). Thus, we confirmed that all the series are integrated of orders one, that is to say *I* (I).

Cointegration analysis and the choice of error correction model

With our series integrated of orders 1, we use the bounds testing (or autoregressive distributed lag (ARDL)) cointegration procedure, developed by Pesaran et al (2001) to analyse the long-run relationships and dynamic interactions among our variables. This cointegration technique is applicable irrespective of whether the regressors in the model are purely I(0), purely I(1) or mutually cointegrated. But the implementation of the unit root test is necessary in order to avoid including series integrated of order 2 in the regressions.

The ARDL bounds testing approach to cointegration involves estimating the following unrestricted error correction models; but within the sample of SSA countries poor in NR, the variable *Tsbs* is excluded since, as previously noted, this variable is highly correlated with the variable *Cisp*:

$$\Delta Tcrrpt_{it} = c_{i0} + \alpha_{i1} Tcrrpt_{it-1} + \alpha_{i2} Ofc_{it-1} + \alpha_{i3} Touvc_{it-1} + \alpha_{i4} T\inf d_{it-1} + \alpha_{i5} Dcfap_{it-1} + \alpha_{i6} Cisp + \alpha_{i7} Tsbs_{it-1} + \alpha_{i8} Log(Popt)_{it-1} + \sum_{j=1}^{p} \beta_{ij} \Delta Tcrrpt_{it-j} + \sum_{j=0}^{p} \lambda_{ij} \Delta Ofc_{it-j} + \sum_{j=0}^{p} \varphi_{ij} \Delta Touvc_{it-j} + \sum_{j=0}^{p} \rho_{ij} \Delta T\inf d_{it-j} + \sum_{j=0}^{p} \phi_{ij} \Delta Dcfap_{it-j} + \sum_{j=0}^{p} \gamma_{ij} \Delta Cisp_{it-j} + \sum_{j=0}^{p} \theta_{ij} \Delta Tsbs_{it-j} + \sum_{j=0}^{p} \psi_{ij} \Delta Log(Popt)_{it-j} + \varepsilon_{it} \quad (7)$$

$$\Delta Tcrrpt_{it} = c_{i0} + \alpha_{i1} Tcrrpt_{it-1} + \alpha_{i2} Ofc_{it-1} + \alpha_{i3} Dprop_{it-1} + \alpha_{i4} Touvc_{it-1} + \alpha_{i5} T\inf d_{it-1} + \alpha_{i6} Dcfap_{it-1} + \alpha_{i7} Cisp + \alpha_{i8} Tsbs_{it-1} + \alpha_{i9} Log(Popt)_{it-1} + + \sum_{j=1}^{p} \beta_{ij} \Delta Tcrrpt_{it-j} + \sum_{j=0}^{p} \lambda_{ij} \Delta Ofc_{it-j} + \sum_{j=0}^{p} \delta_{ij} \Delta Dprop_{it-j} + \sum_{j=0}^{p} \varphi_{ij} \Delta Touvc_{it-j} + \sum_{j=0}^{p} \rho_{ij} \Delta T\inf d_{it-j} + \sum_{j=0}^{p} \phi_{ij} \Delta Dcfap_{it-j} + \sum_{j=0}^{p} \gamma_{ij} \Delta Cisp_{it-j} + \sum_{j=0}^{p} \theta_{ij} \Delta Tsbs_{it-j} + \sum_{j=0}^{p} \psi_{ij} \Delta Log(Popt)_{it-j} + \varepsilon_{it} \quad (8)$$

$$\Delta Tcrrpt_{it} = c_{i0} + \alpha_{i1} Tcrrpt_{it-1} + \alpha_{i2} Ofc_{it-1} + \alpha_{i3} Dprop_{it-1} + \alpha_{i4} Touvc_{it-1} + \alpha_{i5} T\inf d_{it-1} + \alpha_{i6} Dcfap_{it-1} + \alpha_{i7} Cisp + \alpha_{i8} Tsbs_{it-1} + \alpha_{i9} Log(Popt)_{it-1} + \alpha_{i10} Ofc * Dprop_{it-1} + \sum_{j=1}^{p} \beta_{ij} \Delta Tcrrpt_{it-j} + \sum_{j=0}^{p} \lambda_{ij} \Delta Ofc_{it-j} + \sum_{j=0}^{p} \delta_{ij} \Delta Dprop_{it-j} + \sum_{j=0}^{p} \varphi_{ij} \Delta Touvc_{it-j} + \sum_{j=0}^{p} \rho_{ij} \Delta T\inf d_{it-j} + \sum_{j=0}^{p} \phi_{ij} \Delta Dcfap_{it-j} + \sum_{j=0}^{p} \gamma_{ij} \Delta Cisp_{it-j} + \sum_{j=0}^{p} \theta_{ij} \Delta Tsbs_{it-j} + \sum_{j=0}^{p} \psi_{ij} \Delta Log(Popt)_{it-j} + \sum_{j=0}^{p} \pi_{ij} \Delta Ofc * Dprop_{it-j} + \varepsilon_{it} \quad (9)$$

where, Δ is the difference operator, c_{i0} is the constant term, ε_{it} is the error term, pis the maximum lag length and α_i the long-run multipliers.

The procedure of the ADRL bounds testing approach leads us to estimate equations 7, 8, and 9 by OLS[12] in order to test the existence of a long-run relationship among our variables by implementing an F-test for the joint significance of the coefficients of the lagged levels of the variables;that is to say,

the null hypothesis of no cointegration in equations 7, 8, and 9:

(Equation 7: $H_0 = \alpha_{i1} = \alpha_{i2} = \alpha_{i3} = \alpha_{i4} = \alpha_{i5} = \alpha_{i6} = \alpha_{i7} = \alpha_{i8} = 0$,

Equation 8: $H_0 = \alpha_{i1} = \alpha_{i2} = \alpha_{i3} = \alpha_{i4} = \alpha_{i5} = \alpha_{i6} = \alpha_{i7} = \alpha_{i8} = \alpha_{i9} = 0$

and

Equation 9: $H_0 = \alpha_{i1} = \alpha_{i2} = \alpha_{i3} = \alpha_{i4} = \alpha_{i5} = \alpha_{i6} = \alpha_{i7} = \alpha_{i8} = \alpha_{i9} = \alpha_{i10} = 0$)

is tested against the alternative hypothesis

(Equation 7: $H_a = \alpha_{i1} \neq \alpha_{i2} \neq \alpha_{i3} \neq \alpha_{i4} \neq \alpha_{i5} \neq \alpha_{i6} \neq \alpha_{i7} \neq \alpha_{i8} \neq 0$,

Equation 8: $H_a = \alpha_{i1} \neq \alpha_{i2} \neq \alpha_{i3} \neq \alpha_{i4} \neq \alpha_{i5} \neq \alpha_{i6} \neq \alpha_{i7} \neq \alpha_{i8} \neq \alpha_{i9} \neq 0$

and

Equation 9: $H_a = \alpha_{i1} \neq \alpha_{i2} \neq \alpha_{i3} \neq \alpha_{i4} \neq \alpha_{i5} \neq \alpha_{i6} \neq \alpha_{i7} \neq \alpha_{i8} \neq \alpha_{i9} \neq \alpha_{i10} \neq 0$)

In this regard, Pesaran et al (2001) have tabulated some asymptotic critical bounds values providing a test for cointegration when the independent variables are integrated of order d (I (d) with d = 0 or d = 1). In these tables, a lower value assumes that the regressors are I (0), and an upper value assumes that the regressors are purely I (1). If the F-statistic is above the upper critical value, the null hypothesis of no long-run relationship can be rejected irrespective of the orders of integration for the series. Conversely, if the test statistic falls below the lower critical value the null hypothesis cannot be rejected. Finally, if the statistic falls between the lower and upper critical values, the result is inconclusive.

Once the cointegration is established (see tables A-9 and A-10 in the appendix), the conditional ARDL (p, q) long-run model and its error correction version are estimated in order to get the long-run parameters and those of the short-run dynamic.

As bounds test proved cointegration between all variables, we will make our estimates through error correction estimators proposed by Pesaran and Smith (1995) and Pesaran et al, (1999, 2001), namely, the Mean Group (MG), the Pooled Mean Group (PMG)

and Dynamic Fixed Effects (DFE) considered efficient to estimate the cointegrating relationship on panel data. These methods rely on a dynamic panel specification of an Auto-Regressive Distributive lags model (ARDL) (p, q_1,....q_k)). Thus, they come about in the context of our data integrated of order 1. We use these estimators at the expense of fixed/random effects estimators or generalized methods of moments (GMM) because they allow heterogeneity in the dynamics of adjustment of our variables towards their long-term relationship. According to Keho (2012), fixed/random effects or GMM estimators imposed homogeneity of the coefficients except the constant that is assumed to capture the specific effects. Thus, if a variable has a positive effect in a sub-sample of countries and a negative effect in the other sub-sample, force a single coefficient for the entire panel may give a non-significant coefficient. In this case, the estimation of a single coefficient for each explanatory variable will be affected by a serious heterogeneity bias (Pesaran and Smith, 1995). Furthermore, in generalized methods of moments in differences or system, the choice of the number and the quality of the instruments affect certain results.

Estimation methods in PMG, MG and DFE allow heterogeneity in the adjustment dynamic of variables towards the long-term relationship.

The MG method calls to estimate separated regressions for each country and in calculating the coefficients as unweighted means of estimated coefficients for each country. This doesn't impose any restriction. It allows all coefficients to vary and to be heterogeneous in the longrun and the shortrun. However, the necessary condition to the validity and consistency of this approach is to have a sufficiently large size of time series data.

The estimator of dynamic fixed effects (DFE) as the PMG method restricts the cointegrating vector coefficients to be equal between all panels (Blackburne and Frank, 2007). It also, restricts the adjustment speed coefficient and short-run coefficients to be equal. However, it presents country-specific intercepts. A tolerance for intra-group correlation in standard errors calculation is made with the "cluster ( )" option in the Stata 11 Software. Its "cluster" option is used to estimate intra-country correlations with standard errors.

We will use the joint Hausman test to determine which of these three estimators is more efficient in estimating our data.

The ARDL procedure

Consider the following error correction model:

$$\Delta y_{it} = c_i + \alpha_{i1}\Delta y_{it-1} + \alpha_{i2}\Delta y_{it-2} + \ldots + \alpha_{ip}\Delta y_{it-p} + \ldots + \beta_{i0}\Delta x_{it} + \beta_{i1}\Delta x_{it-1} + \ldots + \beta_{ip}\Delta x_{it-p} + \alpha_i\left(y_{it-p} - \beta_i x_{it-1}\right) + u_{it} \quad (10)$$

where, α_i is the call-back force towards the long-run equilibrium $y_{it} = -\left(\beta_i / \alpha_i\right) x_{it}$ for the series *i*.

The method relies on the panel dynamic specification of Auto Regressive Distributive Lags (ARDL) of the following form:

$$y_{it} = \sum_{j=1}^{p} \lambda_{ij} y_{i,t-j} + \sum_{j=0}^{q} \alpha_{ij}^{'} X_{i,t-j} + \mu_i + \varepsilon_{it} \tag{11}$$

where, the number of individuals $i = 1,2,\ldots,N$, the number $t = 1,2,\ldots,T$; X_{it} is a vector with $k \times 1$ explanatory variables; α_{ij} are the $k \times 1$ vectors of coefficients, λ_{ij} are the scalars, and μ_i the country-specific effect. *T* should be as large as the model can be adjusted for each individual separately. Some temporal trends and other fixed regressors can be added. If the variables in Equation 11, for example, are *I* (1) and cointegrated, then the error term is an *I* (0) process for all *i*. A main feature of cointegrated variables is their responsibility for any deviation from the long-term equilibrium. This feature involves an error correction model in which the short-run dynamics of the system variables are influenced by the deviation of the equilibrium. Thus, it is commonly accepted to re-parameterize Equation 11 into the error correction equation as follows:

$$\Delta y_{it} = \phi_i \left(y_{i,t-1} - \theta_i^{'} X_{it} \right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*} \Delta y_{i,t-1} + \sum_{j=0}^{q-1} \alpha_{ij}^{'*} \Delta X_{i,t-j} + \mu_t + \varepsilon_{it} \tag{12}$$

where, $\phi_i = -\left(1 - \sum_{j=1}^{p} \lambda_{ij}\right)$, $\theta_i = \sum_{j=0}^{q} \delta_{ij} / \left(1 - \sum_k \lambda_{ik}\right)$, $\lambda_{ij}^{*} = \sum_{m=j+1}^{p} \lambda_{im}$;

$j = 1,2,...,p-1$, $\delta_{ij}^{*} = \sum_{m=j+1}^{q} \delta_{im}$, $j = 1,2,...,q-1$.

The parameter ϕ_i is the speed of errors correction of the adjustment term. If $\phi_i = 0$ then there is no evidence oft he presence of along-term relationship. If $\phi_i < 0$ then there is an error correction, which implies that the variables y_{it} and x_{it} are cointegrated. This parameter is expected to be significantly negative under the prior assumption that the variables show a return to a long-run equilibrium.

The long-run equations of the conditional ARDL(p, q) model are as follows:

$$Tcrrpt_{it} = c_{i0} + \sum_{j=1}^{p} \beta_{ij} Tcrrpt_{it-j} + \sum_{j=0}^{q} \lambda_{ij} Ofc_{it-j} + \sum_{j=0}^{q} \varphi_{ij} Touvc_{it-j} + \sum_{j=0}^{q} \rho_{ij} T\inf d_{it-j} + \sum_{j=0}^{q} \phi_{ij} Dcfap_{it-j} + \sum_{j=0}^{q} \gamma_{ij} Cisp_{it-j} + \sum_{j=0}^{q} \theta_{ij} Tsbs_{it-j} + \sum_{j=0}^{q} \psi_{ij} Log(Popt)_{it-j} + \varepsilon_{it} \quad (13)$$

$$Tcrrpt_{it} = c_{i0} + \sum_{j=1}^{p} \beta_{ij} Tcrrpt_{it-j} + \sum_{j=0}^{q} \lambda_{ij} Ofc_{it-j} + \sum_{j=0}^{q} \delta_{ij} Dprop_{it-j} + \sum_{j=0}^{q} \varphi_{ij} Touvc_{it-j} + \sum_{j=0}^{q} \rho_{ij} T\inf d_{it-j} + \sum_{j=0}^{q} \phi_{ij} Dcfap_{it-j} + \sum_{j=0}^{q} \gamma_{ij} Cisp_{it-j} + \sum_{j=0}^{q} \theta_{ij} Tsbs_{it-j} + \sum_{j=0}^{q} \psi_{ij} Log(Popt)_{it-j} + \varepsilon_{it} \quad (14)$$

$$Tcrrpt_{it} = c_{i0} + \sum_{j=1}^{p} \beta_{ij} Tcrrpt_{it-j} + \sum_{j=0}^{q} \lambda_{ij} Ofc_{it-j} + \sum_{j=0}^{q} \delta_{ij} Dprop_{it-j} + \sum_{j=0}^{q} \varphi_{ij} Touvc_{it-j} + \sum_{j=0}^{q} \rho_{ij} T\inf d_{it-j} + \sum_{j=0}^{q} \phi_{ij} Dcfap_{it-j} + \sum_{j=0}^{q} \gamma_{ij} Cisp_{it-j} + \sum_{j=0}^{q} \theta_{ij} Tsbs_{it-j} + \sum_{j=0}^{q} \psi_{ij} Log(Popt)_{it-j} + \sum_{j=0}^{q} \pi_{ij} Ofc * Dprop_{it-j} + \varepsilon_{it} \quad (15)$$

The equations of the conditional error correction model are as follows:

$$\Delta Tcrrpt_{it} = \mu_{i0} + \sum_{j=1}^{p} \beta_{ij} \Delta Tcrrpt_{it-j} + \sum_{j=0}^{q} \lambda_{ij} \Delta Ofc_{it-j} + \sum_{j=0}^{q} \varphi_{ij} \Delta Touvc_{it-j} + \sum_{j=0}^{q} \rho_{ij} \Delta T\inf d_{it-j} + \sum_{j=0}^{q} \phi_{ij} \Delta Dcfap_{it-j} + \sum_{j=0}^{q} \gamma_{ij} \Delta Cisp_{it-j} + \sum_{j=0}^{q} \theta_{ij} \Delta Tsbs_{it-j} + \sum_{j=0}^{q} \psi_{ij} \Delta Log(Popt)_{it-j} + \eta ecm_{it-1} + \varepsilon_{it} \quad (16)$$

$$\Delta Tcrrpt_{it} = c_{i0} + \sum_{j=1}^{p} \beta_{ij} \Delta Tcrrpt_{it-j} + \sum_{j=1}^{q} \lambda_{ij} \Delta Ofc_{it-j} + \sum_{j=1}^{q} \delta_{ij} \Delta Dprop_{it-j} + \sum_{j=1}^{q} \varphi_{ij} \Delta Touvc_{it-j} + \sum_{j=1}^{q} \rho_{ij} \Delta T\inf d_{it-j} + \sum_{j=1}^{q} \phi_{ij} \Delta Dcfap_{it-j} + \sum_{j=1}^{q} \gamma_{ij} \Delta Cisp_{it-j} + \sum_{j=1}^{q} \theta_{ij} \Delta Tsbs_{it-j} + \sum_{j=1}^{q} \psi_{ij} \Delta Log(Popt)_{it-j} + \eta ecm_{it-1} + \varepsilon_{it} \quad (17)$$

$$\Delta Tcrrpt_{it} = c_{i0} + \sum_{j=1}^{p} \beta_{ij} \Delta Tcrrpt_{it-j} + \sum_{j=1}^{q} \lambda_{ij} \Delta Ofc_{it-j} + \sum_{j=1}^{q} \delta_{ij} \Delta Dprop_{it-j} + \sum_{j=1}^{q} \varphi_{ij} \Delta Touvc_{it-j} + \sum_{j=1}^{q} \rho_{ij} \Delta T\inf d_{it-j} + \sum_{j=1}^{q} \phi_{ij} \Delta Dcfap_{it-j} + \sum_{j=1}^{q} \gamma_{ij} \Delta Cisp_{it-j} + \sum_{j=1}^{q} \theta_{ij} \Delta Tsbs_{it-j} + \sum_{j=1}^{q} \psi_{ij} \Delta Log(Popt)_{it-j} + \sum_{j=1}^{q} \pi_{ij} \Delta Ofc * Dprop_{it-j} + \eta ecm_{it-1} + \varepsilon_{it} \quad (18)$$

Constructing the appropriate ARDL model for our study, we have chosen lags using the Bayesian criterion of Schwartz by setting the maximum number of lags p to 2. η represents the adjustment speed to equilibrium in equations 16, 17,and 18.

4. Results

The results of our estimates using Mean Group (MG), Pooled Mean Group (PMG) and Dynamic Fixed Effects (DFE) estimators are reported in tables 7, 8, and 9. According to Hausman test statistics, DFE regressions are the most efficient in the global sample equations while PMG regressions are the most efficient in SSA countries rich in NR and those poor in NR equations.

Table 7: Relationship between openness to international capital flows, property rights and economic growth in sub-Saharan Africa: Estimates of the linear (the basic model) and nonlinear model (the model with multiplicative specification)

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)									
Equations	**1**			**2**			**3**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables									
Long-run coefficients									
Ofc	0.0013 (0.55)	0.6010 (0.57)	0.0163 (1.07)	0.0343 (0.05)	0.1049 (0.40)	0.0064 (1.78)***	0.1167 (2.08)**	15.9223 (1.32)	0.4562 (1.92)***
Dprop				0.1723 (9.73)*	0.5190 (1.10)	0.0212 (0.35)	0.0981 (3.66)*	-5.5976 (-1.03)	0.0503 (1.57)
TOuc	0.0076 (1.36)	-0.4048 (-0.87)	0.1132 (2.10)**	-0.0930 (-8.73)*	-0.0552 (-0.27)	0.0990 (2.11)**	0.0387 (3.90)*	0.1087 (0.29)	0.0598 (2.71)*
Infd	-0.0001 (-0.34)	2.6998 (0.86)	-0.0004 (-2.74)*	-0.0006 (-1.77)***	0.0884 (0.29)	-0.0005 (-2.68)*	-0.0002 (-0.61)	-2.2376 (-0.81)	-0.0004 (-2.57)**
Dcfap	0.1818 (5.81)*	0.6604 (0.25)	-0.0541 (-0.46)	0.2724 (6.21)*	1.3603 (1.89)***	-0.1419 (-1.03)	-0.4637 (-1.09)	-14.1248 (-1.00)	-0.1397 (-0.98)
Cisp	-0.0704 (-2.84)*	-3.1613 (-1.74)***	-0.0761 (-1.57)	-0.0384 (-1.72)***	2.2326 (1.12)	-0.1070 (-2.40)**	-0.0043 (-0.16)	-7.7929 (-1.12)	-0.0781 (-1.70)***
Tsbs	-0.0307 (-1.61)	4.8945 (1.45)	0.0209 (0.22)	-0.1178 (-4.98)*	-0.4473 (-0.70)	0.0149 (0.16)	0.1636 (7.13)*	0.2288 (0.13)	0.0228 (0.29)
Log(Pop)	13.1733 (10.64)*	-166.5699 (-1.09)	-2.7804 (-0.33)	18.2724 (10.80)*	11.5778 (0.53)	0.6230 (0.07)	-2.5245 (-1.39)	-1.3925 (-0.16)	-0.7859 (-0.11)
*Ofc * Dprop*							-0.0017 (-2.10)**	-0.2553 (-0.60)	-0.0066 (-1.95)***

continued next page

Table 7 Continued

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)									
Equations	**1**			**2**			**3**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables									
Short-run coefficients									
Convergence Coefficients	-0.8624 (-11.75)*	-1.0371 (-4.15)*	-0.9021 (-13.24)*	-1.0170 (-9.88)*	-0.9365 (-2.41)*	-0.9188 (-14.27)*	-0.9290 (-11.22)*	-1.3461 (-3.96)*	-0.9361 (-10.11)*
Δ*Ofc*	0.2013 (1.30)	-0.5391 (-0.64)	-0.0433 (-0.84)	0.1622 (0.76)	0.7629 (1.18)	0.0059 (1.73)***	0.7048 (0.96)	-1.0616 (-0.20)	-0.3348 (-5.20)*
Δ*Dprop*				0.0454 (0.36)	1.2671 (1.49)	0.0830 (1.43)	-0.0556 (-0.43)	0.6996 (1.19)	0.0452 (0.93)
Δ*TOuc*	0.0344 (1.30)	-0.1283 (-0.55)	-0.0154 (-0.36)	0.0353 (1.01)	-0.5061 (-1.90)***	-0.0254 (-0.53)	-0.0059 (-0.18)	0.1999 (0.63)	0.0093 (0.25)
Δ*Infd*	0.0483 (0.82)	-1.0181 (-1.03)	0.0005 (6.13)*	0.0066 (0.13)	0.6587 (1.83)***	0.0005 (6.12	-0.0823 (-1.30)	-0.8394 (-0.99)	0.0005 (7.68)*
Δ*Dcfap*	-0.1785 (-1.17)	1.0780 (0.87)	-0.1949 (-1.23)	0.1140 (0.56)	-0.3696 (-0.20)	-0.0076 (-0.07)	0.1355 (0.54)	0.5521 (0.45)	-0.1308 (-0.95)
Δ*Cisp*	0.0192 (0.11)	1.5637 (1.15)	0.0470 (1.92)**	0.0617 (0.29)	3.4508 (1.47)	0.0630 (2.40)**	0.3289 (1.12)	-0.0156 (-0.01)	0.0549 (2.02)**
Δ*Tsbs*	-0.1594 (-0.67)	-0.5677 (-0.51)	0.0267 (0.45)	-0.4508 (-1.22)	-2.1986 (-2.16)**	-0.0052 (-0.07)	-0.3162 (-1.11)	4.6974 (1.35)	-0.0161 (-0.25)
Δ*Log*(*Pop*)	-188.2252 (-0.29)	-2033.357 (-0.29)	27.9667 (0.42)	1056.107 (1.57)	531.7022 (0.25)	24.3252 (0.36)	-363.5048 (-0.53)	-294.4651 (-0.41)	33.7862 (0.53)
Δ*Log*(*Pop*)(–2)				1273.398 (0.68)	2700.75 (1.58)	30.0367 (0.40)			

continued next page

Table 7 Continued

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)									
Equations	**1**			**2**			**3**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables									
Short-run coefficients									
*∆Ofc * Dprop*							-0.0217 (-1.06)	-0.1522 (-0.67)	0.0045 (7.39)*
Constant	-173.0489 (-7.23)*	-425.977 (-0.44)	34.1226 (0.30)	-319.3112 (-8.63)*	833.0212 (1.36)	-12.3872 (-0.09)	40.4320 (2.36)**	-145.7526 (-0.70)	8.2217 (0.08)
Number of countries	36	36	36	36	36	36	36	36	36
Observations	612	612	612	576	576	576	612	612	612
Hausman test statistics	Hausman (MG ; PMG)=0.15(1.0000) Hausman (MG ; DFE)=0.32 (0.9999) Hausman (DFE ; PMG)=10.15 (0.0407)			Hausman (MG ; PMG)=0.00 (1.0000) Hausman (MG ; DFE)=0.00 (1.0000) Hausman (DFE ; PMG)=32.00 (0.0000)			Hausman (MG ; PMG) = 0.00 (1.0000) Hausman (MG ; DFE) = 0.00 (1.0000) Hausman (DFE ; PMG) = 23.83(0.0012)		

Source: Authors' estimates from Stata 10 software.
NB: In brackets we have the z-statistic values . *=significant at 1%, ** =significant at 5%, ***=significant at 10%. Hausman tests indicate that the DFE regressions are the most efficient.

Table 8: Relationship between openness to international capital flows, property rights and economic growth in sub-Saharan Africa: Estimates of the linear model

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)												
Countries	**SSA countries rich in natural resources**						**SSA countries poor in natural resources**					
Equations	**1**			**2**			**1**			**2**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables												
Long-run coefficients												
Ofc	-0.3942 (-8.05)*	1.5032 (1.24)	0.3405 (2.19)**	0.0613 (1.28)	1.4256 (1.48)	0.2610 (2.16)**	0.0007 (0.29)	-0.7654 (-1.26)	0.0027 (138)	0.0071 (2.05)**	-6.4630 (-1.65)***	0.0016 (0.97)
Dprop				0.1605 (3.14)	-0.1025 (-0.27)	-0.0096 (-0.11)				0.0949 (4.42)*	11.5734 (0.90)	0.0851 (2.42)**
TOuc	-0.1313 (-8.04)*	-0.0179 (-0.06)	0.0965 (2.05)**	0.1202 (6.13)*	0.0247 (0.08)	0.1035 (2.09)**	0.0065 (0.94)	0.0047 (0.03)	0.0521 (1.20)	0.0152 (2.23)**	2.5870 (1.18)	0.0545 (1.28)
Infd	-0.0178 (-1.90)***	0.8641 (0.25)	-0.0276 (-1.82)***	-0.6458 (-16.37)*	-0.8437 (-1.33)	-0.0281 (-1.87)***	0.0016 (1.83)***	-0.1937 (-0.83)	-0.0001 (-1.08)	0.0028 (3.11)*	-1.0909 (-0.55)	-0.0001 (-0.66)
Dcfap	0.1045 (2.10)**	3.7634 (0.78)	-0.5115 (-1.77)***	0.0325 (0.39)	1.4221 (1.56)	-0.5995 (-2.24)**	0.2131 (5.00)*	0.8312 (1.43)	0.1777 (1.86)***	0.1843 (4.55)*	9.6115 (1.03)	0.1764 (2.04)**
Cisp	0.0072 (0.36)	-3.2268 (-1.30)	0.0227 (0.32)	0.0028 (0.63)	-1.3641 (-0.64)	-0.0015 (-0.02)	-0.1176 (-2.92)*	-0.6400 (-1.21)	-0.1112 (-2.68)*	-0.1267 (-3.47)*	-3.7443 (-1.85)***	-0.1015 (-2.70)*
Tsbs	11.18219 (4.27)*	-0.6498 (-0.90)	-0.0096 (-0.09)	-0.4868 (-19.02)*	-0.2403 (-0.53)	-0.0164 (-0.12)						
Log(*Pop*)	24.1376 (11.09)*	30.8514 (0.20)	-11.0257 (-1.09)	29.4916 (13.71)*	25.3971 (1.02)	-10.4454 (-0.82)	10.6015 (8.48)*	-24.4986 (1.00)	3.9885 (1.38)	11.8302 (10.10)*	676.9062 (1.08)	6.5487 (2.15)**

continued next page

Table 8 Continued

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)												
Countries	**SSA countries rich in natural resources**						**SSA countries poor in natural resources**					
Equations	**1**			**2**			**1**			**2**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables												
Short-run coefficients												
Convergence Coefficients	-0.7434 (-7.91)*	-0.9343 (-7.46)*	-1.0085 (-8.82)*	-0.6128 (-4.39)*	-1.5450 (-7.01)*	-1.0061 (-8.06)*	-0.8909 (-9.42)*	-1.5097 (-8.68)*	-0.9278 (-13.68)*	-0.9174 (-10.95)*	-20.9893 (-1.10)	-0.9614 (-15.21)*
Δ*Ofc*	0.4799 (1.01)	-0.0584 (-0.10)	-0.2779 (-6.29)*	0.3330 (1.08)	-0.6967 (-1.81)***	-0.1216 (-2.76)*	0.0395 (0.26)	0.9807 (1.87)***	0.0094 (3.45)	-0.0393 (-0.22)	10.5816 (1.02)	0.0118 (3.30)*
Δ*Dprop*				0.1968 (0.54)	0.5634 (0.84)	0.1891 (0.92)				-0.0659 (-0.59)	-4.3467 (-0.84)	0.0178 (0.46)
Δ*Dprop*(–2)				0.0313 (0.28)	-0.0673 (-0.30)	-0.068 4(-0.48)						
Δ*TOuc*	0.0595 (1.15)	-0.1701 (-0.91)	-0.0132 (-0.22)	-0.1002 (-2.05)**	-0.0055 (-0.02)	-0.0600 (-0.79)	0.0124 (0.23)	0.0084 (0.05)	0.0132 (0.30)	-0.0096 (-0.16)	-14.8966 (-0.96)	0.0138 (0.31)
Δ*Infd*	0.0476 (0.32)	-0.5795 (-0.43)	-0.0010 (-1.52)	0.1353 (0.85)	0.7280 (1.27)	0.0057 (0.75)	0.0851 (1.69)***	0.0848 (0.52)	0.0004 (5.31)*	0.0799 (1.30)	-0.10453 (-014)	0.0003 (5.73)*
Δ*Dcfap*	-0.2314 (-0.76)	1.5165 (1.78)***	-0.0613 (-0.31)	0.2544 (0.58)	1.7590 (1.43)	0.0449 (0.18)	-0.4471 (-2.22)**	-1.7137 (-2.09)**	0.0063 (0.05)	-0.5554 (-2.18)**	-1.9543 (-0.78)	0.0098 (0.08)
Δ*Cisp*	-0.3354 (-0.58)	1.0496 (0.69)	0.0364 (0.97)	-0.2130 (-0.66)	2.5234 (1.05)	0.0106 (0.31)	0.3091 (1.19)	-0.7020 (-0.76)	0.0867 (5.01)*	0.4595 (1.50)	-82.1655 (-0.98)	0.0887 (4.55)*
Δ*Tsbs*	-8.4789 (-7.55)*	0.1892 (0.73)	-0.0097 (-0.09)	-0.5077 (-0.61)	-2.5310 (-1.09)	0.0098 (0.08)						

continued next page

Table 8 Continued

Dependent variable: Growth rate of real GDP per capita (Tcrrpt)												
Countries	**SSA countries rich in natural resources**						**SSA countries poor in natural resources**					
Equations	**1**			**2**			**1**			**2**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables												
Short-run coefficients												
ΔLog(Pop)	2132.621 (1.25)	-9705.727 (-0.99)	141.4349 (1.79)***	198.0459 (0.34)	1616.68 (0.99)	98.6800 (1.78)***	-999.644 (-1.42)	1278.369 (0.31)	-13.1009 (-0.28)	-791.9954 (-1.03)	1361.285 (0.28)	21.0478 (0.42)
Constant	-324.5847 (-4.72)*	1156.446 (0.98)	172.7324 (1.00)	-278.5323 (-4.00)*	-538.6495 (-1.27)	166.302 (0.76)	-122.9815 (-5.35)*	-25.9494 (-0.04)	-60.7151 (-1.48)	-155.8673 (-6.07)*	19946.66 (0.92)	-106.3538 (-2.24)**
Number of countries	16	16	16	16	16	16	20	20	20	20	20	20
Observations	269	269	269	253	253	253	340	340	340	320	320	320
Hausman test statistics	Hausman (MG ; PMG)=0.00 (1.0000) Hausman (MG ; DFE)=0.75 (0.9979) Hausman (DFE ; PMG)=11.24 (0.1287)			Hausman (MG ; PMG)=0.00 (1.0000) Hausman (MG ; DFE)=0.00 (1.0000) Hausman (DFE ; PMG)= 0.00 (1.0000)			Hausman (MG ; PMG) = 0.40 (0.9989) Hausman (MG ; DFE) = 020 (0.9998) Hausman (DFE ; PMG) = 6.67 (0.9997)			Hausman (MG ; PMG) = 0.08 (1.0000) Hausman (MG ; DFE)= 0.01 (1.0000) Hausman (DFE ; PMG) =6.91 (0.4384)		

Source: Authors' estimates from Stata 10 software.

NB: In brackets we have the z-statistic values. *=significant at 1%, ** =significant at 5%, ***=significant at 10%. Hausman tests indicate that PMG regressions are the most efficient in all equations.

Table 9: Relationship between openness to international capital flows, property rights and economic growth in sub-Saharan Africa: Estimates of the nonlinear model

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)						
Countries	**SSA countries rich in natural resources**			**SSA countries poor in natural resources**		
Equations	**3**			**3**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables						
Long-run coefficients						
Ofc	-0.6198 (-10.26)*	2.9932 (0.48)	0.6876 (2.34)**	-0.3423 (-3.90)*	15.4949 (0.81)	-0.217 5(-0.92)
Dprop	0.2785 (3.17)*	1.7982 (1.12)	0.0827 (1.29)	0.0060 (0.35)	0.9701 (0.64)	0.0847 (2.49)**
TOuc	0.0908 (5.23)*	-0.3177 (-0.33)	0.0827 (1.90)***	0.0247 (3.58)*	0.1730 (0.73)	0.0522 (1.41)
Infd	-0.0174 (-5.33)*	-1.2140 (-0.82)	-0.0214 (-2.32)**	0.0068 (0.03)	-0.3253 (-1.43)	0.0002 (3.27)*
Dcfap	-0.8413 (-8.72)*	-1.3078 (-0.86)	-0.5770 (-1.95)***	-0.0909 (-1.83)***	1.2838 (1.69)***	0.2175 (1.91)***
Cisp	0.0657 (1.51)	-1.3426 (-0.28)	0.0355 (0.51)	-0.3324 (-8.02)*	0.2931 (0.39)	-0.1082 (-2.73)*
Tsbs	-0.3850 (-10.75)*	5.2011 (1.17)	-0.0150 (-0.12)			
Log(Pop)	5.5626 (2.00)**	20.9011 (0.89)	-8.7718 (-0.94)	18.3770 (12.20)*	-19.9917 (-0.57)	7.3729 (2.49)**
*Ofc * dprop*	0.0106 (4.56)*	-0.1724 (-0.61)	-0.0170 (-1.90)***	0.0050 (3.92)*	-0.5495 (-1.03)	0.0032 (0.94)

continued next page

Table 9 Continued

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)						
Countries	**SSA countries rich in natural resources**			**SSA countries poor in natural resources**		
Equations	**3**			**3**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables						
Short-run coefficients						
Convergence Coefficients	-0.8800 (-5.04)*	-1.6899 (-3.66)*	-1.0400 (-7.93)*	-0.8661 (-8.78)*	-0.6092 (-0.88)	-0.9690 (-15.89)*
Δ*Ofc*	8.5793 (1.03)	-12.0743 (-1.24)	-0.4228 (-7.37)*	1.9708 (1.71)***	2.9376 (0.09)	0.1589 (1.77)***
Δ*Dprop*	-0.3502 (-1.74)***	1.0640 (1.44)	0.0860 (1.22)	-0.2077 (-0.48)	0.3984 (0.26)	0.0167 (0.41)
Δ*TOuc*	-0.0471 (-0.88)	0.5707 (0.91)	-0.0100 (-0.18)	-0.0133 (-0.19)	-0.2396 (-0.72)	0.0084 (0.19)
Δ*Infd*	-0.1109 (-0.77)	-1.2012 (-1.12)	-0.0008 (-1.43)	0.0470 (0.45)	0.4524 (0.77)	0.0002 (3.34)*
Δ*Dcfap*	-0.0280 (-0.04)	-1.0938 (-0.23)	0.0386 (0.23)	-0.4015 (-1.47)	-3.7153 (-3.07)*	-0.0133 (-0.14)
Δ*Cisp*	-0.2403 (-0.51)	14.0734 (1.25)	0.0053 (0.18)	0.5093 (2.32)**	-2.4095 (-0.97)	0.0971 (4.87)*
Δ*Tsbs*	-0.3977 (-0.53)	-10.8529 (-1.14)	-0.0307 (-0.20)			
Δ*Log*(*Pop*)	-0.1007 (-0.81)	705.066 (1.18)	179.2607 (1.84)***	-751.551 (-1.09)	-1040.625 (-1.27)	23.1978 (0.48)

continued next page

Table 9 Continued

Dependent variable: Growth rate of real GDP per capita (*Tcrrpt*)						
Countries	**SSA countries rich in natural resources**			**SSA countries poor in natural resources**		
Equations	**3**			**3**		
Regressions	**PMG**	**MG**	**DFE**	**PMG**	**MG**	**DFE**
Explanatory variables						
Short-run coefficients						
*∆Ofc * Dprop*	1335.904 (1.03)	0.5519 (1.37)	0.0085 (2.81)*	-0.0544 (-2.14)**	-0.1323 (-0.12)	-0.0019 (-1.82)***
Constant	-102.8966 (-2.48)**	-784.3802 (-1.13)	139.7237 (0.85)	-224.6422 (-7.08)*	2278.142 (1.35)	-119.9638 (-2.59)**
Number of countries	16	16	16	20	20	20
Observations	269	269	269	340	340	340
Hausman test statistics	Hausman (MG ; PMG)=0.00 (1.0000) Hausman (MG ; DFE)=0.00 (1.0000) Hausman (DFE ; PMG)= 0.00 (1.0000)			Hausman (MG ; PMG)=0.04(1.0000) Hausman (MG ; DFE)=0.01 (1.0000) Hausman (DFE ; PMG)= 0.00 (1.0000)		

Source: Authors' estimates from Stata 10 software.
NB: In brackets we have the z-statistic values. *=significant at 1%, ** =significant at 5%, ***=significant at 10%. Hausman tests indicate that the PMG regressions are the most efficient.

Reviewing the efficient results of Equation 1 in tables 7 and 8, we find that the elasticity coefficients of the variable of the openness to international capital are almost all non-significant in the long-run and short-run relationships of our three samples, except the one of the long-run in SSA countries rich in NR which is significantly negative. However, among non-significant coefficients those of the long-run relationship in the global sample and short-run relationships of the two sub-samples are positive. These positive results confirm that the openness to international capital flows contribute to economic growth in SSA, but this contribution is small due to the non-significance of the positive results and the significance of the negative one.

Moreover, when we compare the efficient regression of Equation 1 with those of Equation 2 in tables 7 and 8, we find that the coefficient of the elasticity of the variable of the openness to international capital flows that is non-significant in the short-run and the long-run relationships of the Equation 1 of the global sample becomes significantly positive in those of Equation 2 in the presence of the indicator of private property rights. Also, in the context of SSA countries poor in NR, this coefficient that is not significant in the long-run relationships of Equation 1 became significantly positive in Equation 2 in the presence of private property rights indicator. In contrast, in SSA countries rich in NR, the coefficient passed in Equation 1 from a significantly negative state in the long-run relationship and a non-significant positive state in the short-run relationship to non-significant positive state in Equation 2 in the presence of property rights indicator. This significant improvement clearly shows that the quality of property rights stimulate the contribution of international capital to economic growth in SSA countries. But this influence is more significant in countries poor in NR. These results show that property rights are well-improved in SSA countries poor in NR.

The indicator of property rights score is present in most of our efficient regressions positive elasticity coefficients except the one of short-run relationship of Equation 3 of SSA countries rich in NR in Table 9 that is significantly negative. However, the positive elasticities are significant in the long-run relationship of Equation 2 of SSA countries poor in NR in Table 8 and in the long-run relationship of Equation 3 for SSA countries rich in NR in Table 9. These results allow us to affirm the contribution of property rights to long-run economic growth of SSA countries; which is not the case in the shortrun. We deduce, in view of the results in tables 8 and 9, respectively, in countries rich in NR and countries poor in RN, that an increase of one percentage point of property rights score lead to an increase of the long-run economic growth rate of nearly 0.28% and 0.09%.

When we examine the results of the nonlinear model (Equation 3), we note that in the short-run relationship of the global sample and the one of the long-run of the two sub-samples in tables 7 and 9 that when the elasticity coefficient of the openness to capital flows is significantly negative, the marginal effect of the interaction term is significantly positive. These results suggest that when international capital tends to negatively influence economic growth, property rights contribute to attenuate this adverse effect. Thus, we deduce, respectively, within SSA countries rich in NR and those poor in NR that an increase of one percentage point in the score of the property rights would attenuate the adverse effect of foreign capital on economic growth to around 0.01% and 0.005%.

Moreover, with these results of Equation 3 in the long-run relationship of the global sample in Table 7 and the one of the short-run of SSA countries poor in RN in Table 9,

we note that when the elasticity coefficient of the openness to capital flows is significantly positive, the marginal effect of the interaction term is significantly negative. This suggests that when international capital tends to positively affect economic growth, property rights come to reduce this favourable effect. This result highlights the negative influence of the precarious state of property rights. Thus, an increase of one percentage point of the precariousness of property rights in all SSA countries would lead to a fall in economic growth effect of the openness to foreign capital of nearly 0.007%.

With significantly positive marginal effects, we deduced from the short-run relationship of the global sample a threshold level of about 74[13] in terms of property rights score beyond which the growth effect of the openness to international capital flows begin to appear. In the context of SSA countries rich in NR, this threshold is 58[14],while it is 68[15] in the context of SSA countries poor in NR. This gives an average threshold of 63[16].

However, the significantly positive marginal effects of the interaction terms found in this study confirm that the impact of international capital on economic growth of SSA countries is an increasing function of private property rights; this indicates that the impact of international capital on economic growth becomes more important when the scores of property rights improve positively. This result corroborates that found above on the role of catalyst factor of property rights for economic growth effects of international capital.

The speed of adjustment reflected by the coefficient of convergence in the short-run relationship is significantly negative in all our efficient estimates and tends towards unity, that is -0.92 in Table 7, -0.79 in Table 8,and -0.87 in Table 9. This means that a boost in the openness to capital flows process is likely to propel sub-Saharan Africa countries on a rapid path to their steady state of long-run growth rate.

Regarding the control variables, we find that the trade openness rate has a significantly positive elasticity coefficient in the long-run relationships of efficient regressions of the global sample in Table 7 and those of equations 2 and 3 of both sub-samples in tables 8 and 9. But this elasticity is significantly negative in the long-run relationship of the Equation 1 of SSA countries rich in NR in Table 8. The positive results indicate that trade openness contributes to long-run economic growth in SSA countries. Thus, when we consider the long-run results of Equation 3, we find that an increase in the rate of trade openness of one percentage point leads to an increase of 0.09 and 0.02%, respectively, in SSA countries rich in NR and those poor in NR. The negative coefficient of the Equation 1 in SSA countries rich in NR that becomes positive in the Equation 2 with the introduction of property rights indicator confirms that these rights affects economic growth effect of trade openness in these countries. Indeed, the high presence of foreign investors, attracted by the abundance of natural resources in SSA countries rich in NR, confronts these countries to an abundance of commercial exchanges with the rest of the world, hence the necessity of rules to make this openness beneficial to economic growth.

The elasticity coefficients of the domestic inflation rate's variable are significantly negative in the long-run relationships of efficient regressions of the global sample and of SSA countries rich in NR,respectively,in tables 7, 8, and 9, while those of the short-run in equations 1 and 3 of the global sample and those of the short-run and long-run in Equation 2 of SSA countries poor in NR are significantly positive. We conclude that, inflation rate has a strong negative impact on economic growth in SSA countries rich in NR in the longrun, but in countries poor in NR, inflation hardly affects economic

growth. Considering the long-run relationship of Equation 2 in Table 8, in the case of SSA countries rich in NR, we note that an increase in the inflation rate of 1% leads to a decrease in economic growth rate of 0.65%.Our results show that macroeconomic instability is less severe in SSA countries poor in NR than those rich in NR.

The elasticity coefficients of public expenditures are positive in all efficient regressions of the long-run of equations 1 and 2 of both sub-samples in Table 8, and all are significant except the one of Equation 2 of SSA countries rich in NR. But this elasticity becomes significantly negative in the short-run relationship of SSA countries poor in NR and in the long-run relationship of Equation 3 of both sub-samples in Table 9, with the consideration of the interaction between the private property rights and the openness to capital flows' indicator. We then conclude that public consumption has a positive effect on the long-run growth of SSA countries, but this effect is strongly influenced by the regulation on foreign capital's action. Moreover, in countries poor in NR, an increase in public consumption reduces economic growth in the shortrun. In view of the long-run results of the Equations 1 in Table 8, we note that an increase in public consumption of one percentage point increases the economic growth rate by around 0.10% in countries rich in NR and of nearly 0.21% in countries poor in NR. These results assert that, an increase in public expenditure propels economic growth in SSA countries.

The variable of domestic credit to the private sector has significantly negative elasticity coefficients in the long-run relationships of the efficient regressions of equations 2 and 3 of the global sample in Table 7 and those of equations 1, 2, and 3 of the SSA countries poor in NR in tables 8 and 9. In contrast, these coefficients are significantly positive in the short-run relationships of equations 1, 2, and 3 of the global sample and of Equation 3 in SSA countries poor in NR. These results support the view that, in SSA countries, the level of financial development contributes to short-run economic growth with a greater intensity in countries poor in NR, but in the long-run this contribution becomes harmful to economic growth. The results of the short-run relationship of equations 1, 2, and 3 of the global sample indicates that, after an increase of 1% in the level of financial sector development, SSA countries record an average growth rate of just 0.05%. These results show that the financial systems in most SSA countries are still underdeveloped to guarantee the financing of indispensable investments for the recovery of economic growth.

The elasticity coefficient of gross enrolment rate in secondary education variable is significantly positive and negative, respectively, in the long-run and short-run efficient regression of Equation 1 of Table 8 of SSA countries rich in NR, while it is significantly negative in the long-run relationships of efficient regressions of equations 2 and 3 within the same sample. We note that this coefficient becomes negative in Equation 2 (Table 8) and Equation 3 (Table 9) after taking into account the private property rights and the interaction term in the regressions. We then deduce that, human capital has a week impact on economic growth in the shortrun in SSA countries rich in NR, whereas the impact is important in the longrun but remains sensitive to the quality of regulation. These results show that in the longrun, the stock of human capital becomes important and gains the appropriate qualities to make proper investments in SSA countries rich in NR, whereas in the shortrun, the available stock doesn't possess the necessary resources to be beneficial to economic growth. However, the negative influence of human capital, recorded in the

presence of property rights, shows how far these rights are still precarious and that this precariousness makes the quality of human capital stock very fragile.

The variable of the population presents, within the framework of both sub-samples, a significantly positive elasticity coefficient of long-run relationships of efficient regressions in equations 1 and 2 of Table 8 and those of Equation 3 in Table 9. These results support the view that in SSA countries, whether rich or poor in NR, an increase in the level of population contributes significantly to economic growth. Indeed, given the results of Equations 3, we note that an increase in the population level of 1% leads to an increase in economic growth of about 5.56% and about 18.38%, respectively, in SSA countries rich in NR and SSA countries poor in NR. Indeed, in SSA countries that still remain underdeveloped, a growing population is a potential market, leading to an increase in global demand that in turn arouses an increase in investments and consequently an increase in economic growth.

5. Conclusion

In this paper, we tried to check, on the one hand, the relevance of property rights quality in the contribution of the openness to international capital flows to economic growth in sub-Saharan Africa, and on the other hand, if this contribution depends on natural resource endowment. Our analysis focused on panel data of 36 sub-Saharan Africa countries which we then split into sub-samples of 16 countries rich in natural resources and 20 countries poor in natural resources over the period 1996-2013. Our results confirm that the contribution of foreign capital to economic growth improves when the property rights are included in the regressions. But this improvement is more significant in countries poor in natural resources than in countries rich in natural resources.

We conclude that, in fact, the quality of property rights is a precondition for economic growth effects of the openness to international capital flows in sub-Saharan Africa. However, within both groups of countries, we identified thresholds of 58 and 68 in terms of private property rights scores, respectively, in SSA countries rich in NR and SSA countries poor in NR, from which the openness to international capital flows begins to show its beneficial effect on economic growth.

Insofar as the consideration of private property rights reveals the beneficial effect of international capital on economic growth, the implication is a large depreciation of these rights in SSA countries, evidenced by the lack of laws protecting private investors against expropriation and ensuring the conclusion of reliable contracts. As another implication, there is the discrimination in the private sector or against foreign investors. This occurs when governments impose too heavy taxes on the activities of foreign investors and on foreign capital inflow.

In light of these implications, and, with a view to enable the sub-Saharan Africa countries to better benefit from international financial liberalization, we recommend that policy makers in these countries must:

1. Promote the improvement of private property rights. This action could concern new laws protecting capital and equipment, new laws for the establishment of contracts between private investors and between private investors and governments, new laws for the settlement of conflicts between private investors and between private investors and governments. The improvement could also concern the creation of control units that enforce property rights, the access of foreign investors to the same rights that protect domestic investors.
2. Conduct attraction policies of foreign capital and improvement actions of property rights simultaneously.
3. Use the average threshold of 74 as the standard score of private property rights to achieve and improve.

Notes

1. That is to say, the removal of arbitrary fixing constraint of real interest rates by governments below their equilibrium value of markets.

2. Here, it is the International Monetary Fund and the World Bank.

3. Foreign direct investments

4. United States of America.

5. Foreign direct investment is net inflows of investment to acquire a lasting management interest (10% or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital, as shown in the balance of payments.

6. Portfolio equity includes net inflows from equity securities other than those recorded as direct investment and including shares, stocks, depository receipts and direct purchases of shares in local stock markets by foreign investors.

7. Bonds are securities issued with a fixed rate of interest for a period of more than one year. They include net flows through cross-border public and publicly guaranteed and private non-guaranteed bond issues.

8. Commercial bank and other lending include net commercial bank lending (public and publicly guaranteed and private non-guaranteed) and other private credits.

9. Multicolinearity favours instability of estimated coefficients, an increase in the estimated variance of some coefficients (Bourbonnais, 1993).

10. Belsley et al (1980).

11. This command, its syntax and some examples of its implementation are detailed in the reference manual accompanying Stata 11 software.

12. Ordinary Least Squares.

13. The cut-off is :0.3348/0.0045≈74,40

14. The cut-off is :0.6198/0.0106≈58.47

15. The cut-off is :0.3423/0.0050≈68.46

16. The cut-off is : (58+68)/2=63

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Appendix

Table A-1: Complete list of countries used in the study

Sub-Saharan Africa countries rich in natural resources	Sub-Saharan Africa countries poor in natural resources
Côte d'Ivoire	Benin
Guinea	Burkina Faso
Sierra Leone	Guinea-Bissau
Democratic Republic of Congo	Niger
Republic of Congo	Senegal
Cameroon	Togo
Angola	Mali
Chad	Gambia
Gabon	Cape Verde
Equatorial Guinea	Ghana
Central African Republic	Uganda
Mozambique	Ethiopia
Tanzania	Madagascar
Botswana	Malawi
Namibia	Rwanda
South Africa	Kenya
	Mauritius
	Lesotho
	Zimbabwe
	Swaziland

Source: Report on Development in Africa, 2007.

Table A-2: Results of the existence of temporal fixed effects

Samples	Sub-Saharan Africa countries	Sub-Saharan Africa countries rich in natural resources	Sub-Saharan Africa countries poor in natural resources
Basic model	F-statistic	F-statistic	F-statistic
Equation 1	1.38	1.15	1.85**
Equation 2	1.38	1.21	1.90**
Model with the interaction term	F-statistic	F-statistic	F-statistic
Equation 3	1.37	1.25	1.87**

Source: Authors' estimates from Stata 10 software.
NB: *, ** and *** designate, respectively, significance at 1%, 5% and 10% thresholds. The null hypothesis is that all years' coefficients are jointly equal to zero. The rejection of the null hypothesis confirm the presence of temporal effects in the panel.

Table A-3: Results of the global heterogeneity test of Fisher

Samples	Sub-Saharan Africa countries	Sub-Saharan Africa countries rich in natural resources	Sub-Saharan Africa countries poor in natural resources
Basic model	F-statistic	F-statistic	F-statistic
Equation 1	5.07*	3.80*	4.50*
Equation 2	5.06*	3.93*	4.34*
Model with the interaction term	F-statistic	F-statistic	F-statistic
Equation 3	4.30*	3.98*	4.32*

Source: Authors' estimates from Stata 10 software.
NB: *, ** and *** designate, respectively, significance at 1%, 5% and 10% thresholds. The rejection of the null hypothesis confirms the presence of individual fixed effects.

Table A-4: Results of the cross-sectional dependence test of Breusch-Pagan and Pesaran(2004)

Samples	Sub-Saharan Africa countries	Sub-Saharan Africa countries rich in natural resources	Sub-Saharan Africa countries poor in natural resources
Basic model	Computed Statistic	Computed Statistic	Computed Statistic
Equation 1	2.337**	150.754**	3.070*
Equation 2	2.310**	139.244	3.069*
Model with the interaction term	Computed Statistic	Computed Statistic	Computed Statistic
Equation 3	2.479**	139.688	3.046*

Source: Authors' estimates from Stata 11 software.
NB: *, ** and *** designate, respectively, significance at 1%, 5% and 10% thresholds. The null hypothesis indicates that the residuals are not correlated. So, the rejection of the null hypothesis indicates the presence of cross-sectional dependence.

Table A-5: Results of the CIPS-test of unit root of Pesaran (2007) (specification without trend)

	Variables at level					
Samples	**Sub-Saharan Africa countries**		**Sub-Saharan Africa countries rich in natural resources**		**Sub-Saharan Africa countries poor in natural resources**	
Variables	**Lags**	**Zt-Bar**	**Lags**	**Zt-Bar**	**Lags**	**Zt-Bar**
Tcrpt	0	-7.010*	2	0.270	0	-6.825*
Ofc	4	2.615	1	-0.978	4	2.006
Dprop	0	2.084	0	0.741	0	0.641
Touvc	0	-2.118**	1	0.413	4	1.775
Tinfd	1	-10.458*	2	-2.210**	1	-8.643*
Dcfap	0	-1.645**	0	-0.845	0	-1.692**
Cisp	3	-0.192	0	0.186	3	1.930
Tsbs	4	24.936	4	16.110	4	19.029
Ofc * *Dprop*	4	25.529	0	-5.838*	4	19.029
Log(*Pop*)	4	25.529	4	16.940	4	19.029

Source: Authors' estimates from Stata 10 software.
NB: The null hypothesis of the CIPS-Test of Pesaran (2007): series is I(1). *, ** and *** designate significance, respectively, at 1%, 5% and 10%.

Table A-6: Results of the CIPS-test of unit root of Pesaran (2007) (specification with trend)

Variables at level						
Samples	**Sub-Saharan Africa countries**		**Sub-Saharan Africa countries rich in natural resources**		**Sub-Saharan Africa countries poor in natural resources**	
Variables	**Lags**	**Zt-Bar**	**Lags**	**Zt-Bar**	**Lags**	**Zt-Bar**
Tcrpt	0	-5.949*	2	-0.744	0	-5.685*
Ofc	4	23.703	1	-2.096**	4	17.623
Dprop	0	3.442	0	1.702	0	0.061
Touvc	0	-0.325	1	-0.409	4	17.623
Tinfd	1	-8.625*	2	-2.173**	1	-7.656*
Dcfap	0	-1.619***	0	-1.528***	0	-0.866
Cisp	3	1.090	0	1.046	3	2.602
Tsbs	4	23.703	4	15.654	4	17.623
*Ofc * Dprop*	4	23.703	0	-5.596*	4	17.623
Log(*Pop*)	4	23.703	4	15.654	4	17.623

Source: Authors' estimates from Stata 10 software.
NB: The null hypothesis of the CIPS-Test of Pesaran (2007): series is I(1). *, ** and *** designate significance, respectively, at 1%, 5% and 10%.

Table A-7: Results of the CIPS-test of unit root of Pesaran (2007) (specification without trend)

Variables at first differences						
	Sub-Saharan Africa countries		**Sub-Saharan Africa countries rich in natural resources**		**Sub-Saharan Africa countries poor in natural resources**	
Variables	**Lags**	**Zt-Bar**	**Lags**	**Zt-Bar**	**Lags**	**Zt-Bar**
Tcrpt	0	-18.954*	2	-4.701*	0	-15.019*
Ofc	2	-3.367*	1	-7.264*	1	-5.035*
Dprop	0	-6.345*	0	-3.713*	0	-5.840*
Touvc	0	-13.941*	1	-4.519*	1	-3.923*
Tinfd	1	-16.881*	2	-5.323*	1	-13.538*
Dcfap	0	-14.014*	0	-10.202*	0	-10.538*
Cisp	2	-5.029*	0	-5.488*	2	-2.148**
Tsbs	2	-3.226*	1	-3.393*	2	-4.283*
*Ofc * Dprop*	2	-3.775*	0	-14.587*	1	-5.559*
Log(*Pop*)	1	-8.744*	1	-8.293*	1	-8.999*

Source: Authors' estimates from Stata 10 software.
NB : The null hypothesis of the CIPS-Test of Pesaran (2007): series is I(1). *, ** and *** designate significance, respectively, at 1%, 5% and 10%.

Table A-8: Results of the CIPS-test of unit root of Pesaran (2007) (specification with trend)

	Variables at first differences					
	Sub-Saharan Africa countries		Sub-Saharan Africa countries rich in natural resources		Sub-Saharan Africa countries poor in natural resources	
Variables	Retards	Zt-Bar	Retards	Zt-Bar	Retards	Zt-Bar
Tcrpt	0	-15.924*	2	-2.814*	0	-12.371*
Ofc	2	-0.832	1	-5.325*	1	-3.433*
Dprop	0	-4.015*	0	-2.625*	0	-3.684*
Touvc	0	-10.973*	1	-3.133*	1	-1.620***
Tinfd	1	-13.318*	2	-3.856*	1	-10.835*
Dcfap	0	-11.253*	0	-8.053*	0	-8.656*
Cisp	2	-1.891**	0	-3.389*	2	0.477
Tsbs	2	-0.334	1	0.098	2	-4.243*
Ofc*Dprop	2	-0.264	0	-12.926*	1	-3.832*
Log(Pop)	1	-13.004*	1	-9.348*	1	-12.938*

Source: Authors' estimates from Stata 10 software.
NB: The null hypothesis of the CIPS-Test of Pesaran (2007): series is I(1). *, ** and *** designate significance respectively at 1%, 5% and 10%.

Table A-9: Asymptotic critical value bounds for the F-statistic tabulated by Pesaran et al (2001)

Number of regressors (K)	Critical thresholds	Lower bound) values : I(0)	Upper bound values : I(1)
6	10%	1.99	2.94
	5%	2.27	3.28
	1%	2.88	3.99
7	10%	1.92	2.89
	5%	2.17	3.21
	1%	2.73	3.90
8	10%	1.85	2.85
	5%	2.11	3.15
	1%	2.62	3.77
9	10%	1.80	2.80
	5%	2.04	3.08
	1%	2.50	3.68

Source: Pesaran et al (2001).
NB: The critical values are from table C1.ii : Case 2 (restricted intercept and no trend) from Pesaran et al (2001).

Table A-10: F-Statistic values from estimations of our equations

Samples	Equations	F-Statistics	Decisions
SSA countries (global sample)	1	12.37947	Cointegration
	2	11.00188	Cointegration
	3	10.41202	Cointegration
SSA countries rich in natural resources	1	6.638127	Cointegration
	2	5.856354	Cointegration
	3	5.232807	Cointegration
SSA countries poor in natural resources	1	9.316021	Cointegration
	2	8.818312	Cointegration
	3	7.873545	Cointegration

Source: Authors' calculation from Stata 10 software.
NB: The F-Statistics found here are superior to the upper critical bounds values at 1%, 5% and 10% thresholds.