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Understanding the Growth of African Financial Markets

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Understanding the Growth of African Financial Markets

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Abstract

This Working Paper should not be reported as representing the views of the IMF. The views expressed in this Working Paper are those of the authors and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the authors and are published to elicit comments and to further debate.

This paper examines empirically the determinants of financial market development in Africa with an emphasis on banking systems and stock markets. The results show that income level, creditor rights protection, financial repression, and political risk are the main determinants of banking sector development in Africa, and that stock market liquidity, domestic savings, banking sector development, and political risk are the main determinants of stock market development. We also find that liberalizing the capital account promotes financial market development only in countries with high incomes, well- developed institutions, or both. The powerful impacts of political risk on both banking sector and stock market development suggest that resolution of political risk may be important to the development of African financial markets.

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[1] Mihasonirina Andrianaivo is a PhD candidate at L'Universite de Rennes I (CREM-UMR CNRS 62-11). She was a summer intern in the African Department when this paper was written. We would like to thank participants in the African department's financial sector network seminar series for comments and suggestions. The paper has also benefited from useful suggestions from Norbert Funke, Patrick Imam and Roland Kpodar. The usual caveat for responsibility applies.

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I. INTRODUCTION

This paper studies the determinants of financial market development in Africa, especially banking systems and stock markets. Over the past few decades, world capital markets have surged, with significant contributions from emerging markets. In Africa, the financial landscape has changed with the growth of stock and bond markets as well as the private equity market. The number of stock markets in Africa has risen from 5 in 1990 to 18 currently. In the banking system, credit to the private sector and bank assets—both indicators of banking sector development—have increased significantly since 1990.

With extensive empirical evidence supporting the assertion that the financial development promotes growth (see Levine and Zervos, 1998, for instance), research is now shifting toward explaining the most important policy question: What explains cross-country differences in financial development? Why have some economies developed well- functioning financial systems while others have not? Understanding the determinants of financial development is important because financial development is expected to promote savings and investment, thereby facilitating economic growth.

This paper studies the determinants of financial market development in Africa using a panel of 53 countries for the period 1990 to 2006. Specifically, it examines the impact of income level, macroeconomic stability, financial liberalization and institutional quality on both banking sector and stock market development. Demirguc-Kunt and Levine (1996) have found that most stock market indicators are highly correlated with banking sector development. Countries with well-developed banking sectors also tend to have well-developed stock markets. We investigate if this positive relationship between banking sector and stock market development is observable in Africa.

Due to differences in the underlying theoretical foundation, our approach is to model banking sector and stock market development separately to identify both market-specific factors and general economic and institutional factors that can explain financial market development.[1] We model the determinants of banking sector development using the Mckinnon–Shaw hypothesis—financial repression hinders financial development and economic growth—as the baseline. Specifically, we regress two important indicators of banking sector development—credit to the private sector relative to GDP and commercial bank assets relative to total financial assets of the banking sector—on measures of economic stability, income level, institutional quality, and financial liberalization and trade openness. We model stock market development using the Calderon Rossell model—stock market development is a function of income level and stock market liquidity—as the baseline. We regress stock market capitalization relative to GDP on measures of stock market liquidity, income level,

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[1] We use a panel of 18 countries for the stock market regression and 53 countries for the banking sector development regression.

capital account liberalization, and macroeconomic and institutional environment. Our general approach allows us to test the importance of competing theories (for instance, the financial repression hypothesis) in explaining financial market development.

We use annual data from 1990 to 2006 in order to maximize sample size and identify parameters of interest more precisely. In the banking sector regression, by including a lagged dependent variable as one of the explanatory variables we allow for dynamics in the behavior of the dependent variable to capture the possibility of partial adjustment toward the steady state. Our preferred method of estimating is the system generalized method of moments (GMM), but in the stock market regression, we used fixed effects and instrumental variable techniques because the system GMM was not designed for a small number of cross-section units (maximum 18 in the stock market regression).

Income level, creditor rights protection, financial repression, and political risk are shown to be the main determinants of banking sector development in Africa. Stock market liquidity, domestic savings, banking sector development, and political risk are shown to be the main determinants of stock market development. The powerful impact of political risk on both banking sector and stock market development suggest that resolution of political risk may be important for the development of African financial markets. Another interesting result is that liberalization of the capital account promotes financial market development only in countries with high-income levels, well-developed institutions, or both.

The findings on political risk, macroeconomic stability and creditor rights protection all being important for financial market development have significant implications for developing African financial markets. Their significance implies that any efforts by African governments to reduce political risk and improve institutions, implement more open trade and sound economic policies, and protect creditor rights can stimulate banking sector development. Similarly, policies to increase stock market liquidity, promote domestic savings, promote financial intermediaries, and reduce political risk can stimulate stock market development.

In what follows, Section II documents developments in Africa's financial markets over the last few decades. Section III reviews the literature on the determinants of financial market development. Section IV discusses the data and methodology of the paper. Section V presents the empirical results, and Section VI presents our conclusions.

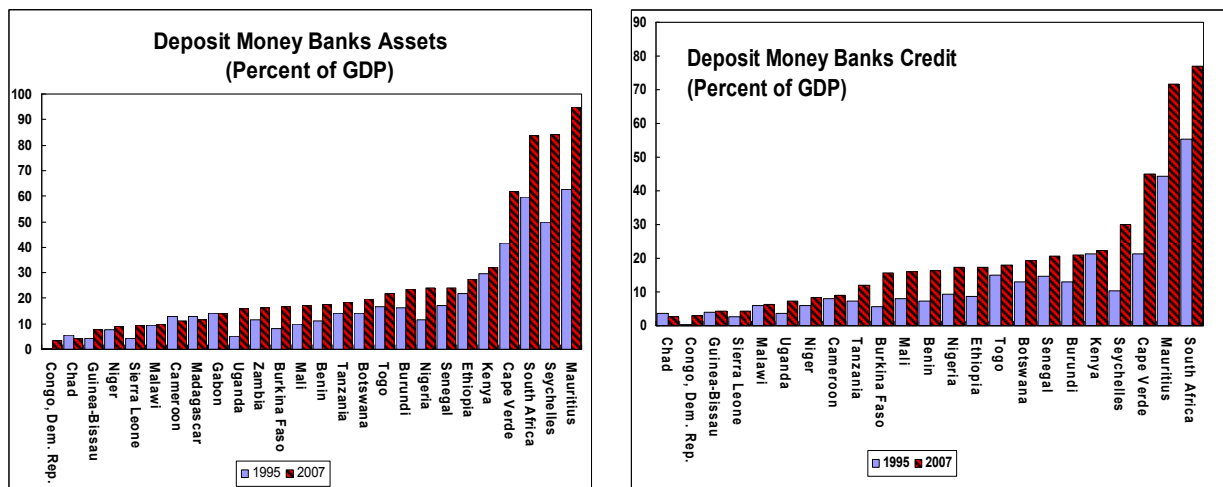## II. THE GROWTH OF AFRICAN FINANCIAL MARKETS

The financial systems of most African countries have undergone substantial changes over the last few decades. Most countries traditionally depended on the banking system, but in recent times (until the outbreak of the global financial crisis); capital markets have gained a prominent role.

A. Banking in Africa

It is difficult to generalize about banking system development because African countries are so diverse in terms of financial development and access to financial services. Nevertheless, we can identify a number of common trends. For African countries, credit to the private sector relative to GDP and bank assets relative to GDP are now higher than 10 years ago. However, despite the rapid growth of African banking systems, indicators of financial depth in Africa are the lowest in the world. On average bank credit to the private sector represents no more than 15 percent of GDP in Africa; in developed economies, it is more than 100 percent.

Compared with their counterparts in emerging markets, African banks have a limited role in the economy. Banking services penetration is as low as 5 percent, and access in most countries is limited to the urban centers. The fact that the ratio of M1 to M2 is the highest in the world means that cash is still the dominant financial instrument. Financial intermediation is hampered by the slow execution of due process as manifested in slow court proceedings, the absence of credit assessment information, and little protection for property rights.

Figure 1. Africa: Banking Sector Development

Despite its small size compared to other economies, banking systems in Africa are reasonably sound (Gulde *et al.*, 2006). Better macroeconomic conditions and less government intervention seem to have diminished the ratio of nonperforming loans, even though the characteristics of a specific country, such as current or past conflicts and the implication for the government, can cause differences between countries. The capital adequacy ratio, which is respected, averages 16 percent of risk-weighted assets.

Banks are profitable even though they are less efficient than in other countries. Overhead costs and net interest rate margins are better than in other low-income countries (Beck and Honohan, 2007). The banking system is generally very concentrated; perhaps because the size of the market is small (the number of banks does increase with the size of the country

African stock markets are still small compared to stock markets in other emerging markets. They are dominated by a few large firms that represent a high proportion of total market capitalization. The number of listed companies is also small, except in South Africa, Egypt, and to some extent Nigeria. The Johannesburg stock exchange in South Africa dominates the region in terms of market capitalization, but the Cairo and Alexandria Stock Exchange (CASE) have recently been growing rapidly. Together South Africa and Egypt account for more than 50 percent of all listed companies in the entire continent. Institutional investors and governments with minority stockholdings are not active traders in secondary markets and lack of experience and resources for issuing shares prevent effective use of exchanges.

African stock markets are illiquid. Shares are rarely traded and there are large gaps between buy and sell orders. Usually, trading occurs in only a few stocks, those that represent the majority of market capitalization (Yartey and Adjasi, 2007). Turnover ratios are as little as 0.04 percent in Swaziland compared with about 31 percent in Mexico. Low liquidity implies more difficulty in supporting a local market with its own trading systems, market analysis, and brokers because business volume is too low.

Africa: Indicators of Stock Market Development, 2007

	Number of Listed Companies	Stock Market Capitalization/ GDP	Value Traded/GDP	Turnover
Botswana	18	41.9	0.9	2.2
Cote d' Ivoire	40	32	0.8	2.5
Egypt	603	91.2	41.4	45.4
Ghana	32	18.6	0.7	3.8
Kenya	51	42.2	4.5	10.6
Morroco	65	85.5	35.9	41.9
Mauritius	41	73.1	5.8	7.9
Namibia	9	9.3	0.3	3.7
Nigeria	202	35.9	10.1	28.2
South Africa	401	280.8	153.4	54.6
Tanzania	n.a	4	0.1	2.1
Tunisia	48	14.1	1.9	13.2
Uganda	n.a	1.2	0.1	5.2
Zambia	n.a	15.6	0.6	4.1
Argentina	103	31.9	3.1	9.8
Brazil	392	79.3	44.5	56.1
Chile	244	118.9	27.1	22.8
Mexico	131	42	12.9	30.8
Malaysia	1027	156	83	53.2
Thailand	476	64.3	45.1	70.2

Source: Beck *et al.* (2008)

African stock markets suffer from infrastructural bottlenecks. Trading, clearing, and settlement systems are so slow it can take months to execute a single transaction (Senbet, 2008), and most of the exchanges still operate manual systems. That slows information production, hampers activity and turnover, and renders financial integration difficult. Similarly, most markets do not have central depository systems, and some restrict foreign participation. Such bottlenecks induce inactivity (Yartey and Adjasi, 2007).

Despite the problems of small size and low liquidity, returns on African markets have generally been high. Senbet (2008) shows that after controlling for risk (Sharpe ratio) returns are similar to those realized in Latin America and Asia even when the results are converted into dollars. Therefore, these markets represent unexploited opportunities for international investors. They are diversification opportunities that are minimally lowly correlated with the global system and its risk.

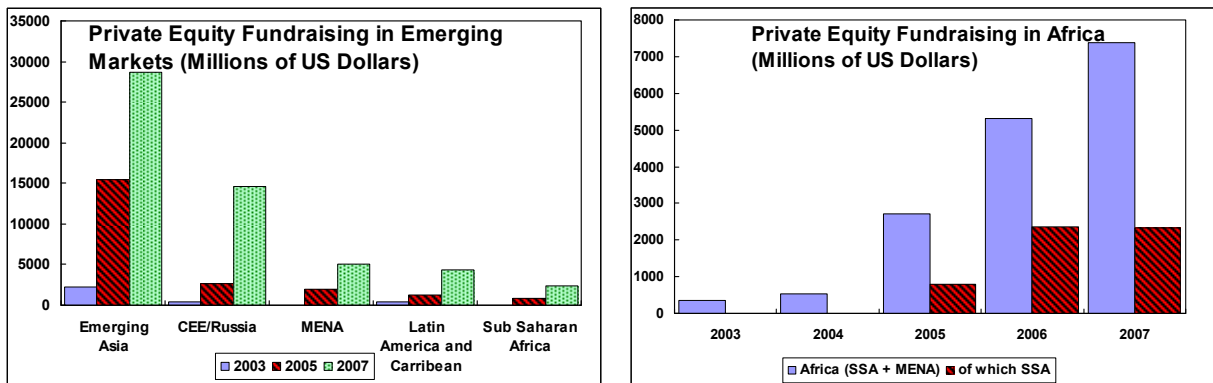### C. The Private Equity Market

Private equity is a broad term that refers to any type of investment in an asset in which the equity is not freely tradable on a public stock market. In fact, private equity refers to how the funds have been raised—on private rather than public markets.[2]

Following the trend of increases in capital flows and investments in emerging markets, there has been a significant boom in private equities in the last few years in Africa. According to the OECD, investments in private equity reached US$2.3 billion in 2006, and there has since been the buyout of Celtel, Africa's third largest mobile operator, for US$3.4 billion (OECD, 2008). In 2007, Pamodzi Investments Holdings in South Africa announced a US$1.3 billion pan-African fund, backed by American financial institutions, after Rennaissance Capital launched its US$1 billion pan-African investment fund.

With African stock markets small and illiquid, private equity is another way for investors to take advantage of the opportunities in African emerging economies. According to the South African Venture Capital Association, although international conditions have pushed money into riskier but more profitable investments, nevertheless risk premiums in Africa decreased from 8.9 percent in 2006 to 6.7 percent in 2008.[3]

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[2] Private equity investments are generally made through funds. Typically, the funds raise equity at the time they are formed and raise additional capital when investments are made. This additional capital usually takes the form of debt when the investment is collaterizable, as in buy outs, or equity from syndication partners when it is not, as in a start up. The typical private equity fund has a relatively long investment horizon (at least 5-7 years), and is often active in the operation or restructuring of acquired firms.

[3] Because in the U.S. and Europe competition for good deals became fierce as the amount of capital available increased, managers went looking for alternative investment destinations.

Figure 3: Private Equity Fundraising (Millions of US$)

Private Equity Fundraising in Emerging Markets (Millions of US Dollars)

Categories: Emerging Asia, CEE/Russia, MENA, Latin America and Carribean, Sub Saharan Africa. Legend: 2003, 2005, 2007.

Private Equity Fundraising in Africa (Millions of US Dollars)

Years: 2003, 2004, 2005, 2006, 2007. Legend: Africa (SSA + MENA), of which SSA.

Source: EMPEA

Private equity funds in Africa are small by international standards. There are currently about 31 fund managers active in Africa and about seven private equity funds are dedicated to infrastructure (Ndiaye, 2008).[4] South Africa dominates the African equity market with a share of 80 percent of sub-Saharan African private capital, and Nigeria has another 10 percent (Santiso, 2007). South Africa's private equity market compares favorably with those in developed countries. Total funds under management were roughly 2.8 percent of GDP in 2007—higher than the global average of 2.1 percent and the European average of 1.9 percent (KPMG and SAVCA, 2008).

Funds for private investment in Africa come from a variety of sources. The United States provides 50 percent of the capital of private equity funds in Africa. South Africa is second with 25 percent, of which a third is raised from pension and endowment funds (Santiso, 2007). Europe contributes about 9 percent of the capital, primarily from public funds of European development finance institutions such as Proparco (France) and CDC (UK). China also recently bought a 20 percent stake in Standard Bank, the largest bank in South Africa, for US$56.5 billion.

A better macroeconomic environment characterized by high growth and low inflation has been a primary factor in the growth of private equity. Even though the absence of systems and institutions to ease deal flows and the exit of private equity funds, poor governance, and political instability militate against market development, foreign investment is attracted by the high returns in African markets over the last five years due to cheap labor, little competition, low rents, and therefore higher margins. The institutional environment and the quality of regulation are important to the proper functioning of the private equity market in Africa (Yartey, 2007b).

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[4] AIG African infrastructure Fund, EU Africa Infrastructure Trust Fund, Pan African Infrastructure Development Fund, China-Africa Fund, Comesa Infrastructure Fund, Emerging Africa Infrastructure Fund, Southern Africa Infrastructure Fund.

D. The Bond Market in Africa

The market for long-term debt is the least developed segment of Africa's capital market, attracting only a small proportion of total financial system assets. Much of the momentum for the growth in nonintermediated debt markets in Africa has come from the government sector. Corporate debt markets (including issues by government-sponsored enterprises) have generally lagged the government bond market. However, evidence from seven sub-Saharan African countries (Botswana, Ghana, Kenya, Mauritius, Nigeria, Tanzania, Uganda, and Zambia) shows a marked increase in the volume of nongovernment domestic debt, from US$91 million in 2001 to US$801 million in 2006. Nevertheless, the corporate debt market is underdeveloped in most African countries mainly because the government debt market, which is expected to provide the foundation for a number of hedging instruments, is itself developing slowly.

Foreign currency debts dominate the debt market in Africa mainly due to a reliance on concessional multilateral and bilateral funding and the fact that domestic markets are rudimentary (Sy, 2007). Some countries have, however, been able to access international capital markets or develop domestic debt markets. Local currency debt is mainly short- term with maturities usually less than a year; maturities of 3 to 6 months are the most popular. Local currency markets have been used extensively for recapitalizing banks, setting benchmarks for the pricing of financial assets and risk management tools, and helping governments to finance their deficits. Commercial banks use these opportunities to increase their profits by transferring their excess liquidity held in reserves at the central banks into government bills.

Figure 4: Bond Markets in Africa
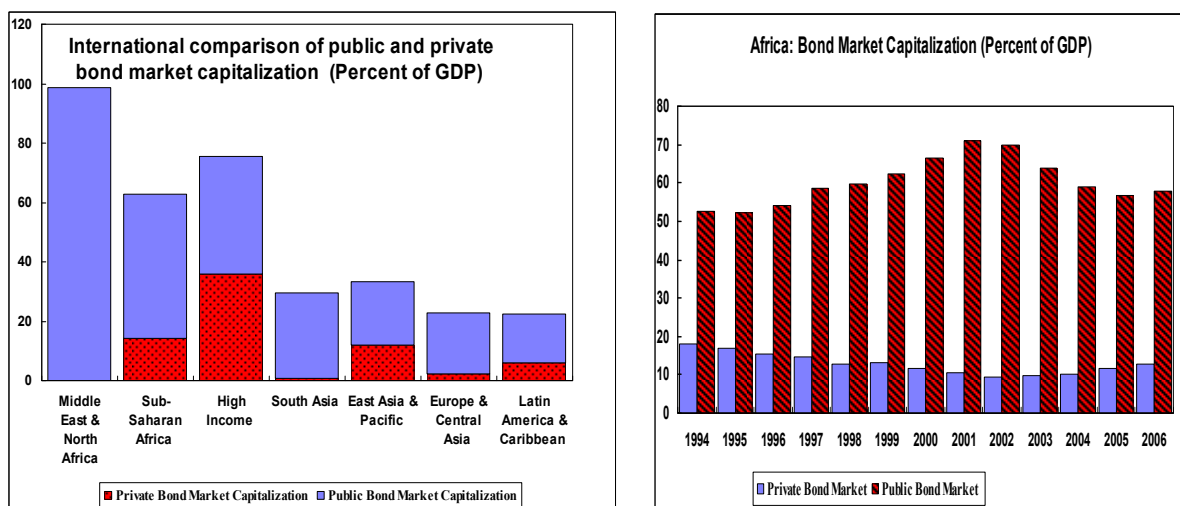
Source: Financial structure database- Beck *et al.* 2008

Issuers on the local currency debt market differ by country; they include governments, regional development banks, and corporations. Issuance of local currency debt is erratic and small in volume, leading to problems in developing fungible and liquid instruments and

benchmarks. Domestic market infrastructure, including clearing, settlement, and systems, is underdeveloped. Local commercial banks and institutional investors account for about 70 percent of outstanding debt. This reflects weaknesses in commercial bank lending and in some cases excessive requirements to hold government securities (Blommestein and Horman, 2007). Institutional investors like pension funds are vibrant in some countries, promoting more diverse ownership.

Nonresident holdings of domestic debts are typically low, but several countries have managed to issue debt securities in their own currency to foreign investors. At the end of June 2007 foreigners held about 11 percent of Ghana's domestic currency government debt (more than US$400 million) and 14 percent of Zambia's (Linn and Nagy, 2008). In 2007, Ghana and Gabon entered the international capital market. To fund new public infrastructure spending, Ghana issued US$750million in bonds and Gabon issued US$1 billion (Linn and Nagy, 2008).

Market microstructure problems—small size, low liquidity, lack of long-term maturities, and limited investor base—pose challenges for bond market development and debt strategy in Africa (Blommestein and Horman, 2007). These problems have led to the lack of reliable yield curves, pricing benchmarks, and financial products to hedge risk. Mitigating the risks requires sound macroeconomic policy and a stable political environment. Building up market infrastructure, including trading, information dissemination, clearing and settlement systems; incentives that reinforce good market participation; and developing a yield curve would also be beneficial.

III. THE LITERATURE ON DETERMINANTS OF FINANCIAL MARKET DEVELOPMENT

The relationship between financial development and economic growth has been the subject of extensive research. Financial intermediaries emerge mainly due to informational problems and transaction costs. Studies of finance and development can be traced back to Schumpeter (1911). Recently, endogenous growth models have been used to explain how the financial system can affect steady-state growth. The usual result is that financial development promotes economic growth. Levine and Zervos (1998), for instance, show that stock market development affects growth through capital accumulation and improvement in productivity.

While the question of whether financial market development promotes growth has gained considerable attention in academic and policy discussions, there is little work, theoretical or empirical, on what determines financial market development in developing economies. Understanding the determinants of financial market development is crucial to understanding the finance-growth relationship. The small number of studies has divergent views on cross-country differences, ranging from time-invariant fixed factors, such as historical factors or country characteristics, to macroeconomic policies and institutional development.

The initial endowment hypothesis argues that the initial endowment of a country, such as colonization, shapes institutions that can retard financial development and long-run growth

(Acemoglu, Johnson, and Robinson, 2001). Geography variables, such as latitude or isolation (landlocked, for instance) and natural resource endowments, also influence financial development from the demand side (see Huang, 2005, for a review). Other country characteristics, such the degree of ethnic fractionalization and differences in culture measured by differences in the religion and language practiced by the majority of the population, also affect financial development even though the impacts are less robust (Stulz and Williamson, 2003).

The law and finance view argues that the origin of a country's laws affects the degree of financial development (La Porta *et al.*, 1997): a common law basis is more conducive to the development of capital markets than a civil law basis because the flexibility of common law legal system allows for protection of small investors.[5] In fact, Djankov, McLiesh and Schleifer (2007) show that legal origin is an important determinant of creditor rights and private credit, and creditor protection also has an independent effect on private credit. They distinguish two broad views on private credit determinants: the power of creditors and credit-information-sharing. They argue that lenders, who can more easily force repayment, attach collateral, or gain control over a firm will be more willing to lend, as will those who know borrower credit history and debts to other lenders.[6]

There are two opposing views about openness and access to international capital markets. The sequencing literature advocates that domestic systems need first to be developed to a certain level before they can profit from financial liberalization. In other words, trade openness should come first, followed by financial liberalization, and finally capital account liberalization (McKinnon, 1991). Rajan and Zingales (2003a, 2003b), however, argued for the simultaneous opening of both trade and the capital account because this reduces interest groups opposition to financial development: the new opportunities brought by both trade and financial openness can outbalance the losses from greater competition. Baltagi, Demetriades, and Law (2008) show that both trade openness and financial openness are important, but they only find partial evidence that they have to be simultaneous. Chinn and Ito (2002, 2006) show that greater financial openness contributes to financial development, but only when the legal system and institutions have reached a certain level.

Finally, favorable economic conditions are also important for financial development. For instance, inflation above a certain level brings adverse consequences (Azariadis and Smith, 1996; and Khan, Senhadji, and Smith, 2001), whereas income level and savings are positively related to financial development.

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[5] Common-law-based systems have evolved to protect private property, whereas civil-law-based systems were developed to enhance state powers and to address corruption.

[6] Mc Donald and Schumacher (2007) find such evidence for Africa.

On the specific question of stock market development, Calderon-Rossell (1991) developed a partial equilibrium model of stock market growth. This model represents the most comprehensive attempt to date to law the foundation of a financial theory of stock market development. Recent works tend to focus on the role of financial liberalization. Mishkin (2001) argued that financial liberalization promotes transparency and accountability, reducing adverse selection and moral hazard. It thus tends to reduce the cost of borrowing in stock markets, which eventually increases the liquidity and size of the stock market.

Garcia and Liu (1999) examined the macroeconomic determinants of stock market development in a sample of Latin American and Asian countries. They found that GDP growth, domestic investment, and financial intermediary development are important factors. El-Wassal (2005) investigated the relationship between stock market growth and economic growth, financial liberalization, and foreign portfolio investment in 40 emerging markets between 1980 and 2000. He found that economic growth, financial liberalization, and foreign portfolio investments were the leading factors in emerging stock market growth.

The literature also demonstrates that stock market development has a nonlinear relationship with banking sector development: stock market development is initially supported by banking sector development through trade intermediation. However, as stock markets develop they begin to compete with banks in financing investment (Yartey, 2008b).

Even though financial development comprises development of the banking sector, stock markets, and other financial intermediaries, the literature is mainly concerned with banks. We study the determinants of stock market development on the one hand and the determinants of banking sector development on the other, because, although they are related, some variables have been shown to be specific to stock market development and others are more relevant to the banking sector. For instance, capital account liberalization and shareholder rights protection are more important for stock market development, and reserve requirements and creditor rights protection for banking sector development.

IV. METHODOLOGY

A. Modeling Banking Sector Development

We use panel data techniques to study the main determinants of banking sector development in Africa. The estimation sample comprises 53 African countries and covers the recent period 1990 to 2006. Based on the theoretical and empirical literature, we estimate the following equation:

$$y_{i,t} = \alpha_0 y_{i,t-1} + \beta_1 M_{i,t} + \beta_2 L_{i,t} + \beta_3 I_{i,t} + \eta_i + \varepsilon_{i,t},$$

where $M_{i,t}$ is a vector of macroeconomic variables, including GDP per capita, inflation volatility, and domestic savings and investment; $L_{i,t}$ is a vector of liberalization variables

including reserve requirements, trade openness, and financial openness; and $I_{i,t}$ is a vector of institutional variables, including creditor rights and political risk rating.[7]

The Dependent Variable

We use two alternative measures of bank development—credit to the private sector relative to GDP and bank assets relative to total banking system assets—to enhance the robustness of our results.[8] Credit to the private sector by deposit money banks and other financial intermediaries relative to GDP is used because the measure isolates credit issued to the private sector, as distinct from credit issued to governments, government agencies, and public enterprises. Bank assets relative to GDP measures the degree to which commercial banks rather than central banks allocate savings because banks are more likely to identify profitable investments, monitor managers, and manage risk.

Explanatory Variables

Table 1a (Appendix) summarizes the explanatory variables used in the banking sector regressions. Two lags of endogenous variables are used to address the reverse causality problem and any endogeneity biases. As mentioned, we first introduce the lagged values of income levels and inflation volatility to control for income and macroeconomic stability. We also control for openness by introducing a measure of trade openness. We use the creditor rights index and the political risk rating to proxy institutions.

Financial repression

Like Bonis and Stachinni (2009), we use bank reserve requirements to proxy financial repression. Reserve requirements, which include bank free reserves, represent the ratio of domestic currency holdings and deposits with the monetary authorities to claims on other governments, nonfinancial public enterprises, the private sector, and other financial institutions.[9] This measure, which is more relevant for banking sector development, follows the literature on financial repression, which stresses the negative effects on financial deepening of credit controls, interest rate ceilings, and high reserve requirements. Therefore, we expect the sign of reserve requirements to be negative.

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[7] All variables are in logarithm, as in Levine (2002), which makes it possible to interpret the estimated coefficients as elasticities.

[8] Bank credit to the private sector is measured using the following deflation method: $\{(0.5)*[Ft/P\_et + Ft\text{-}1/P\_et\text{-}1]\}/[GDPt/P\_at]$ where F is bank credit to the private sector, P_e is end-of period CPI, and P_a is average annual CPI.

[9] They are measured by the ratio of bank liquid reserves to bank assets.

Protection of creditor rights

We also use the creditor rights index developed by Djankov, McLiesh, and Schleifer (2005). This index ranges from 0 (weak creditor rights) to 4 (strong) and is constructed from 1978 to 2003. The measure aims at assessing collateral and bankruptcy laws, following La Porta *et al.* (1997). The use of this variable is another way to examine the impact of institutional quality on financial development because it refers to the country's performance in providing a good environment for secure financial transactions.

Income level

We test the effect that income has on financial intermediation and stock market development using lagged values of real GDP per capita. In fact, high incomes are usually accompanied by better education, better property rights, and all good business environment, all of which support financial development. High income could also explain the enforcement of legal rights and the quality of accounting standards, which are important for stock market development (La Porta *et al.*, 1997).

Macroeconomic environment

Lagged values of savings or investments are used because financial intermediaries and stock markets allocate savings to investment projects. Therefore, we expect these variables to be positive determinants of banking sector development.[10]

Macroeconomic stability

Macroeconomic volatility as well as bank willingness to lend can restrain participation in the market. Because profitability is likely to diminish in an unstable environment with frequent changes in policies, we expect lagged values of inflation, inflation volatility to have a negative impact on financial market development.[11] We also consider the impact of lagged values of real interest rates.

Financial openness

Previous studies have found financial openness to be an important determinant of financial development. It helps alleviate the negative effects of financial repression by both reducing

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[10] The correlation of savings and investments with incomes is low in our sample.

[11] Inflation affects the severity of the frictions that arise in the process of allocating credit and capital. For instance, by lowering real rates, high levels of inflation exacerbate the adverse selection problem on the credit market, leading to more credit rationing (to prevent lenders from misrepresenting their types and misallocating funds) and to less funds for investment and growth (Khan, Senhadji and Smith, 2006).

the cost of capital and increasing its availability. Financial openness can also improve the financial infrastructure by weeding out inefficient institutions. We use the index of capital account liberalization developed by Chin and Ito (2006) as a measure of financial openness.

Trade openness

Following Rajan and Zingales (2003b), we include lagged value of the sum of imports and exports relative to GDP as a measure of trade openness. Trade openness can be linked to financial development because openness may influence the demand for external finance through specialization and sectoral structure or technology transfer and innovation and can therefore require more use of external finance. Since openness may be associated with higher risks (external shocks and foreign competition), financial markets that can diversify risks and cushion adverse shocks and cash flow problems can evolve with trade activities (Svaleryd and Vlachos, 2002 ; Chinn and Ito, 2006).[12]

Capital flows

We test the effects on financial development of financial flows, such as foreign direct investments and remittances. Aggarwal, Demirguc-Kunt, and Martinez Peria (2006) found that worker remittances are a significant determinant of financial development.

Political and legal institutions

This paper measures institutional quality using political risk, a composite index from the International Country Risk Guide (ICRG).[13] The composite political risk index is a 100 point scale. Higher rating (maximum, theoretically, is 100) indicate lower risk, and vice versa.[14] The advantage of the ICRG indicators is that they have been used extensively in the literature (see Knack and Keifer, 1995; and Yartey, 2007) and have distinct categories of political risk that allow researchers to be reasonably specific in what they are measuring.[15] Because good-quality institutions are expected to foster financial development, we expect their values to be

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[12] Financial development can also influence the development of trade, because better-developed financial markets will tend to have a comparative advantage in manufacturing (Beck, 2002, 2003).

[13] The ICRG Risk Rating System assigns a numerical value to a predetermined range of risk components, according to a weighted scale, for each country covered by the system. Each scale is designed to award the highest value to the lowest risk and the lowest value to the highest risk. All countries are assessed on the same basis to allow for comparability.

[14] The definition of the components of the institutional index is from the International Country Risk Guide. See The International Country Risk Guide for a detailed explanation and computation of the various components of our index of institutional quality.

[15] Erb *et al.* (1996b) and Diamonte *et al.* (1996) find that changes in political risk are related contemporaneously to stock returns, using quantitative indicators that proxy for the notion of political risk.

positively correlated with financial development.[16] The problem with the political risk indicator is that it gives us very little guidance on the aspects of institutions that policy should be directed to.[17] To avert this problem, the paper studies the impact of four of the political risk components on stock market development: law and order, bureaucratic quality, democratic accountability, and corruption.

Estimating Method

Given the nature of our dataset this paper uses panel data techniques for estimating the regression models. All the relationships studied can be characterized by the joint endogeneity of most of the variables involved. That is, most explanatory variables in our model are either simultaneously determined with the dependent variable or have a two-way causal relationship with it. We recognize that there may also be unobserved country-specific effects, and ignoring them may produce inconsistent estimates given that they are likely to be correlated with the explanatory variables. If there is correlation between the right-hand-side variables and the country-specific effect, estimation methods like ordinary least squares will not be consistent because the assumption of strict exogeneity of the explanatory variables is violated. Also the orthogonality condition between the error term and the regressors is not likely to be met for either the generalized least squares (GLS) or the fixed effects estimator to produce consistent estimates. Though it can be met through appropriate differencing of the data, because the equation contains endogenous regressors as well as the effects of lagged endogenous variables, the error term in the differenced equation is correlated with the lagged dependent variable through contemporaneous error terms. Under these conditions, neither the fixed effect nor the GLS estimator will produce consistent estimates.

Arellano and Bond (1991) propose using a dynamic panel data estimator based on the GMM methodology that optimally exploits the linear moment restrictions implied by the dynamic panel model. The dynamic GMM estimator is an instrumental variable estimator that uses as instruments both lagged values of all endogenous regressors and lagged and current values of all strictly exogenous regressors. Equations can be estimated using the levels or the first differences of the variables. For the difference estimator, the variables are measured as first differences and their lagged values are used as appropriate instruments.[18]

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[16] Because the other variables relating to law and finance (such as legal origin) and endowment (such as geography, religion, etc.) and information sharing (such as private and public registries) are both invariant in time and are cross- sectional, we do not include them, under the assumption that they are captured by the fixed effects introduced in the panel regressions and because some of their impacts can be captured by the institutional variables that we introduce in the model. Moreover, they are differenced away with the first differenced models and therefore cannot be identified.

[17] The four measures are chosen because of their importance in past studies. Yartey (2007a) found that law and order, democratic accountability, and bureaucratic quality are important for stock market development in Africa.

[18] Arellano and Bond proposed two estimators, one-step and two–step, with the two-step being the optimal estimator. The two estimators will be asymptotically equivalent if the error terms are spherical. There is a tendency for the two-step estimator to underestimate the standard errors of estimates and hence provide a false

However, before proceeding with the GMM, the following identifying assumption is necessary.

- We assume that there is no second-order serial correlation in the first differences of the error term. The consistency of the GMM estimator requires that this condition be satisfied. Given the construction of the instruments as lagged variables the presence of second-order serial correlation will render such instruments invalid.

- The specification tests for the GMM estimator are the Sargan test of over- identifying restrictions and the test of lack of residual serial correlation. The Sargan test, which is based on the sample analog of the moment conditions used in the estimation process, evaluates the validity of the set of instruments and therefore determines the validity of the assumptions of predeterminacy, endogeneity, and exogeneity. Since in this case the residuals examined are those of the regressions in differences, first-order serial correlation is expected by construction and thus only second and higher order serial correlation is a sign of misspecification.

Blundell and Bond (1998) argue that lagged levels of variables are likely to be weak instruments for current differenced variables when the series are close to random walk. In these conditions, the differenced GMM estimates are likely to be biased and inefficient. They suggest the more efficient system GMM estimator that combines the difference equation and a levels equation in which suitably lagged differenced variables are the appropriate instruments. The system GMM is consistent and more efficient than the difference estimator so long as there is no significant correlation between the differenced regressors and country fixed effects. The efficiency gains of the system GMM estimator will depend how close the series is to a random walk (see appendix for details). [19]

B. Modelling the Determinants of Stock Market Development

Cadeleron-Rossell has developed a behavioral structural model of stock market development in which economic growth and stock market liquidity are considered the main determinants of stock market development. To examine the validity of the model, he used annual observations from 1980–87 from 42 of the main active stock markets in the world and found that stock market liquidity and economic growth are indeed important determinants of stock

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sense of precision under some circumstances. The usual practice is to estimate with the two-step estimator but base hypothesis tests on the one-step estimator's statistics.

[19] The System GMM estimation of Blundell and Bond (1998) requires the series of $y_{i,1}, y_{i,2}.....y_{i,T}$ to be mean stationary, that implies that they have a constant mean of $\dfrac{\eta_i}{1-\alpha}$ for each country i .

market growth. Yartey (2008) modified the Calderon-Rossell model to incorporate other financial, economic, and institutional variables that might affect stock market development. Following Yartey (2008), we estimate the following baseline equation:

$$y_{i,t} = \beta_1 M_{i,t} + \beta_2 F_{i,t} + \beta_3 I_{i,t} + \eta_i + \varepsilon_{i,t},$$

where $M_{i,t}$ is a vector of macroeconomic variables, including GDP per capita, real interest rate, and domestic savings and investment; $F_{i,t}$ is a vector of financial variables including stock market liquidity, private credit, and financial openness; and $I_{i,t}$ is a vector of institutional variables, including political risk rating. [20] The sample consists of 17 African countries that had stock market activities between 1990 and 2006.

The Dependent Variable

The dependent variable, stock market capitalization, represents the deflated value of listed shares relative to GDP.[21] The assumption is that overall market size is positively correlated with the ability to mobilize capital and diversify risk economy-wide. Since market capitalization is measured at the end of the year and GDP is measured over the year, the measure has a stock flow problem. To solve it, we use the average of two consecutive year-end market capitalizations to estimate the mid-year value.

Explanatory Variables

Table 1b (Appendix) summarizes the explanatory variables used for the stock market regressions. They include measures of macroeconomic environment with lagged gross domestic savings as a percentage of GDP and lagged values of real interest rates. In further estimations, real interest rate is replaced by lagged inflation and budget deficits as a percentage of GDP. We include political risk as a measure of the institutional environment.[22] Two lags of endogenous variables are used to address the reverse causality problem and any endogeneity biases.

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[20] Note that unit root tests such as Levin *et al.* (2002) and Im *et al.* (2003) show that most variables are I(0), therefore it does not allow us to undertake panel cointegration. For variables which are I(1), results vary sometimes according to the method used, therefore it does not help us to be certain about the non stationarity of the variables, to be able to use their first differences in the model.

[21] The stock market capitalization variable is the ratio of the value of listed shares to GDP, calculated using the following deflation method: $\{(0.5)*[Ft/P\_et + Ft-1/P\_et-1]\}/[GDPt/P\_at]$ where F is stock market capitalization, P_e is end-of period CPI, and P_a is average annual CPI.

[22] Explanation and justification of variables are given in the section on modeling banking sector development.

Stock market liquidity

Liquidity is the ease and speed at which economic agents can buy and sell securities. More liquid markets channel more savings and also encourage investment in long-term projects that potentially have higher yields. Therefore, using lagged values of total value traded as a percentage of GDP, we expect liquidity to be positively correlated with the measure of stock market development.

Banking sector development

Yartey (2008b) demonstrated that well-developed financial intermediaries promote development of the stock market, but the relationship is not linear in emerging market countries. We therefore include a measure of banking sector development as an explanatory variable, using deposit money bank credit to the private sector as a percentage of GDP.

We improve on previous studies by taken into account endogeneity, not only by running fixed-effect estimations on lagged values of endogenous variables but also by implementing GMM estimation that corrects this endogeneity using instrumental variables estimations. We use lagged values of explanatory variables as instruments in the GMM specification (see appendix for further details).

V. EMPIRICAL RESULTS

A. Banking Sector Development

The first empirical analysis we conduct is to examine the determinants of banking sector development in Africa. In the first set of regressions, we use credit to the private sector relative to GDP as the dependent variable. The results are presented in Table 2. Model 1 is the baseline model, which has GDP per capita, reserve requirements, trade openness, creditor rights, standard deviation of inflation, and political risk as the explanatory variables. The analysis shows that political risks, creditor rights protection, and trade openness are positively associated with banking sector development, and reserve requirements and inflation volatility are negatively associated with it. Economic instability negatively affects banking sector growth because inflation volatility reduces bank activities and assets. The negative impact of financial repression on banking sector development confirms the financial liberalization thesis that restrictions on interest rates and mandated credit allocation inhibit the growth of the banking sector.

An analysis on the impact of current inflation on development of the banking system found a positive and significant effect. We attempt to understand this puzzle by removing episodes of

very high inflation (outliers) from the regression in Model 2 and find that current inflation is now negative and statistically significant.[23]

In Model 4, we examine the impact of capital account liberalization on banking sector development using the Chinn-Ito index and find that capital account liberalization negatively affects banking sector development.

The result of Model 1 found trade openness to be positive and statistically significant in explaining banking sector development. There is an argument, the simultaneous openness hypothesis (Baltagi, Demestriades and Law, 2008), that argues that the simultaneous opening of trade and financial accounts is the key to successful financial development. Testing this hypothesis in Models 3 and 5, we find that trade openness negatively affects bank credit when reserve requirements are high. The analysis also shows that simultaneous opening of trade and capital account tends to promote banking sector development. Overall, the results show that financial openness accompanied by trade openness is likely to promote financial development.

In Model 6, we examine the impact of law and order on banking sector development. The result is in line with the view (see, for instance, La Porta *et al.*, 1997) that sound legal systems promote financial development. We also interact financial openness with law and order to understand the earlier results that capital account liberalization negatively affects banking sector development. Here we find this variable to be significant, indicating that capital account liberalization positively influences banking sector development only in countries with good legal systems. Private capital flows, such as inward remittances, are positively associated with banking sector development (Model 7).[24]

To check the robustness of our results, we use alternative measure of banking sector development, namely commercial bank assets relative to total assets of the banking system. The result (see Table 3) is similar to that obtained using private credit relative to GDP as the dependent variable.

B. Determinants of Stock Market Development

Stock market development is measured by market capitalization as a percentage of GDP. Table 4 presents the results of the fixed effects estimation. Model 1 is our baseline regression model, which includes variables such as GDP per capita, bank credit, stock market liquidity, real interest rate, and gross domestic savings. We find that bank credit, stock market

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[23] Further analysis is needed to understand the relationship between inflation and financial market development. Threshold regressions would help uncover the nature of relationship between inflation and financial development.

[24] We examine the impact of some of the components of political risks on banking sector development. We also find law and order and government stability to be important in explaining it.

liquidity, gross domestic savings, and GDP per capita are significant and have positive effects on stock market development. Real interest rate has a negative effect but it is not statistically significant. Income level is an important determinant of stock market development—a 1 percentage point increase in GDP per capita speeds stock market development by 0.2 percentage points.

We also find that banks and stock markets are complements rather than substitutes, confirming earlier empirical findings: a 1 percentage point increase in bank credit as a percentage of GDP increases stock market development by 0.5 percentage points. Our result is different from Yartey's finding (2008a) of a non-monotonic relationship between banking sector and stock market development.[25] His view is that at the early stages of its development, the banking sector is a complement to the stock market in financing investment, but as they both develop, the two begin to compete with each other as vehicles for financing investment.

Stock market liquidity and domestic savings relative to GDP are also important for stock market development in Africa. When value traded as a percentage of GDP increases by 1 percentage point, stock market capitalization increases by 0.2 percentage points. Finally, a 1 percentage point increase in gross domestic savings as a percentage of GDP increases stock market development by 0.2 percentage points.

To examine the effect of inflation on stock market development we use last year's inflation instead of the real interest rate in Model 2. GDP per capita, bank credit, gross domestic savings, and stock market value traded are all significant and positive. Inflation has an unexpected positive sign but is statistically significant. To control for this surprising result, we remove inflation swings larger than 20 percent (Model 3) and find that inflation levels do not significantly affect stock market capitalization.[26] When we replace inflation with budget deficits as a percentage of GDP, we find no conclusive evidence of any impact on stock market development.

Model 4 investigates the effect of capital account liberalization on stock market development. Capital account liberalization is measured using the Chinn-Ito index of financial openness. We find that financial openness has a negative effect on stock market development. In line with the current thinking on the subject, we examine whether the effect of capital account liberalization would change in countries with higher income or a better institutional quality. We do this by interacting financial openness with income level and later with institutional quality. The analysis (see Models 5 and 7) shows that capital account

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[25] Yartey's 2008a result was based on a sample of emerging market countries with relatively higher levels of stock market development.

[26] Inflation volatility has no significant impact on stock market development. We later use inflation greater than 100 and find that it is not statistically significant in explaining stock market development.

liberalization has a negative impact generally, but, in countries with sufficiently high income and low political risk, capital account liberalization has a positive effect on stock market development.

In Model 6, we look at the impact of political risk on stock market development in Africa. It appears to be positive and significant. A 1 percentage point improvement in the ICRG political risk rating increases stock market development by 0.9 percentage points. This result suggests that resolution of political risk is important. Bank credit, domestic savings and stock market liquidity are also all positive and significant. The problem with the concept of political risk is that it tells us very little about where to direct institutional policy. To remedy this deficiency, we study the impact of some of the components of the index of political risk on stock market development. Our results show that law and order and government stability are the most important for Africa. [27]

One interesting result of the paper is that capital account liberalization negatively affects stock market development except in countries with high income and better institutional quality. We investigate whether there are threshold levels of real GDP per capita and political risk below which the effect of capital account liberalization on stock market capitalization is negative. Further analysis suggests that the marginal effect of capital account liberalization on stock market capitalization is positive if real GDP per capita is above 7.2 in logarithm corresponding to roughly US$1,300.

Regression results show that the effect of financial openness on market capitalization is positive for values of political risk greater than 4.27 in logarithm, corresponding to 71.5. It is therefore appropriate to undertake further analysis to identify the threshold level of real GDP per capita under which capital account liberalization has a negative effect on the stock market development.

We considered two plausible threshold variables: income level and political risk using two methods of simulations: rolling and recursive simulations. We observed how the coefficient of financial openness changes with the addition of higher values of the threshold variable in the sample. We used a window starting with the median of the threshold variables until it reaches the value of the 95th percentile of the entire sample. We also undertake simulations introducing interaction effect between financial openness and the threshold variable.

Simulation results show that there is indeed an interaction effect between income level and financial openness and that financial openness has a positive effect on stock market development for higher values of GDP per capita. For regressions with political risk as the threshold variable, we find that the negative effect of financial openness on stock market development decreases with higher values of risk (low political risk).

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[27] The components were selected because of their importance in past results. Yartey (2008a), for instance, found that law and order, bureaucratic quality, and democratic accountability are all important for stock market development in emerging market countries.

The evidence in the paper suggests that banking sector development, domestic savings, GDP per capita, and stock market liquidity are important determinants of stock market development in Africa.[28] Institutional development is also positive, especially government stability and law and order, because they tend to reduce political risk, enhance regulatory capacity, and support the viability of external finance. We find no conclusive evidence that macro economic stability has an impact. Finally, capital account liberalization has a positive impact on stock market development only in higher-income and low political risk countries.

VI. SUMMARY AND CONCLUSION

This study uses panel data techniques to investigate the determinants of financial markets development in Africa. Using a dynamic panel estimator, we find that creditor rights protection, income level, trade openness, financial repression, and political risk are the most important determinants of banking sector development. Better protection of creditor rights, sound economic and trade policies, and economic growth stimulate the demand for cheaper credit. Good-quality institutions also lead to efficient supply of external finance; inefficient institutions form structural impediments to the supply of external finance (Huang, 2008). On the other hand, macroeconomic mismanagement and financial repression tend to discourage the demand for external finance, thereby derailing development of the banking system.

As for stock markets, domestic savings, stock market liquidity, and bank credit are shown to be important determinants of stock market development. Institutional quality is also found to be a robust and statistically significant determinant, which supports the case made by La Porta *et al.* (1997, 1999). Well-established institutions reduce political risk, a factor in investment decisions.

We do not, however, find any positive and robust relationship between capital account liberalization and stock market development. Further analysis showed the existence of threshold levels of real GDP per capita and political risk below which the effect of capital liberalization on stock market capitalization is negative. Simulation results suggest that the overall marginal effect of capital account liberalization on stock market capitalization is positive in high-income and low-political risk countries. This finding is in agreement with recent studies showing that the impact of capital account liberalization on a country's financial development depends on its level of income and the quality of its domestic institutions. We also confirm that the relationship between banking sector and stock market development in Africa is positive, indicating that financial intermediaries and stock markets are complements, not substitutes.

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[28] Another likely determinant of stock market development in Africa is the degree of privatization. However, since data on privatization are difficult to find, we do not analyze it. Similarly, pension reforms and the creation of pension funds are likely to have had an impact on stock market development in some African countries.

The results that political risk, economic stability, and creditor rights protection are all important for banking sector development have significant implications for financial markets in developing Africa. Their significance implies that further efforts by African policy makers to reduce political risk and improve institutions, implement more open trade and sound macroeconomic policies, and better protect improve creditor rights can promote banking sector development. Similarly, policies to increase stock market liquidity, promote domestic savings, and build the financial intermediary sector can stimulate stock market development.

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Table 1a. Explanatory Variables Used for Banking Sector Regression

Income	Macroeconomic environment	Creditor rights
GDP per capita	Inflation	Creditor rights
Domestic investment	Inflation volatility	
Domestic savings	Real interest rate	
Financial openness + capital flows	Institutions	Trade openness
Reserve requirements	Risk	Trade openness
Financial openness	Law and order	
Remittances	Corruption	
FDI	Bureaucratic quality	
Capital flows	Government stability	

Table 1b. Explanatory Variables Used for Stock Market Regression

Income and Macro Environment	Macroeconomic environment	Financial development
GDP per capita	Inflation	Stock market liquidity
Savings	Inflation volatility	Private credit/GDP
Investments	Real interest rate	
Financial openness	**Institutions**	**Trade openness**
Financial openness	Risk	Trade openness
FDI	Law and order	
Capital flows	Corruption	
Remittances	Bureaucratic quality	
	Government stability	

Table 2. Determinants of Banking Sector Development:
System GMM Estimation
Dependent variable: Credit to the private sector relative to GDP

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Lagged dependant	0.999	0.998	0.926	0.857	0.843	0.824	0.868
	(0.037)***	(0.026)***	(0.022)***	(0.055)***	(0.082)***	(0.075)***	(0.027)***
GDP per capita	0.054	0.056	0.157	0.175	0.192	0.169	0.127
	(0.046)	(0.042)	(0.056)***	(0.063)***	(0.080)**	(0.077)*	(0.080)
Reserve requirements	-0.037	-0.047	-0.130	-0.014	-0.003	-0.041	-0.009
	(0.021)*	(0.020)**	(0.035)***	(0.023)	(0.020)	(0.021)*	(0.017)
Political risk	0.304	0.218	0.378	0.408	0.625		0.005
	(0.167)*	(0.104)**	(0.151)**	(0.062)***	(0.183)***		(0.216)
Creditor rights	0.145	0.163	0.137	0.140	0.037	0.140	0.223
	(0.023)***	(0.035)***	(0.040)***	(0.035)***	(0.048)	(0.037)***	(0.063)***
Trade openness	0.088	0.077	0.468	0.074	0.117	0.001	-0.082
	(0.051)*	(0.023)***	(0.132)***	(0.051)	(0.059)**	(0.052)	(0.062)
SD annual inflation	-0.857		0.291	-0.174	-2.993	-2.702	-1.040
	(0.389)**		(0.630)	(0.608)	(1.799)*	(1.184)**	(0.367)***
Inflation (<100%)		-0.304					
		(0.049)***					
Trade Openness * Financial Repression			-0.163				
			(0.047)***				
Financial Openness			-0.031	-0.039	0.036	-0.207	
			(0.011)***	(0.014)***	(0.028)	(0.090)**	
Trade Openness * Financial Openness					0.126		
					(0.045)***		
Law and Order						0.247	
						(0.116)**	
Financial openness * Law and Order						0.138	
						(0.074)**	
Remittances							0.058
							(0.012)***
Constant	-1.731	-1.404	-2.700	-3.252	-3.907	-1.835	-1.176
	(0.888)*	(0.575)**	(0.801)***	(0.472)***	(0.842)***	(0.489)***	(0.956)
Observations	350	352	322	322	322	308	296
Number of groups	28	28	27	27	27	26	28
AR(2) (p-value)	0.2348	0.1669	0.1416	0.1741	0.1334	0.3579	0.3811
Sargan (p-value)	0.5985	0.7057	0.9605	0.9716	0.9976	0.9986	0.849

Notes: All regressions include a constant and time effects. Standard errors are in parentheses. *, **, and *** means significant at 10, 5, and 1 percent level of significance.

Table 3. Determinants of Banking Sector Development:
System GMM Estimation
Dependent variable: Bank assets relative to total assets of the banking system

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Lagged dependant	0.540	0.689	0.507	0.477	0.485	0.454	0.431
	(0.020)***	(0.009)***	(0.042)***	(0.028)***	(0.038)***	(0.027)***	(0.027)***
GDP per capita	0.647	0.112	0.676	0.711	0.714	0.564	0.262
	(0.047)***	(0.042)***	(0.062)***	(0.028)***	(0.036)***	(0.076)***	(0.035)***
Reserve requirements	-0.061	-0.063	0.017	-0.080	-0.078	-0.041	-0.029
	(0.007)***	(0.006)***	(0.018)	(0.008)***	(0.008)***	(0.008)***	(0.006)***
Political risk	0.274	0.175	0.226	0.215	0.141		0.447
	(0.101)***	(0.038)***	(0.135)*	(0.094)**	(0.154)		(0.031)***
Creditor rights	0.047	-0.098	0.055	0.056	0.059	0.014	-0.024
	(0.012)***	(0.016)***	(0.021)***	(0.017)***	(0.017)***	(0.031)**	(0.015)
Trade openness	-0.018	0.131	-0.400	0.012	0.133	0.203	-0.101
	(0.028)	(0.010)***	(0.073)***	(0.015)	(0.035)***	(0.057)***	(0.020)***
SD annual inflation	-1.165		-2.617	-2.398	-2.763	-3.420	-0.341
	(0.370)***		(0.726)***	(0.575)***	(0.701)***	(0.416)***	(0.238)
Inflation (<100%)		-0.310					
		(0.034)***					
Trade Openness * Financial Repression			0.151				
			(0.026)***				
Financial Openness			-0.073	-0.075	0.019	-0.120	
			(0.014)***	(0.012)***	(0.035)	(0.055)**	
Trade Openness * Financial Openness					0.107		
					(0.032)***		
Law and Order						0.051	
						(0.051)**	
Financial openness * Law and Order						0.090	
						(0.036)**	
Remittances							0.036
							(0.004)***
Constant	-5.255	-1.250	-5.653	-5.603	-5.207	-3.606	-3.342
	(0.407)***	(0.319)***	(0.475)***	(0.457)***	(0.631)***	(0.450)***	(0.274)***
Observations	346	346	316	316	316	302	290
Number of groups	29	29	29	29	29	28	29
AR(2) (p-value)	0.586	0.3591	0.4971	0.5234	0.5157	0.4146	0.4271
Sargan (p-value)	0.6748	0.5369	0.4183	0.3981	0.4262	0.9691	0.8275

Notes: All regressions include a constant and time effects. Standard errors are in parentheses. *, **, and *** means significant at 10, 5, and 1 percent level of significance.

Table 4. Determinants of Stock Market Development:
Panel Data Estimation
Dependent variable: Stock market capitalization relative to GDP

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	RE	**FE**	**FE**	**FE**	**RE**	**RE**	**RE**
L. GDP per capita	0.218	0.575	0.116	1.228	0.027	0.189	0.075
	(0.114)*	(0.331)*	(0.135)	(0.469)**	(0.168)	(0.151)	(0.147)
Stock Market liquidity	0.214	0.255	0.243	0.212	0.202	0.239	0.220
	(0.028)***	(0.029)***	(0.028)***	(0.036)***	(0.030)***	(0.035)***	(0.036)***
Private Credit	0.521	0.267	0.464	0.567	0.514	0.402	0.523
	(0.134)***	(0.115)**	(0.110)***	(0.178)***	(0.146)***	(0.131)***	(0.124)***
L. Gross domestic savings	0.155	0.287	0.216	0.177	0.145	0.222	0.095
	(0.060)**	(0.055)***	(0.058)***	(0.066)***	(0.061)**	(0.091)**	(0.097)
L. Real interest rate (%)	-0.304			-0.017	-0.125	-0.081	0.280
	(0.398)			(0.402)	(0.411)	(0.386)	(0.375)
L. Inflation (%)		0.934					
		(0.351)***					
L. Inflation<20%			0.357				
			(0.927)				
Financial Openness				-0.028	-0.936		-4.206
				(0.046)	(0.235)***		(0.957)***
L.GDP * Financial Openness					0.130		
					(0.033)***		
Political Risk						0.921	1.133
						(0.341)***	(0.322)***
Political Risk * Financial Openness							0.997
							(0.228)***
Observations	134	184	146	122	114	108	99
Number of group	14	16	15	14	13	12	12
R-squared	0.69	0.67	0.75	0.65	0.62	0.79	0.78
Test of poolability (p-value):	15.04	16.34	17.40	11.96	11.77	13.86	11.21
R-Squared Between :	0.78	0.67	0.70	0.79	0.80	0.58	0.85
Hausman test (p-value):	0.59	0.00	0.00	0.03	0.82	0.28	0.31

Notes: All regressions include a constant and time effects. Robust standard errors in parentheses. *, **, and *** means significant at 10, 5, and 1 percent level of significance. FE and RE are fixed and random effects respectively.

Table 5. Determinants of Stock Market Development:
GMM Estimation
Dependent variable: Stock market capitalization relative to GDP

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
GDP per capita	0.082	0.208	0.437	0.650	-0.006	0.209	0.335
	(0.213)	(0.647)	(0.500)	(0.956)	(0.245)	(0.283)	(0.496)
Stock Market liquidity	0.216	0.303	0.293	0.233	0.216	0.238	0.190
	(0.032)***	(0.067)***	(0.049)***	(0.078)***	(0.035)***	(0.039)***	(0.066)***
Private Credit	0.647	0.555	0.466	0.815	0.562	0.406	0.416
	(0.202)***	(0.237)**	(0.207)**	(0.346)**	(0.230)**	(0.212)*	(0.250)*
Gross domestic savings	0.319	0.720	0.579	0.456	0.337	0.358	0.006
	(0.109)***	(0.265)***	(0.176)***	(0.201)**	(0.131)**	(0.178)**	(0.377)
Real interest rate (%)	-1.201			-1.001	-0.344	-0.617	1.616
	(1.681)			(1.513)	(2.028)	(1.598)	(2.889)
Inflation (%)		1.831					
		(0.811)**					
Inflation (<20%)			-3.273				
			(5.072)				
Financial Openness				-0.047	-0.675		-5.317
				(0.091)	(0.255)***		(1.987)***
GDP * Financial Openness					0.100		
					(0.035)***		
Political Risk						0.985	0.956
						(0.355)***	(0.419)**
Political Risk * Financial Openness							1.258
							(0.460)***
Observations	127	180	137	114	116	102	94
Number of group(countryname)	14	14	14	12	14	12	12
R squared	0.7798	0.4489	0.61	0.5206	0.7679	0.7986	0.8275
Hansen (equation exactly identified)							

Notes: All regressions include constant and time effects. Robust standard errors in parentheses. *, **, and *** means significant at 10, 5, and 1 percent level of significance. FE and RE are fixed and random effects respectively.

Dynamic System GMM Estimation

Used for estimation of the following dynamic equation:

$$y_{i,t} = \alpha_0 y_{i,t-1} + \beta_1 X_{i,t-2} + \eta_i + \varepsilon_{i,t},$$

- **OLS** is inconsistent because η_i is correlated with $y_{i,t-1}$ (even if there is no correlation between η_i and $X_{i,t}$)

- The **LSDV estimator** (fixed effects or within group estimator) is obtained after applying OLS to the time demeaning deviation applied to the equation. Because it eliminates the unobserved individual effects, it gets rid of possible correlation between η_i and $X_{i,t}$, but there is still correlation between $y_{i,t}$ and $y_{i,t} - \overline{y}_{i,-1}$ and $\varepsilon_{i,t} - \overline{\varepsilon}_{i,-1}$. That is why the LSDV estimator is inconsistent for finite T and N $\rightarrow \infty$.

- **Anderson and Hsiao (1981) (AH)** suggest an IV estimator that is consistent with fixed T and N $\rightarrow \infty$. It starts by eliminating the unobserved heterogeneity by first differencing the model. Then it uses $y_{i,t-2}$ and $y_{i,t-2} - y_{i,t-3}$ as valid instruments (because they are correlated with $y_{i,t-2} - y_{i,t-1}$ but uncorrelated with $\varepsilon_{i,t-2} - \varepsilon_{i,t-1}$). The AH estimator is consistent but not efficient: it does not use all the available moment conditions.

- **Arellano and Bond (1991) (AB)** suggest a generalized method of moments (GMM) estimator. Like the AH estimator, it relies on first differencing the model fit and then using the orthogonality conditions between the lagged values of $y_{i,t}$ and the disturbances $\varepsilon_{i,t} - \varepsilon_{i,t-1}$ to obtain an estimator. These conditions can be written as: $E\left[y_{i,t-1-s}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0,$ for $t \geq 2$ and $1 \leq s \leq t$.
  Moreover, explanatory variables can be predetermined or endogenous with the AB estimator. $E\left[x_{i,t-s}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0,$ for $t \geq 2$ and $s \geq 1$, if $x_{i,t}$ is strictly exogenous (the complete time series can be used to instrument $x_{i,t} - x_{i,t-1}$);
  $E\left[x_{i,t-s}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0,$ for $t \geq 2$ and $1 \leq s \leq t$, if $x_{i,t}$ is predetermined and
  $E\left[x_{i,t-s}\left(\varepsilon_{i,t} - \varepsilon_{i,t-1}\right)\right] = 0,$ for $t \geq 3$ and $2 \leq s \leq t$, if $x_{i,t}$ is endogenous.
  The AB estimator, also called difference GMM, has proved to generate large-sample bias, and poor precision and lagged levels of the series produce weak instruments for first differences.

- **Kiviet (1995), Bun and Kiviet (2003) and Bruno (2005a)** derive an approximation of the small-sample bias with strictly exogenous vector and homoskedastic disturbance and use it to construct a bias-corrected LSDV. Bruno extends it to unbalanced panels.

- **Blundell and Bond (1998) (BB)** suggest the dynamic system GMM estimation. It consists of:
    - using lagged differences of explanatory variables as instruments for equations on levels, and

    - using, as in Arellano and Bond (1991) first difference GMM estimator (AB) lagged levels of explanatory variables as instruments for equations in first differences,

  The moment conditions for the equations in levels are

  $$\cdot E\big[(y_{i,t-1-s} - y_{i,t-2-s})(\eta_i + \varepsilon_{i,t})\big] = 0, \text{ for } t \geq 2 \text{ and } 1 \leq s \leq t-1.$$

  Introducing explanatory variables:
    - $E\big[(x_{i,s} - x_{i,s-1})(\eta_i + \varepsilon_{i,t})\big] = 0,$ for all $t \geq 2$ and $s \geq 2$ if $x_{i,t}$ is strictly exogenous;
    - $E\big[(x_{i,t-s} - x_{i,t-1-s})(\eta_i + \varepsilon_{i,t})\big] = 0,$ for all $t \geq 2$ and $0 \leq s \leq t-1$ if $x_{i,t}$ is predetermined; and
    - $E\big[(x_{i,t-s} - x_{i,t-1-s})(\eta_i + \varepsilon_{i,t})\big] = 0,$ for all $t \geq 3$ and $1 \leq s \leq t-1$ if $x_{i,t}$ is endogenous.

After that combining the equations in levels with the equations in differences makes any moment conditions redundant.

Figure 1a. Political Risk, Income Level and Capital Account Liberalization
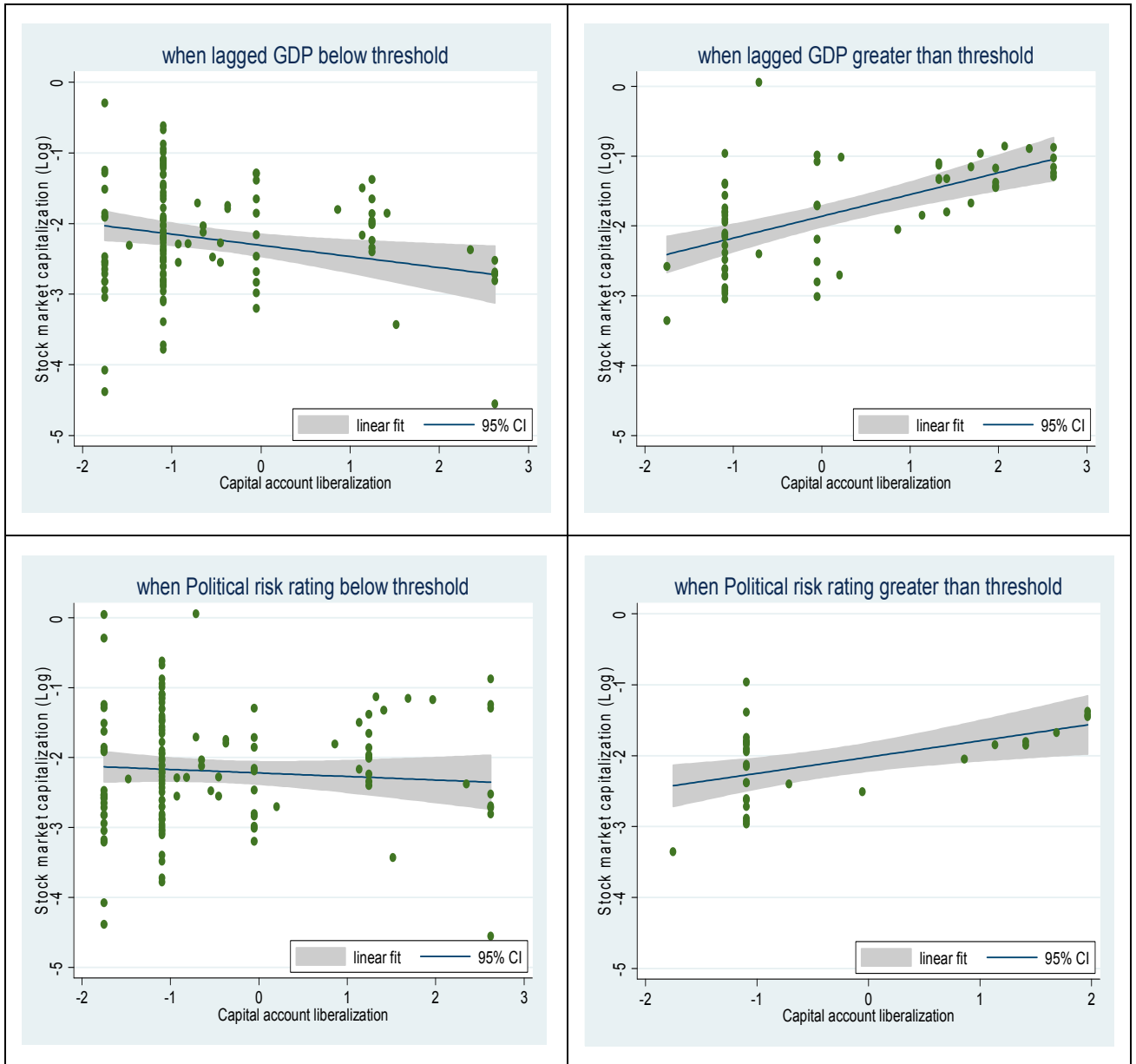
Simulation Results

1. Financial openness and stock market capitalization with income level as the threshold variable[1]
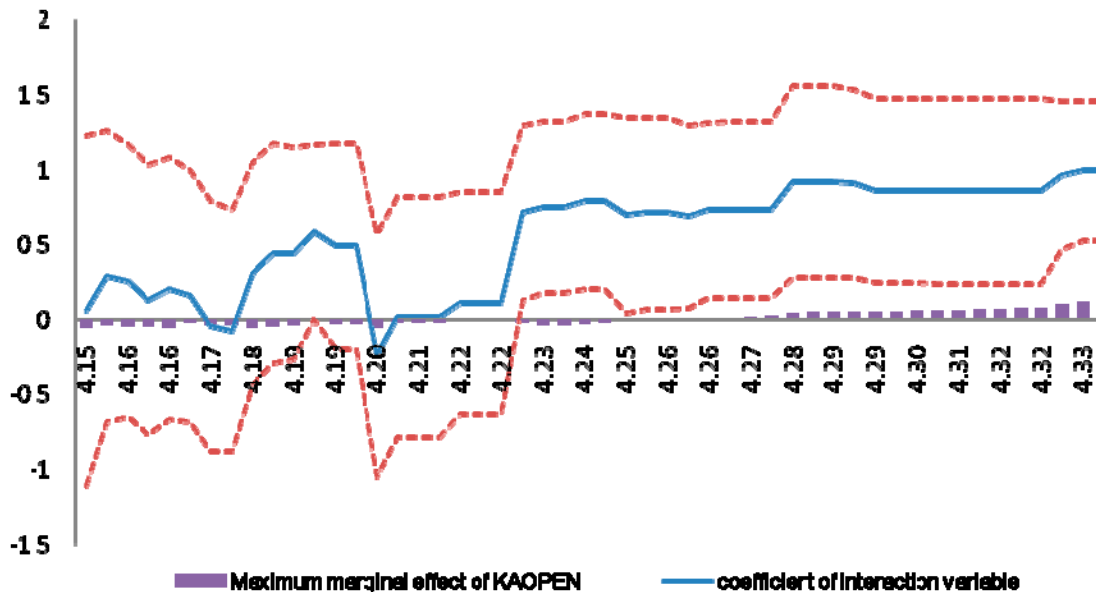

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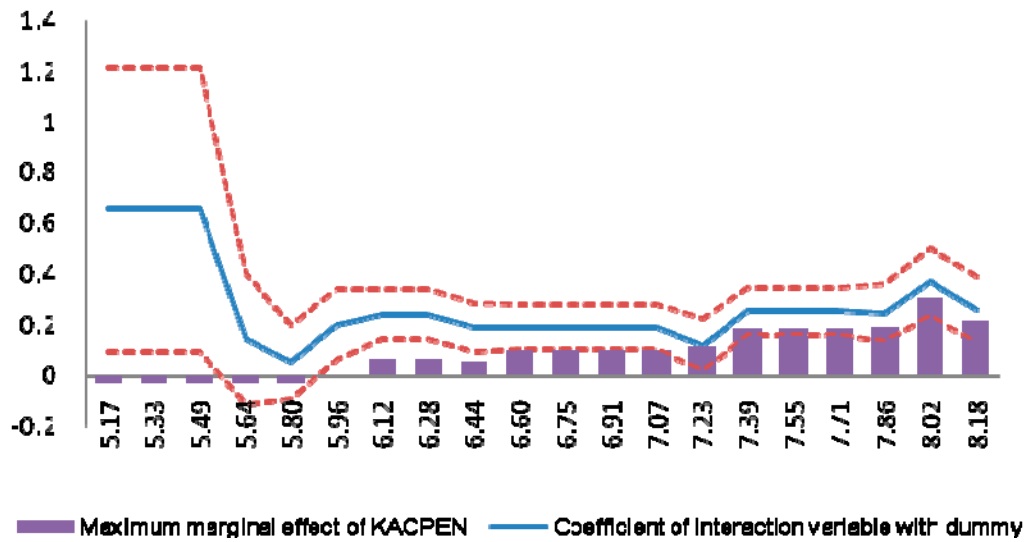
[1] Simulation methodology:

$$y_{i,t} = \alpha_0 + \beta_1 X_{i,t-2} + \beta_2 Z_{i,t} + \alpha_1 KAOPEN_{i,t} + \alpha_2 KAOPEN_{i,t} * DUMMY_{i,t} + \eta_i + \varepsilon_{i,t}, \text{where}$$

$DUMMY_{i,t} = 1$ if $THRESHOLD \geq j$ and $DUMMY_{i,t} = 0$ otherwise.

Window variation: [5th percentile, 95th percentile]; Number of iterations: 20; Estimation: robust random effects (including RISK in the control variables); dotted lines are 90% confidence intervals

2. Financial openness and stock market capitalization with political risk as the threshold variable: Recursive simulation including interaction variable[2]
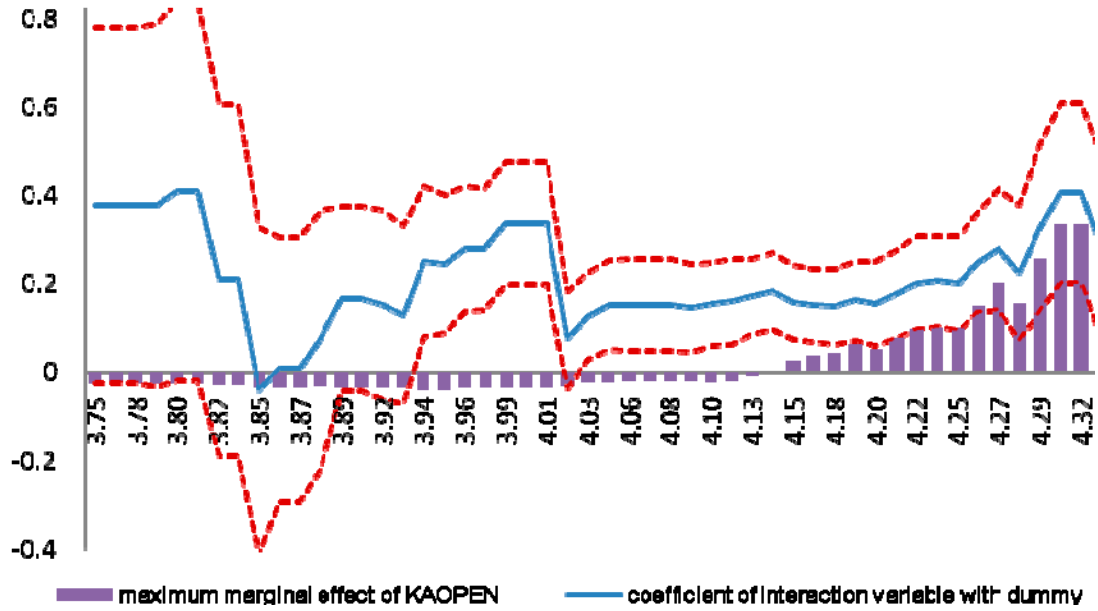

$$y_{i,t} = \alpha_0 + \beta_1 X_{i,t-2} + \beta_2 Z_{i,t} + \alpha_1 KAOPEN_{i,t} + \alpha_2 KAOPEN_{i,t} * THRESHOLD_{i,t} + \eta_i + \varepsilon_{i,t},$$
$$\text{if } THRESHOLD \leq j$$

Window variation: [50th percentile, 95th percentile]; Number of iterations: 50; Estimation: robust random effects; dotted lines are 90% confidence intervals

3. Financial openness and stock market capitalization with political risk as the threshold variable: Threshold simulation[3]