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Financial market structure and capital controls in Sub-Saharan Africa

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Abstract

Purpose – This study investigates the influence of capital controls on financial market structure in Sub-Saharan Africa (SSA). This is especially relevant as the former restrictions are relatively common on the sub-continent. At the same time, the sub-region's financial markets are highly bank-based and focused on the short term, with stock markets being illiquid and stunted.

Design/methodology/approach – To achieve its research objectives, the study posits an original model and uses comparative statics to analyze the relation between the aforestated phenomena in a representative SSA economy. Key hypothesized conclusions derived therefrom are tested using panel econometrics.

Findings – The comparative static analysis illustrates that capital controls favor banks, making them monopolistic and inefficient. This is confirmed by the empirical investigation, as the said market restriction skews financial market structure towards a bank-dominated system.

Research limitations/implications – The study limits itself to capital controls and their effects on financial market structure. It does not particularly investigate the influence of different types of these restrictions. Specifically, it dichotomizes the influence of the examined controls on bank and stock markets.

Practical implications – The dissimilar influence of capital controls on banks relative to stock markets is critical for decision and policymakers. This paper highlights that capital controls may have unintended adverse effects on domestic financial markets. Also, they may not be the most appropriate policy to deepen markets and enhance domestic resource retention. There is, consequently, a need to determine fitting policies that attract rather than repel financial flows. Furthermore, capital controls may engender rather than address macroeconomic misalignment.

Social implications – As a social imperative, it is necessary to analyze SSA's framework of capital restrictions to better understand how they distort market incentives and mechanisms. This would help identify adverse effects that retard social development.

Originality/value – This study extends existing literature by developing a novel analytical framework incorporating key characteristics of SSA economies. This helps to better understand the nature of the capital controls–financial market structure relation in imperfect market conditions.

Keywords Capital controls, Financial market structure, Sub-Saharan Africa

Paper type Research paper

1. Introduction

A key tenet in international economics is freedom of movement of resources. Global market restrictions impair such flows. A common form of these limitations is capital controls. The latter is a relatively typical feature in Sub-Saharan Africa (SSA), despite most of these nations being comparatively small open economies. Between 1995 and 2020, about half of SSA's 45 economies maintained a low-to-medium degree of capital restrictions (Sriram *et al.*, 2020).

JEL Classification — E44, G15, G21, G29, O55

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About 10 of these may be described as highly restrictive (Ntembe, 2022). Approximately the same numbers, 10, are relatively financially open, namely: Botswana, Djibouti, Gambia, Kenya, Liberia, Mauritius, Sao Tome, Seychelles, Uganda and Zambia (Chinn and Ito, 2022; Fernández *et al*., 2021).

Juxtaposed with the above phenomenon is the sub-region's anomalous financial market structure. It is characterized by bank-dominated systems focused on short-term financing (Nyantakyi and Sy, 2015; World Bank, 2022, 2023). Less than 25% of domestic financial resources have a maturity exceeding 10 years. Capital markets, especially stock exchanges, are incomplete, inefficient, illiquid and stunted (World Bank, 2022, 2023). As such, stock market financing is woefully inadequate.

The relation between capital controls and financial market structure is an area of study with scant literature. Concerning SSA, the literature is even more limited. Current studies on the mentioned topic do not particularly take into account the sub-continent's anomalous financial market structure (Chokri, 2020a; Mutize *et al.*, 2020; Pasricha *et al*., 2019; Rebucci and Ma, 2020). This study, consequently, answers the research question: What are the critical features of SSA's capital control-financial market structure relation? Also, it investigates whether capital controls enhance or worsen the sub-region's financial market structure aberration.

To answer the prior stated concerns, an original model is constructed and analyzed using comparative statics. The derived analytical framework is subsequently tested empirically. Regarding its organizational structure, the paper commences with an introduction followed by a review of relevant studies. The third section presents the novel framework. The data and research methodology employed are outlined in the fourth section, while the fifth segment presents and discusses the empirical results. The paper ends with a conclusion and summary.

2. Literature review

2.1 Capital controls–financial market structure relation

It is worth noting that the focus of this study is on capital controls and financial market structure rather than on banks and stock markets separately. Theories on the relation between the two may be categorized into interventionist and non-interventionist precepts. The non-interventionist schools of thought include the classical and parity frameworks. They theorize that markets are, generally, near perfect and will tend towards steady state equilibrium (Romer, 2019; Salvatore, 2013). Therefore, there is little or no need for capital controls (Aizenmann, 2019; Blanchard, 2018; Chokri, 2020b). Overall, they presume that banks and stock markets produce similar financial resources. These non-interventionist theories are silent on whether banks and stock markets compete or complement each other. According to them, therefore, financial market structure is irrelevant. These precepts agree that the said financial restrictions have immediate adverse effects, but such are almost instantly addressed. Consequently, capital controls do not affect financial market structure (Benigno *et al*., 2017; Graham *et al*., 2015; Schmitt-Grohe and Uribe, 2017).

The key interventionist precepts mainly consider capital controls and financial markets but not financial market structure. They include current account optimization, dilemma/trilemma dichotomy, Keynesian, macroeconomic stabilization, Mundell–Fleming, parity variants, portfolio balance and speculative attack theories (Graham *et al*., 2015; Iqbal, 2022; Magud *et al.*, 2018; Montecino, 2015; Pasricha *et al.*, 2019; Rebucci and Ma, 2020). The aforementioned precepts argue that financial systems are imperfect. One group, however, accepts that such flaws are short term, while the other cohort assumes they are long term (Krugman *et al.*, 2014). Within the interventionist school of thought, some proponents find that the immediate effects of capital controls may be both positive and negative, resulting in either a J- or S-curve (Chokri, 2020a, b). Overall, interventionist precepts affirm that these restrictions affect the balance of payments, the international flow of goods and services as well as financial resources. These frameworks conclude that capital controls may temporarily minimize

financial market swings and associated macroeconomic gyrations (Batini and Durand, 2020; Graham *et al.*, 2015). Most of such theories see little or no difference between bank and stock market financing. Consequently, they theorize that capital controls have a uniform effect on both systems. Similar to their non-interventionist counterparts, they conclude that capital controls are irrelevant to financial market structure.

Despite the foregoing seeming uniformity within interventionist tenets, they differ with regard to the key transmission mechanism between capital controls and financial markets. In several of these precepts, the balance of payment, especially its current account, is the major medium connecting the former to the latter and, consequently, its structure. This is highlighted by the following concepts: current account optimization, dilemma/trilemma dichotomy and Keynesian theories (Graham *et al.*, 2015; Magud *et al.*, 2018; Montecino, 2015; Pasricha *et al.*, 2019; Rebucci and Ma, 2020). An alternative transmission medium, espoused by parity and portfolio balance concepts, is the currency market. These tenets presume that capital controls affect asset markets, including financial resources. A third group, consisting of the Mundell–Fleming, parity variants and speculative attack concepts, combine both currency markets and current accounts as transmission mechanisms (Aizenmann, 2019; Alfaro *et al.*, 2018; Chokri, 2020a, b; Magud *et al.*, 2018). Despite the differences among interventionist proponents regarding the said transmission mechanisms, they are similar to non-interventionist theories, as they also do not particularly consider financial market structure.

2.2 Financial market structure in SSA

Financial market structure refers to the relative mix of banks versus stock markets in a macroeconomy. It influences the characteristics, transaction costs and type of predominant financial instruments (Bencivenga *et al.*, 1996; Williamson and Tadelis, 2012). It is a critical feature that influences available tradeoffs and returns of financial assets. Specifically, it affects financial contracts, institutions and instruments (Cihak *et al.*, 2012; Demirguc-Kunt and Levine, 2002, 2011).

Bank-dominated systems, one form of financial market structure, are characterized by debt financing, whether short or long term (Nyasha and Odhiambo, 2017). These institutions tend to have a more intimate relation with firms they lend to in order to minimize monitoring and other transaction costs (Boot and Thakor, 1997; Demirguc-Kunt and Maksimovic, 1996, 2011; Williamson and Tadelis, 2012). In this manner, they are able to offer more personalized assistance, products, resources and services. Market-based systems, on the other hand, differ as they provide more standardized contracts and instruments (Demirguc-Kunt and Levine, 2002). As a comparative advantage, they provide access to a greater array of market investors that are more impartial and removed (Ho and Iyke, 2017; Mutize *et al.*, 2020).

SSA's financial market structure is an aberration of orthodox theories, as it is bank-dominated and focused on the short end (Allen *et al.*, 2011; Boot and Thakor, 1997; Demirguc-Kunt and Levine, 2012). Less than 6% of loans provided extend longer than 7–8 years. About 23% of financial advances and loans have a maturity between 3 and 6 years (Nyantakyi. and Sy, 2015; World Bank, 2022; World Bank, 2023). A little more than 70% of these resources cover 0–3 years. Long-term domestic financing exceeding 10 years is relatively scarce (Soumaré *et al.*, 2021).

The second anomaly of SSA's financial market structure is its severely underdeveloped capital markets, especially stock exchanges. Out of its 45 economies, there are only about 16 active functioning markets. Most of these have an average market capitalization to gross domestic product (GDP) ratio less than 30%. In comparison, in developed and emerging bank-dominated economies, their same ratios exceed 50%. Overall, capital financing provided by these systems is less than a third of domestic credit offered by the banking sector (World Bank, 2022, 2023). Additionally, while developed stock markets are relatively efficient and liquid, in SSA they are severely inefficient, illiquid and stunted.

The third facet of SSA's deviant financial market structure is demonstrated by its incompleteness, especially at the long end. The sub-continent's yield curve and supply of long-term financing are discontinuous (Mutize *et al.*, 2020). Nigeria and South Africa have the main operational bond markets on the sub-continent. As well, the only active derivatives market is in South Africa (World Bank, 2022, 2023).

2.3 Research gap

From the literature reviewed, a research gap is identified. Firstly, there is a dearth of studies that critically examine the capital controls–financial market structure relation. Secondly, there is a scarcity of studies focused on SSA. This is highly relevant as the mentioned sub-region is characterized by moderate-to-high capital controls as well as anomalous financial market structures. This study, therefore, addresses the stated research gap.

3. Analytical model

3.1 Baseline model: no capital controls

To critically analyze the phenomena under study, a baseline framework without the mentioned restrictions is first developed. This is extended by subsequently including capital controls for further analysis. Herein, a financial resource synonymously refers to a contract or instrument. The representative macroeconomy is founded on disequilibrium theory, where, Y_{it}^{E}, aggregate expenditure at time t exceeds national income, Y_{it}, in the same time period (Schoder, 2019). The output gap is denoted as Y_{it}^{D+}. Let Y_{i}^{*} symbolize domestic full employment output, while $Y_{i,t-1}$ is last year's aggregate income. Then, $Y_{it}^{D+} = Y_{i}^{*} - Y_{i,t-1}$ at the beginning of time t. In time t, a portion, α_{it}^{Y}, of the said gap is financed by domestic, Γ_{it}, and foreign, Γ_{jt}, financing, respectively. Presume therefore that $\alpha_{it}^{Y} Y_{it}^{D+} = Y_{it}^{E} - Y_{it} = \Gamma_{it} + \Gamma_{jt}$.

If $\Gamma_{b,it}$ and $\Gamma_{M,it}$ are domestic banking sector and stock market financing, respectively, then $\Gamma_{it} = \Gamma_{b,it} + \Gamma_{M,it}$. As country i only produces short-term financial resources, then $\Gamma_{b,it}$ and $\Gamma_{M,it}$ have the same limited maturity. Long-term finance is only available from country j, the characteristic advanced foreign economy. The form of external financing is ignored for ease of analysis. Suppose that Y_{j}^{*} and Y_{jt} are income at full employment and time t, respectively, in economy j. Let $Y_{j}^{*} - Y_{jt}$ denote the potential–actual output deficit of country j. As such, $Y_{i}^{*} - Y_{it}$ are similarly defined for economy i. The direct exchange rate between economies i and j at time t is defined as follows:

$$\frac{Y_{i}^{*} - Y_{it}}{Y_{j}^{*} - Y_{jt}} = e_{ij,t} \tag{1}$$

According to Equation (1), $e_{ij,t}$ is a function of the ratio of full employment-current output gap in country i to that of economy j. It suggests that a rise $e_{ij,t}$ is due to an increase in the said deficit of country i or the vice versa condition in economy j. As both countries trade only between themselves, their excess demand is met by consuming more of the other economy's output. This is in tandem with orthodox macroeconomic theory (Blanchard, 2018; Romer, 2019).

Assume imports, Z_i, outstrip exports X_i in country i based on the precondition that both variables exceed zero. Γ_{it+} is additional domestic supply of financial resources introduced into the domestic economy at time t. Presume that $\Gamma_{i,t-1}$ is the previous year's domestic finance, while Γ_{it-} is domestic outflow to country j. Alternatively: $\Gamma_{it} = \Gamma_{it+} + \Gamma_{i,t-1} + \Gamma_{it-}$. Let δ_{it} be the proportion of Y_{t-1} used to finance Γ_{it+}.

$$Y_{t}^{E} = \alpha_{t}^{Y} Y_{i}^{*} + \left(1 - \alpha_{t}^{Y}\right) Y_{it} = \left(X_{it} - Z_{it}\right) + \left(1 + \delta_{it}\right) Y_{it} + \Gamma_{i,t-1} \tag{2a}$$

$$Y_{it} = \left(\alpha_{t}^{Y} + \delta_{it}\right)^{-1} \left[\left(\alpha_{t}^{Y} Y_{i}^{*} - \left(X_{it} - Z_{it}\right) - \Gamma_{i,t-1}\right]\right. \tag{2b}$$

If there is no foreign financing, then $Y_t^E - Y_t = \alpha_t^Y (Y_i^* - Y_{i,t-1}) = \Gamma_{it}$. In this instance, capital controls have little or no effect on the financial system. Equation (2a) conjectures that domestic spending is affected by the current account, previous income and present financing. Equation (2b) postulates that current macro output is inversely related to the sum of the current year's fraction of the output gap financed, α_t^Y, as well as the proportion of last year's output injected as additional domestic financial resources at time *t*.

As country *j* is close to steady state, let a change in $Y_j^* - Y_{jt}$ denoted as $\Delta (Y_j^* - Y_{jt})$ be relatively small but greater than zero. According to Equation (3) below, domestic financing of excess expenditure may be approximated by the sum of local currency value of country *j*'s output gap and domestic expenditure less than the totality of full employment output of country *i* and foreign financing of local excess demand. Equation (3) is underpinned by two preconditions: $\Gamma_{b,it} + \Gamma_{M,it} > 0$ and $Y_i^* > Y_{it}^E$. As such, $e_{ij,t} (Y_j^* - Y_{jt}) > Y_i^* + \Gamma_{jt}$. This implies that the domestic currency value of the output gap of country *j* exceeds the combined value of local full employment output and external financing for country *i*.

$$\Gamma_{b,it} + \Gamma_{M,it} \approx e_{ij,t}\left(Y_j^* - Y_{jt}\right) + Y_{it}^E - \left[Y_i^* + \Gamma_{jt}\right] \tag{3}$$

In the absence of capital controls, financing for country *i*'s excess expenditure does not affect its financial market structure. Rather, it enables it to source the needed funding externally, as local resources are inadequate.

3.2 Capital controls

This segment investigates the effects of capital controls on financial market structure. Capital restrictions are imposed at the latter end of time *t*. Its effects occur with a year's lag at the end of *t+1*. Presume that the said capital controls are quota-type restrictions, a form of market ceiling. $\overline{\Gamma}_i$ is the fixed maximum stipulated capital outflow. It raises the cost of international flows between countries, distorting financial market incentives (Schmitt-Grohe and Uribe, 2017).

P1. This study proffers a financial instruments–capital controls hypothesis that extends the tenets of asset specificity and uncertainty within transaction costs theory (Williamson, 1998; Williamson and Tadelis, 2012). Let ν_{ixb} be the value of bank financial instrument *x* in country *i*, while ν_{ixM} is the analogous securitized non-collateral stock market contract. The value of each financial asset is comprised of two parts. The first portion, the commodity or tangible portion, is symbolized by an additional subscript *k*. For bank and market instruments, these are represented by $\nu_{ixb,k}$ and $\nu_{ixM,k}$, respectively. The second part, the value of financial rights, is the intangible facet symbolized by subscript *l*. The non-physical value of bank and stock market resources are denoted by $\nu_{ixb,l}$ and $\nu_{ixM,l}$ accordingly (Bencivenga *et al.*, 1996; Williamson, 1998). Therefore:

$$\nu_{ixb} = \nu_{ixb,k} + \nu_{ixb,l} \tag{4a}$$

$$\nu_{ixM} = \nu_{ixM,k} + \nu_{ixM,l} \tag{4b}$$

Presuppose that $\nu_{ixb,l}$ and $\nu_{ixM,k}$ are asymptotic to but never equal to 0. Thus, for instruments issued by banks, their tangible value significantly exceeds the alternative. Assume the opposite for stock market resources.

Let $w_{ib,l}$ and $w_{iM,l}$ be the degree or weight of intangibility for each respective bank and market instrument, such that $w_{ib,l} = 1 - w_{ib,k}$ and $w_{iM,l} = 1 - w_{iM,k}$. Neither $w_{ib,l}$ nor $w_{iM,l}$ equal zero. However, $w_{ib,k} = \nu_{ixb,k}/\nu_{ixb}$ and $w_{iM,k} = \nu_{ixM,k}/\nu_{ixM}$. These assumptions presume that there exists a tradeoff between the commodity and financial rights values of an instrument.

It is hypothesized that under capital controls c_{ixb}, the cost of estimating ν_{ixb} remains the same as before the imposition of the said restriction. On the other hand, c_{ixM}, the analogous cost for a stock market resource is a direct function of the intensity of the imposed restrictions, $f(\overline{\Gamma}_i)$, as well as $\zeta_{\overline{\Gamma}_i}$, the lost financial flows occurring as result of the instituted capital controls. This is depicted in Equation (5). Both $f(\overline{\Gamma}_i)$ and $\zeta_{\overline{\Gamma}_i}$ are implicit positive functions of $w_{iM,l}$. Given the condition that $c_{ixM} > 0$, then:

$$c_{ixM} = f\left(\overline{\Gamma}_i\right) + \zeta_{\overline{\Gamma}_i} \tag{5}$$

As such, v^c_{ixb} and v^c_{ixM}, the respective net values of bank and stock market instruments are as follows:

$$v^c_{ixb} = \nu_{ixb} \tag{6a}$$

$$v^c_{ixM} = \nu_{ixM} - c_{ixM} \tag{6b}$$

Combining Equations (4a), (4b), (5), (6a) and (b) implies that when $\overline{\Gamma}_i > 0$, then $v^c_{ixb} > v^c_{ixM}$. This concludes that capital controls adversely affect the value of intangible financial instruments, including those issued by stock markets.

$\Gamma_{b,it+1}$ is bank financing at time $t+1$ after imposition of the examined market restrictions. $\Gamma_{M,it+1}$ and $\Gamma_{j,t+1}$ are similarly defined for stock market and foreign financing. ϕ_{bi} is sensitivity of $\Gamma_{b,it+1}$ to $\overline{\Gamma}_i$ computed as $\phi_{bi} = (\nu_{ixb,k} - \nu_{ixb,l})$, as depicted in Formulation (7a). $\Gamma_{M,it+1}$ and $\Gamma_{j,t+1}$ are computed in a similar manner, as illustrated in Equations (7b) and (7c).

$$\Gamma_{b,it+1} = \Gamma_{b,it}\left(1+\phi_{bi}\overline{\Gamma}_i\right);\ 0 < \phi_{bi} < 1 \tag{7a}$$

$$\Gamma_{M,it+1} = \Gamma_{M,it}\left(1+\phi_{Mi}\overline{\Gamma}_i\right);\ 0 < \phi_{Mi} \geq -1 \tag{7b}$$

$$\Gamma_{j,t+1} = \Gamma_{M,it}\left(1+\phi_{ji}\overline{\Gamma}_i\right);\ 0 < \phi_{ji} \geq -1 \tag{7c}$$

Although Equations (7a)–(7c) are derived from preceding axioms, Formulation (7a) postulates that capital controls increases both the value and quantity of bank instruments. The key reason is because financial assets with greater commodity value are a more certain store of value in uncertain environments engendered by capital controls. The opposite relation holds for the two alternative instruments, namely, stock market and foreign financing. A consequence of this is a monopolistic banking system characterized by higher returns ■

For ease of analysis, let $\phi_{bi} + \phi_{Mi} + \phi_{ji} = 1$ such that $|\ \phi_{bi}\ | = |\phi_{Mi} + \phi_{ji}\ |$. This implies that changes in foreign and stock market financing are offset by bank funding. As $\phi_{Mi} + \phi_{ji} < 0$, then $\phi_{Mi} + \Delta\Gamma_{M,it+1} = -(\Delta\Gamma_{M,it+1})$. This based on the assumption that $\Gamma_{j,t+1} - \Gamma_{jt} < 0$ and $\Gamma_{i,t+1} - \Gamma_{it} > 0$. This implies that after the institution of capital controls, the increase in local financing makes up for the decrease in stock and foreign financing. Formally, this may be stated as $|(\Gamma_{b,it+1} - \Gamma_{b,it})| = |(\Gamma_{M,it+1} - \Gamma_{M,it}) + (\Gamma_{j,t+1} - \Gamma_{jt})|$, whereas $(\Gamma_{M,it+1} - \Gamma_{M,it}) + (\Gamma_{j,t+1} - \Gamma_{jt}) < 0$. The reason is because the imposed restrictions discourage potential foreign resource inflows, as external investors cannot freely repatriate their domestic earnings due to a limitation on capital outflows.

Formulation (8) suggests that a change in country i's excess demand at time $t+1$, the left-hand side of the equation, is a function of capital controls as well as the sensitivity of the three sources of funding to the stated market restriction.

$$\Delta\left[Y^{E}_{i,t+1} - Y_{i,t+1}\right] = \overline{\Gamma}_{i}\left(\phi_{bi}\Gamma_{b,it} - \phi_{Mi}\Gamma_{M,it} - \phi_{ji}\Gamma_{M,it}\right) \tag{8}$$

From prior formulations, the reaction function, i.e. Equation (9), is derived. It argues that foreign financing after the imposition of capital controls is a function of four components. The first is the domestic economy's past year's excess demand $Y^{E}_{it} - Y_{it}$. The second is the ratio of ex-post excess demand after capital controls to the sum of one and the product of capital control and its effect on local bank instruments. The third determinant is the value of the previous year's domestic market financing. The final elements are the magnitude of capital controls and the sensitivity of foreign funding to the examined market intervention.

$$\Gamma_{j,t+1} = \left[\left(Y^{E}_{it} - Y_{it}\right) - \frac{\left(Y^{E}_{i,t+1} - Y_{i,t+1}\right)}{\left(1 + \phi_{bi}\overline{\Gamma}\right)} - 2\Gamma_{M,it}\right]\frac{\left(1 + \phi_{j}\overline{\Gamma}\right)}{2} \tag{9}$$

The foregoing analysis suggests that capital controls do not affect banks and stock markets equally. Rather, they adversely impact foreign financial and domestic stock market instruments. In the case of SSA, it appears that these restrictions favor bank issued financing. The latter may be used as a substitute for lost foreign long-term inflows. Consequently, capital controls magnify bank dominance. Currency markets may not be immune, as the said financial restrictions could alter $\frac{Y^{d}_{ij}}{Y^{d}_{ji}}$.

4. Data and empirical methodology

4.1 Data

The empirical analysis uses annual data between 1995 and 2021. Secondary data on all variables excluding the capital control indicators were obtained from World Bank (2022) and World Bank (2023). The study selected these years as a result of missing data and the fact that most SSA stock markets were established at the latter end of the 1990s.

The dataset is originally an unbalanced panel. This is because of the unsystematic nature of unavailable data for some of the sampled countries. Using data imputation processes, the compiled data are enhanced to a balanced panel (Austin *et al*., 2021; Eddings and Machenko, 2012; De Silva, De Livera, Lee and Moreno-Betancur, 2020; Nakai and Weiming, 2011).

To evaluate potential biases with data imputation, the study computes a set of rigorous pre-regression diagnostic tests. The pre-regression analysis enables the study to determine if said data enhancement introduced potential biases or weaknesses that are critical to the empirical analysis and findings. The results of the diagnostic tests are subsequently presented and discussed. The study uses STATA 18 for its empirical analysis.

Data on capital controls are compiled from Chinn and Ito (2022). Missing data preclude sampling all 45 SSA economies (World Bank, 2022, 2023). Although Fernández *et al*. (2021) develop an alternative capital controls dataset, it is not used in this study because it has more missing data for the sampled economies. The Chinn-Ito capital controls index ranges between 2.31 and −2.31. A value of 2.31 implies almost perfect capital mobility. At the other extreme, −2.31 denotes complete capital restriction.

The sampled countries are listed in Table 1. Of the analyzed economies, Botswana, Gambia, Kenya, Mauritius, Uganda and Zambia have relatively low capital restrictions, as their average Chinn-Ito indices are greater than zero. For the remaining 29, their average capital controls indicator is less than 0, highlighting prevalence of these restrictions on the sub-continent. Of these, only four of have a mean indicator between 0 and −1, namely, Cape Verde, Madagascar, Nigeria and Rwanda. Majority of the outstanding 25 have a mean index between −1 and −1.70.

Table 1. Descriptive statistics – capital controls in SSA

Country	Mean	Median	St. Dev	Trend	CV
1. Angola	−1.63	−1.93	0.35	−1.21	−0.21
2. Benin	−1.19	−1.23	0.21	−1.08	−0.18
3. Botswana	1.62	2.31	1.11	0.19	0.69
4. Burkina Faso	−1.19	−1.23	0.21	−1.08	−0.18
5. Burundi	−1.66	−1.93	0.34	−1.22	−0.21
6. Cape Verde	−0.83	−1.23	1.01	−1.84	−1.21
7. Central African Republic	−1.19	−1.23	0.21	−1.08	−0.18
8. Chad	−1.19	−1.23	0.21	−1.08	−0.18
9. Comorros	−1.23	−1.23	0.00	−1.23	0.00
10. Congo (Democratic Republic)	−1.19	−1.23	0.10	−1.09	−0.10
11. Guinea	−1.69	−1.93	0.34	−1.25	−0.20
12. Guinea-Bissau	−1.24	−1.23	0.19	−1.28	−0.16
13. Eriterea	−1.46	−1.93	0.58	−0.70	−0.40
14. Eswatini	−1.19	−1.23	0.21	−1.08	−0.18
15. Ethiopia	−1.23	−1.23	0.00	−1.23	0.00
16. Gabon	−1.19	−1.23	0.21	−1.08	−0.18
17. Gambia	2.31	2.31	0.00	2.32	0.00
18. Ghana	−1.43	−1.23	0.42	−0.87	−0.30
19. Kenya	0.93	1.04	0.58	0.61	0.63
20. Lesotho	−1.22	−1.23	0.07	−1.18	−0.06
21. Madagascar	−0.53	−0.16	0.49	−0.21	−0.93
22. Malawi	−1.38	−1.23	0.39	−1.20	−0.29
23. Mali	−1.19	−1.23	0.21	−1.08	−0.18
24. Mauritania	−1.19	−1.23	0.21	−1.09	−0.18
25. Mauritius	1.44	1.20	0.68	1.49	0.47
26. Mozambique	−1.23	−1.23	0.00	−1.23	0.00
27. Nigeria	−0.85	−0.66	0.39	−1.29	−0.46
28. Rwanda	−0.34	−1.23	1.13	−1.83	−3.35
29. Senegal	−1.19	−1.23	0.21	−1.08	−0.18
30. Sierra Leone	−1.49	−1.58	0.53	−1.41	−0.36
31. South Africa	−1.19	−1.23	0.21	−1.08	−0.18
32. Tanzania	−1.21	−1.23	0.10	−1.16	−0.08
33. Togo	−1.23	−1.23	0.00	−1.23	0.00
34. Uganda	1.98	2.31	0.78	1.16	0.39
35. Zambia	2.00	2.31	0.89	1.20	0.45

Note(s): ST.DEV and CV denote standard deviation and coefficient of variation
Source(s): Authors' own computation from Chinn and Ito (2022)

From Table 1, only nine of the sampled economies have a standard deviation greater than 0.5. Even so, these do not markedly exceed 1. This implies that the intensity of capital controls in SSA does not significantly change over time. This is corroborated by the low coefficient of variation and trend indicators.

In 29 of the examined countries, about 83% of the sampled SSA countries, capital controls had a negative trend, meaning they became more restrictive over time. Such restrictions may have been implemented to address macroeconomic and structural misalignments arising from comparatively weak currencies, high net imports and significant foreign currency components of public debt (Batini and Durand, 2020; Sriram *et al.*, 2020). These restrictions may be intended to minimize the adverse effects of currency mismatch, debt unsustainability and high indebtedness (Batini and Durand, 2020; Blanchard, 2018; Montecino, 2015).

Financial market structure, ϑ_{bMi}, is computed as $\frac{\Gamma_{bi}-\Gamma_{Mi}}{\Gamma_{Mi}+\Gamma_{bi}}$. The literature notes that there are three key dimensions of financial market structure, namely, activity, efficiency and size. In more developed countries with available data, a composite measure integrating all three

components may be computed as the aggregate financial market structure variable. In the case of SSA, however, data on the first two aspects, activity and efficiency, are highly limited. As a consequence, this study uses data on the size dimension of financial market structure.

Following the work of Demirguc-Kunt and Levine (2002) and Levine (2002), $\Gamma_{b,it}$ and $\Gamma_{M,it}$ are proxied by the bank credit-to-GDP ratio and market capitalization ratio, respectively. Using data obtained from the World Bank (2022) and the World Bank (2023) covering 1995–2021, the study finds that all the examined countries in SSA, excluding South Africa, are bank-based. This includes those with active stock markets. For countries without a stock market, $\vartheta_{bMi} = 1$, denoting complete bank dominance (World Bank, 2022, 2023).

Several studies have considered the influence of other variables on financial market structure, including governance and institutional factors as well as macroeconomic variables. These include Allen *et al.* (2015), Demirguc-Kunt and Levine (2012), Ho and Iyke (2017) and Nyasha and Odhiambo (2017). As the study concentrates mainly on the effects of capital controls on the regressand, it subsumes the influence of such potential regressors in the residual error term.

4.2 Empirical methodology

4.2.1 Hypothesis tests. A key conclusion derived from the comparative statics analysis is that capital controls encourage banks but discourage stock markets. As a first test of validity, a Pearson correlation statistic, r, is computed between capital controls and financial market structure. r^2 is the square of r. The computed parameter is -0.21. Formulation (10) is used to convert the correlation to a t-statistic, where n is the sample size. The t-statistic for the correlation coefficient is -6.23. The remaining hypothesis test results are presented in Table 2. As a preliminary result, it confirms that capital controls stimulates excess bank dominance.

$$t\text{-}statistic = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}} \tag{10}$$

To test whether capital controls raise bank returns, the study uses data on return on assets (ROA) and return on equity (ROE) for objectivity. It tests the null hypothesis that sampled SSA countries with negative (restrictive) capital control indices have greater bank returns than the opposite cohort – economies with little or no capital controls, signified by economies with a zero or positive capital controls index. Sample 1 is the group with negative capital controls indices, while Sample 2 is the set with a zero or positive index. The mean ROA and ROE indicators for the two groups are computed. These are transformed to a t-statistic with associated pooled standard deviations using Equations (11a) and (11b) accordingly. The mean ROA or ROE for Samples 1 and 2 are individually represented by $\overline{\tau}_1$ and $\overline{\tau}_2$. The related degrees of freedom are derived as $n_1 + n_2 - 2$ where n_1 and n_2 are the respective sizes of Sample 1 and Sample 2. s_1^2 and s_2^2 are the corresponding variance for Samples 1 and 2, while s_p^2 is the pooled sample variance of the two groups.

Table 2. Hypothesis test statistics and test results

Hypothesis test (null)	Test statistic	*p*-value
1. H_0: Correlation between capital controls and financial market structure is zero	−6.23	0.00
2. H_0: ROA for countries with negative capital control indices is less than the same indicator for economies with positive indicators	1.14	0.56
3. H_0: ROE for countries with negative capital control indices is less than the same indicator for economies with positive indicators	5.58	0.00
4. H_0: Cost-income ratio for countries with negative capital control indices is less than the same indicator for economies with positive indicators	13.29	0.00

$$t = \frac{\overline{\tau}_1 - \overline{\tau_2}}{\left(\left(s_p^2((1/n_1) + (1/n_2))\right)^{1/2}\right.} \tag{11a}$$

$$s_p = \frac{\left(\left(s_1^2 * (n_1 - 1) + \left(s_2^2 * (n_2 - 1)\right)\right.\right.}{n_1 + n_2 - 2} \tag{11b}$$

The hypothesis test results in Table 2 illustrate that when ROA is used as the return parameter, the resulting test statistic, 1.14, does not reject the null hypothesis that capital controls do not alter bank returns. On the other hand, using ROE, the associated test statistic of 5.58 has a *p*-value of 0.00. This suggests that in economies with capital controls, banks have higher returns. The contrasting results from the ROA and ROE parameters are inconclusive.

To overcome the aforementioned problem, the study tests the next hypothesis. It infers that banks with capital controls tend to operate in a monopolistic environment. Consequently, they will be less efficient, having higher cost-income ratios. The associated test statistic, 13.29, has a *p*-value of 0.00. This avers that capital controls foster higher cost-income ratios. This confirms that capital controls encourage banks at the expense of stock markets. Missing data preclude completing similar tests for the latter financial systems in SSA.

4.2.2 Regression analysis. The study employs parametric panel econometrics for the remaining portion of its empirical analysis because of its underlying research objectives as well as the features of the data employed. The methodology comprises of pre-regression diagnostic tests, panel regression and post-regression analysis (Baltagi, 2013; Biorn, 2017; Wooldridge, 2010). The following pre-regression diagnostic test statistics are computed: cointegration, multi-collinearity and stationarity. The panel regression employs a generalized method of moments (GMM) methodology because of its rigor and robustness when there are likely endogenous regressors in the model (Greene, 2017; Kivet *et al.*, 2016; Pesaran, 2015). The regressor coefficients, the beta coefficient, are: $\beta_1,\ \beta_2,\ \beta_3,\ \beta_4,\ \beta_5\ ,\ \beta_6$. They are the respective coefficients of the examined regressors included in the regression model.

$$\vartheta_{bMit} = \beta_1 \overline{\Gamma}_{it} + \beta_2 e_{ijt} + \beta_3 \pi_t + \beta_4 Y_{it}^{\theta} + \beta_5 \psi_{it} + \beta_6 \frac{Z_{it}}{X_{it}} + \varepsilon_{it} \tag{12}$$

The econometric regression is estimated from Equation (12). In the said formulation, the dependent variable, ϑ_{bMit}, is posited as a function of capital controls, $\overline{\Gamma}_{it}$; dollar exchange rate, e_{ijt}; inflation rate, π_t; real GDP per capita, Y_{it}^{θ}; size of the informal sector, ψ_{it} and terms of trade, $\frac{Z_{it}}{X_{it}}$. The latter is estimated as the ratio of imports to exports. ε_{it} is the associated residual error term. Table 3 below summarizes the variables employed in the regression analysis.

Table 3. Variables in empirical analysis

Variable	Type of variable
Financial market structure	Dependent variable
Capital control index	Control/Independent variable
Dollar exchange rate	Control/independent variable
Inflation rate	Control/independent variable
Real GDP per capita	Control/independent variable
Size of informal sector	Control/independent variable
Terms of trade	Control/independent variable

5. Analysis, findings and results

5.1 Pre-regression diagnostic tests

5.1.1 Multi-collinearity tests. The multi-collinearity test statistics are reported in Table 4. The key indicators are condition index, eigenvalue, r-squared, tolerance factor, variance inflation factor (VIF) and square root of the VIF (Baltagi, 2013; Biorn, 2017; Pesaran, 2015; Wooldridge, 2010). The VIF parameters are all less than 2, far below the critical value of 10. The remaining multi-collinearity indicators are also relatively low, highlighting no multi-collinearity.

5.1.2 Panel stationarity tests. To investigate stationarity, the study computes the Levin *et al.* (2002) and Fisher-type unit-root test statistics of the examined variables (Baltagi, 2013; Biorn, 2017; Wooldridge, 2010). Level data of the dollar exchange rate, GDP per capita, inflation and terms of trade are non-stationary. Using the first-differenced form of the data, consequently, the first-differenced version of the data is tested. The results in Table 5 conclude that the latter dataset is stationary. It is rather used for the regression.

5.1.3 Panel cointegration test. The computed Kao (1999), Pedroni (2004) and Westerlund (2007) cointegration test statistics are presented in Table 6. They are similarly based on the first

Table 4. Multi-collinearity test results

Variable	VIF	VIF SQ	TF	R-SQ.	E.V	C.I
GDP per capita	1.40	1.18	0.6	0.50	0.63	1.33
Financial market structure	1.26	1.12	0.74	0.24	0.28	1.28
Size of informal sector	1.24	1.11	0.76	0.29	0.51	1.22
Inflation	1.21	1.10	0.79	0.20	0.53	1.53
Terms of trade	1.20	1.10	0.8	0.27	0.62	1.61
Dollar exchange rate	1.16	1.08	0.84	0.52	0.29	1.29

Note(s): VIF SQ.; TF; R.SQ; E.V and C.I denote VIF square root, tolerance factor, *R*-squared, eigenvalue and condition index, respectively
Source(s): Authors' own computation

Table 5. Panel stationarity tests

Variable	LLC statistic	*p*-value	Fisher-type statistic	*p*-value
Kaopen	−8.4869	0.00	−11.9267	0.00
GDP per capita	44.0006	0.00	27.39	0.00
Financial market structure	−3.21	0.00	−4.12	0.00
Size of informal sector	28.02	0.00	−4.32	0.00
Inflation	8.4187	0.00	6.33	0.00
Terms of trade	−27.71	0.00	−29.16	0.00
Dollar exchange rate	−14.0249	0.00	−4.8138	0.00

Source(s): Authors' own computation

Table 6. Panel cointegration tests

Cointegration test	Test statistic	*p*-value
Westerlund cointegration test	−6.40	0.00
Kao cointegration test	−45.81	0.00
Pedroni cointegration test	−17.92	0.00

Source(s): Authors' own computation

differences, as the level variables were not stationary. Underlying the test is the null hypothesis that the panel is not cointegrated, while the alternative asserts the opposite. The test results presented in Table 6 confirms that the model has a cointegrating relationship.

5.2 Panel regression

Table 7 presents the GMM regression results. In confirmation of the aforestated hypothesis, the paper finds that capital controls skew economies towards bank-based systems. It confirms the supposition that such restrictions distort financial flows from foreign and stock market sources. They may foster a monopolistic environment for local banks. This may be because capital controls add to existing uncertainties, making it difficult to evaluate the worth of financial instruments with relatively high intangible values. This finding is supported by Soumaré *et al.* (2021).

A high dollar exchange rate is also found to tilt SSA economies towards bank dominance. Parity relations between currency and associated asset markets are possibly disturbed in such conditions. The key effects of the noted exchange rate are twofold. It adversely affects goods and financial markets (Chokri, 2020b). In the product economy, output is restricted, as the supply of needed capital is limited (Romer, 2019). Although a weak local currency encourages exports, it worsens its trade balance in SSA, as the sub-region is a net importer. According to Alfaro *et al.* (2018) and Salvatore (2013), depreciated domestic currency alters parity relations in the financial sector. Additionally, it raises local interest rates. Foreign financing becomes relatively expensive. This empirical finding adds another dimension to the relation between currency markets and financial systems, as espoused by Cavusoglu *et al.* (2019), Mundell (2000) and Montecino (2015).

Inflation, on the other hand, was found to encourage a market-based economy in SSA. Alternatively, it discourages bank-dominated systems. Romer (2019) and Salvatore (2013) aver that this is because of the fixed income characteristics of bank financing. They do not compensate for inflation. On the other hand, stock market instruments may be able to pass on price increases better than banks, as highlighted by Mutize *et al.* (2020). For one thing, firms, listed or unlisted, may increase their product or service price margins as general prices rise.

Table 7. GMM panel regression

Variables	Coefficient	Standard error	Z-statistic	*p*-value
Capital controls index (lag)	−0.0325	0.0158	−2.06	0.04
Dollar exchange rate	−0.0001	0.0001	−7.17	0.00
Inflation	0.0002	0.0001	2.27	0.02
Real GDP per capita	−0.0005	0.0000	−3.49	0.00
Size of informal sector	−0.0013	0.0012	−0.98	0.33
Terms of trade	−0.0031	0.006	−0.56	0.58

GMM post-regression diagnostic test statistic	Value
Wald statistic	80.88
p-value	0.00
Sargan test (H_0: over-identifying restrictions are valid)	3.571
p-value	0.69
Arellano–Bond first order test (H_0: no autocorrelation)	−1.29
p-value	0.23
Arellano–Bond second order test (H_0: no autocorrelation)	−1.49
p-value	0.14
Number of observations	858

Source(s): Authors' own computation

Shares and related financial instruments, therefore, easily adjust to extenuating market conditions (Soumaré *et al*., 2021). These results are in tandem with the work of Ho and Iyke (2017). Overall, empirical evidence on the relation between inflation and stock markets is mixed.

From the results, rising GDP per capita encourages bank dominance. In SSA, the former may increase disposable income and spending. This would increase bank deposits by customers. Banks then use such deposits to finance their expanded lending. Added to this, rising incomes may raise bank borrowings. On the other hand, stock market investments remain limited on the sub-continent, as share trading remains an almost elitist activity (Nyasha and Odhiambo, 2017; World Bank, 2023). This result disagrees with mainstream theory (Allen *et al*., 2015; Cihak *et al*., 2012; Demirguc-Kunt and Levine, 2012; Graham *et al*., 2015).

The following independent variables had no effect on the regressand, size of the informal sector and the terms of trade. From the Wald statistic, it may be inferred that the regression model is appropriately specified and fits the data. The Sargan test results highlight that the utilized instruments are valid. There were no first- or second-order auto-correlations.

6. Conclusion and summary

This study investigated the influence of capital controls on financial market structure in SSA. Taking into account the unique characteristics of both variables on the sub-continent, an original analytical framework was developed. Premised on its underlying assumptions, it finds that capital controls encourage banks but deter securitized and foreign financial instruments. The first part of the empirical analysis confirms the supposition that capital controls engender banks, making them more inefficient. The regression results highlight that the said restrictions skew financial markets towards bank-based systems.

As a policy implication, this study, therefore, corroborates the recommendation of Batini and Durand (2020) that capital controls are better utilized as a temporary policy instrument to minimize exchange rate shocks and related anomalies. When implemented permanently, they tend to have significantly adverse consequences by distorting market mechanisms. Most of SSA has maintained these controls for more than a decade, making them an almost perpetual phenomenon. The sub-region, as a result, must critically evaluate the success of these restrictions thus far. This can be done through research that investigates different facets of the complex capital controls–financial markets relation. Furthermore, their immediate, medium and long-term effects should be considered as demonstrated by the J- and S-curve phenomena. More studies on this topic can assist decision and policymakers.

Another area of research interest is the exploration of the effects of different forms of capital restrictions on selected economic variables. One question that may be considered is whether the gradual but selected removal of specific capital controls may be more optimal compared to their immediate elimination. Alternatively, instead of a general application, perhaps if these restrictions are targeted at specific financial flows, they might be more potent at addressing particular macroeconomic misalignment with minimal adverse effects.

One of the underlying justifications of capital controls in SSA was to stem capital flight. Yet, these same governments do not appear to have provided adequate and appropriate incentives to enhance retention of domestic resources. Possibly, strategies of the latter nature may be more effective at discouraging capital outflows. There is, consequently, a need to determine fitting policies that attract more than repel financial flows. This may require a more holistic and integrated approach, as outlined by Sriram *et al.* (2020), where prudent macroeconomic management and increased political stability may be more effective. Other studies argue for policies directed at more specific financial flows and stakeholders.

For policymakers, a more critical analysis of SSA's framework of economic policies is required. This is because although a policy might originally be intended to promote economic activity, it may actually distort market mechanisms. Examples include regulations targeted at

attracting foreign direct investment but simultaneously restricting outward financial flows. This uncoordinated ad-hoc approach to addressing deep and multi-dimensional macroeconomic concerns may aggravate existing anomalous conditions. Further research could help identify such policies. Additional studies to explore such concerns can help untangle the current mix of regulatory frameworks with contrasting objectives.

Insights gleaned from the results herein may be incorporated into extended research to design a more robust financial market structure. This can be combined with an array of scenario analysis to critically evaluate the potential effects of hypothetical as well as actual market interventions. The disparate effects of capital controls on banks and stock markets highlight the need for further analysis on market controls and financial instruments.

As noted by an anonymous reviewer, this study focused particularly on SSA, such that its findings cannot be completely generalized. However, it highlights possible concerns in the sub-region about the interrelation between different financial instruments and economic policies. It therefore highlights research opportunities about the complex nature of these variables.

Due to unavailable data, this study was unable to explore the "trilemma" concern related to capital controls. This is another potential research area where a richer and robust dataset could aid in critical investigation of the effects of balance of payments, capital controls, exchange rates and monetary policy acting together. Trilemma research in SSA and its effects on financial markets are, therefore, open to further exploration.

Furthermore, other areas for further research raised by an anonymous reviewer include the introduction of other independent variables and other types of financial markets. These can be considered in future research. They are critical opportunities to provide additional insight and understanding about the relation between capital controls and financial markets.

Several SSA countries are members of different economic groupings. Restricting asset flows from non-member states may be a stipulated condition. The effects of these on domestic financial systems need to be explored in the literature. It is hoped that this study will stimulate further studies in this area of scholarly inquiry.

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