Implications of Monetary Policy for Credit and Investment in Sub-Saharan African Countries

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Abstract

This paper investigates the implications of monetary policy for domestic investment through its effects on bank lending to the private sector and interest rates in sub-Saharan African countries. The study argues that the pursuit of inflation control through contractionary monetary policy carries high costs in terms of reduced investment and ultimately slower economic growth. The econometric evidence based on a sample of 37 sub-Saharan African countries over 1980-2012 shows that contractionary monetary policy affects domestic investment negatively both indirectly through the bank lending or quantity channel as well as directly through the interest rate or cost of capital channel. The results suggest that policies that maintain a low interest rate regime would stimulate bank lending to the private sector, which in turn would boost domestic investment. The results have important policy implications for African countries in their efforts to achieve and sustain high growth rates as a means of reaching their national development goals notably employment creation and poverty reduction.

Keywords: domestic investment; bank credit; monetary policy; interest rates; sub-Saharan Africa; inflation targeting; growth

JEL Classification: E22; E42; E52; O23 ; O55

1. Introduction

Since the 1980s and more so over the past decade, there has been a gradual convergence of monetary policy regimes in African countries towards inflation control as the overriding objective of monetary policy (Heintz & Ndikumana, 2011; Honohan & O'Connell, 2008;

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Kasekende & Brownbridge, 2011; O'Connell, 2011). In fact two African countries have already formally moved to full-fledged inflation targeting (South Africa and Ghana) while two others (Mauritius and Uganda) have adopted a transition regime of informal inflation targeting or inflation targeting 'lite'[1] (Porter & Yao, 2005). In practice this monetary policy orientation has been characterized by controlling domestic credit as a means of containing domestic demand and therefore reducing inflation and keeping it in check. In 2000, South African Finance Minister Trevor Manuel stated that high domestic credit extension is an obstacle to development and a constraint to monetary policy.[2] He put is as follows: 'Living beyond our means has become part of the national psyche. It is saddening. We would like to bring down interest rates, but as long as private credit extension is so high, that counteracts development.'[3] In fact, given that many African countries live with chronic budget deficits and that fiscal policy is beyond the control of the monetary policy authority, contractionary credit policy ultimately constrains bank lending to the private sector. This paper argues that this policy orientation has adverse effects on the economy, especially by constraining domestic investment. The paper aims to explore this important issue and provide empirical evidence on sub-Saharan African (SSA) countries.

Investigating the linkages between domestic investment and monetary policy especially through the credit channel is important for several reasons in the case of SSA countries. Because of pervasive information asymmetries, poorly developed or non-existent equity markets and other non-bank credit instruments, firms in SSA countries rely substantially on bank credit to finance capital accumulation. Consequently, credit contraction reduces overall private sector activity. Moreover, banks (i.e., the supply side of the credit market) ultimately determine the volume and allocation of credit. Indeed, firms in African countries are credit constrained in the sense that they have profitable investment projects that are unrealized due to the shortage of credit. In this context, a monetary policy stance that restricts domestic credit will further aggravate the adverse effects on private sector activity. Finally, the lack of competition in the banking sector causes equilibrium credit to be supply determined rather than demand determined.

This study emphasizes the effects of monetary policy on domestic investment through the interest rate, or cost of capital, and through credit contraction to explore real-side effects of monetary policy. A weakness of the monetarist orientation of monetary policy is that it ignores the effects of contractionary monetary policy on the supply side of the economy. A shortage of credit constitutes a constraint on capacity utilization, investment, and employment in the business sector. Therefore, as Blinder (1987, p. 336) puts it, 'credit restrictions, which reduce the supply of credit for either working capital or investment, are a major channel through which financial policies have real effects.' If these supply effects are quantitatively important, there may not be a trade-off between price stability and output growth. The upward pressure on the price level may offset the demand-side effects on inflation, thereby reducing the effectiveness of contractionary monetary policy in controlling inflation. This study argues that tight monetary policy constrains capital accumulation by increasing the cost of borrowing due to interest rate hikes and by reducing the pool of loanable funds in the banking system. As the cost of production increases, the prices of goods and services also increase. Ultimately, the higher costs are passed on from firms to consumers. Thus the focus on inflation stabilization as a gauge for success of policy may be problematic. Indeed, while many African countries may

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[1] For a definition of 'inflation targeting lite' regime, see Stone (2003).

[2] For a discussion of past and recent developments in South African monetary policy, especially on inflation targeting, see Du Plessis (2002).

[3] *Saturday Star Business Report*, 12 August 2000. Cited in South African Institute for Race Relations (2000, p. 442).

have been able to bring down inflation to lower levels,[4] they face the more daunting challenge of achieving and sustaining high growth rates, which requires, among other things, raising the level of domestic investment.

It is important to examine supply-side effects of contractionary monetary policy in sub-Saharan African countries for several reasons. First, monetary policy has important distributional effects which are overlooked in analyses that only focus on the demand side. If credit is curtailed due to contractionary monetary policy, then only the relatively better endowed households and firms will have access to credit. Moreover, as firms are forced to cut down employment and investment, the unskilled workers are the primary targets for layoffs. Therefore, the effects of credit constraints may worsen income inequality. Second, tight monetary policy has important open-economy effects that have implications for employment and inflation. Low domestic credit, high interest rates, and a strong national currency undermine export competitiveness, leading to a deterioration of the current account. These potential supply side effects of monetary policy call for careful examination of the implications of the ongoing shift in sub-Saharan African countries toward monetary policy regimes that explicitly commit to targeting a low inflation rate as the overriding goal of monetary policy.

An important aspect that is not empirically explored in this paper is the linkage between monetary policy and fiscal policy and the implications for bank lending to the private sector and domestic investment. Conceptually, large fiscal deficits are associated with high interest rates, which may undermine domestic investment directly and indirectly. The direct effects may arise from the high cost of capital associated with high interest rates. The indirect effects may arise from the fact that high interest rates induce banks to invest more in government securities than in loans to the private sector. Moreover, a weak fiscal position undermines public investment which is an enabler of private investment. These linkages are worth investigating in future research; but the topic is beyond the scope of this paper.

This paper motivates a dynamic structural investment model that incorporates the role of domestic credit under the view that monetary policy affects domestic credit, which affects production for any given level of other inputs. The investment function derived under this view implies a direct positive relationship between capital accumulation and domestic credit.

The empirical analysis is based on an unbalanced annual panel data on a sample of 37 sub-Saharan African countries over the period 1980-2012. It aims to investigate: (1) the effects of contractionary monetary policy on capital accumulation through bank credit to the private sector; (2) the effects of monetary policy on domestic investment through the interest rates or the cost of capital; and (3) the impact of monetary policy on private sector lending through the interest rates. Empirical evidence from this analysis may shed light on the implications of monetary policy for domestic investment in sub-Saharan African countries.

The rest of the paper is organized as follows. The next section reviews developments in monetary policy regimes in Africa over the past decades. Section 3 discusses potential adverse real-side effects of contractionary monetary policy. Section 4 presents a theoretical model of the linkages between investment and credit. Section 5 specifies the empirical model, describes the estimation methods, and discusses the regression results. Section 6 concludes.

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[4] The following statement by Mr. Emmanuel Tumusiime-Mutebile, Governor of the Bank of Uganda illustrates the enthusiasm regarding recent success with monetary policy: 'Over the past two or three decades, monetary targeting frameworks have served sub-Saharan countries quite well. Monetary targeting brought down inflation in many low-income countries, including Uganda in the early 1990s, and maintain it at moderate levels for sustained periods.' (Tumusiime-Mutebile, 2014).

2. Shifts in Monetary Policy Regimes in African Countries

The early post-independence period in Africa was marked by activist expansionary monetary policy with a predominant role of the government activing both as a banker (through government owned financial institutions) and a borrower. This approach proved ineffective over time, as it led to inflationary government borrowing while suffocating the development of private financial institutions. Over time African countries adopted various monetary policy regimes corresponding to shifts in economic doctrine and political orientation. Honohan & O'Connell (2008) provides a survey of monetary regimes in African countries from the 1960s to the 1990, while more recent developments are discussed in Heintz & Ndikumana (2011), Kasekende & Brownbridge (2011), and O'Connell (2011).

Today, sub-Saharan African countries have declared price stability as the ultimate objective of monetary policy.[5] In fact South Africa and Ghana have adopted a full-fledged inflation targeting regime, while Mauritius and Uganda operate a transition regime of inflation targeting 'lite'.[6] Since the structural adjustment programs of the 1980s, sub-Saharan African countries gradually moved away from direct to indirect monetary policy, and pursued pure market oriented monetary policy where, in principle, the price and allocation of credit are set by market forces rather than being administratively controlled by the Central Bank. In practice, however, the majority of sub-Saharan African countries consider commercial bank credit as critical guide for demand management in controlling inflation. Thus, sub-Saharan African countries outside of the CFA common currency area have maintained some sort of credit ceilings for a long time (Honohan & O'Connell, 2008; South African Reserve Bank, 2001).

From an operational perspective, in most SSA countries, monetary policy still uses monetary aggregates as a target towards controlling inflation. This approach has been criticized for both its conceptual limitations (Easterly, 2002) and its practical ineffectiveness. Indeed, attempts to control inflation by using monetary aggregates as intermediate targets are generally unsuccessful, especially because it is difficult to hit the targets. This is especially due to the instability in money demand arising from demand and supply factors. Important structural problems hamper the effectiveness of inflation-targeting monetary policy regimes in subs-Saharan African countries, including the large and frequent supply-side shocks—especially food price shocks—as well as structural features of the financial systems which remain heavily dominated by a monopolistic banking sector.

The main issue pursued in this paper concerns the implications of the focus on monetary policy on inflation control under rigid frameworks where low inflation is pursued at all costs, including by depressing domestic credit. The rigidity of monetary policy frameworks has other very important implications that are beyond the scope of this paper. In particular, lack of flexibility often leads central banks to inappropriately respond to supply shocks with excessive monetary contractions that actually exacerbate the initial supply-side effects. Berg et al. (2013) provide an illustration of this issue in the case of East African countries.

In the case of SSA countries, policies that seek to restrict domestic credit as a means of containing domestic demand and inflation ultimately exacerbate the negative effects of the already pervasive credit rationing by banks. Lack of competition in African banking systems keeps borrowing costs high. In addition, banks tend to lend to sectors that are deemed safe,

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[5] In fact the majority of African central banks intrinsically take a 5 percent inflation rate as guide to monetary policy even when inflation targeting *per se* has not been explicitly institutionalized. An interesting empirical question is why 5% is preferred to higher rates as an optimal target in the context of developing countries. Why different countries choose an identical target inflation rate is an even more daunting empirical question.

[6] See South African Reserve Bank (2001). For a discussion of the history of monetary policy in South Africa, see, among others, Du Plessis (2002) and Padayachee (2001).

notably large trading companies. Banks have little incentives to expand their customer base as long as they are able to maintain high profit rates while minimizing exposure to risk.[7] Due to all these factors, credit is ultimately supply determined, implying that monetary policy regimes that explicitly raise the cost of lending will have significant negative effects on real sector activity.

3. Adverse Real-Side Effects of Contractionary Monetary Policy

One important problem with monetary policies that constrain domestic credit is that they may have substantial adverse supply effects. The conventional view is that tight monetary policy that results in credit contraction causes private expenditures (especially durable goods and investment) to decline, causing a decline in aggregate demand, which reduces inflation. The decline in credit is also supposed to cause a reduction in the demand for imports, which ameliorates the current account deficit and reduces imported inflation. If credit contraction had only aggregate demand effects, then the central bank could indeed control inflation by using contractionary monetary policy.

However, availability of credit determines the ability of firms to accumulate capital and hire labor. Thus, credit contraction causes a decline in capacity utilization, employment, and production. Tight monetary policy, which is usually associated with high interest rates and a strong currency, particularly hurts export-oriented sectors by undermining international competitiveness. The decline in production and exports causes upward pressure on the price level and deteriorates the current account, causing inflation to accelerate. The increase in the price level results in a decline in real credit, which causes investment and employment to decline further. If these supply effects are significant, contractionary monetary policy will fail to reduce and contain inflation.

The inability of monetary policy to control inflation has long been recognized in the economic literature, including by the Real Business Cycle school of thought. Sargent & Wallace (1981, p. 1) pointed out that 'even in an economy that satisfies monetarist assumptions, …, Friedman's list of things that monetary policy cannot permanently control may have to be expanded to include inflation.'[8] Friedman had argued that monetary policy could not permanently influence real output, employment, and real returns on assets, but that it could definitively influence inflation (Friedman, 1968).[9] In practice, however, because monetary policy has both supply and demand effects, especially through the credit channel, contractionary monetary policy may be ineffective in controlling inflation while it may have substantial adverse real effects.

Blinder (1987) offers a simple theoretical framework to illustrate the proposition that the supply side effects of tight monetary policy through credit contraction may outweigh the demand effects on the price level. In Blinder's model, aggregate supply (y) is determined by factor utilization (F), which in turn depends on real credit (c) ($c=C/P$ where C is nominal credit and P is the price level):

$$y_t = \gamma F_{t-1} \tag{1}$$

$$F_t = \alpha(c)_t \tag{2}$$

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[7] See Nkurunziza et al. (2016) for an illustration in the case of Burundi.

[8] A monetarist economy is characterized by (1) a close positive link between the monetary base and inflation (from the quantity-theory demand schedule for high powered money) and (2) the ability of the monetary authority to raise seigniorage.

[9] See Du Plessis (2014) for a discussion of interpretations of Friedman's views on the role of monetary policy.

The aggregate supply equation can therefore be expressed as:

$$y_t = \gamma\alpha(c)_{t-1}; \quad \text{where } \gamma < 1; \alpha < 1 \tag{3}$$

Aggregate demand (*h*) is determined by income:

$$h_t = a + by_t; \quad \text{where } 0 < b < 1 \tag{4}$$

Equations 3 and 4 can be combined to specify aggregate demand as a function of real factor utilization and real domestic credit:

$$h_t = a + by\alpha c_{t-1} \tag{5}$$

The price adjustment process is given by the following equation:

$$p_{t+1} = \lambda(h_t - y_t) \tag{6}$$

It follows from the above relations that credit contraction decreases demand (*h*), which causes the price level to decrease; but it also decreases supply (*y*) which causes the price level to increase. From equations 3 and 5, the effects of a one percent decrease in credit may have a larger effect on supply than on demand under reasonable assumptions about the values of the parameters *b*, γ, and α: as long as *b*, γ, α < 1 it follows that $b\gamma\alpha < \gamma\alpha$, so that $|dy/dc| > |dh/dc|$, implying that *p* > 0. Under these conditions, tight monetary policy is stagflationary: it causes output to decline while inflation accelerates.

Contractionary monetary policy arguably reduces inflation by reducing domestic aggregate demand. However, low aggregate demand may be a constraint to output. Therefore, a contraction in bank credit to the private sector depresses production. Under such circumstances, even when price stability is achieved, the economy may incur a high cost in terms of reduced investment, employment, and output. Therefore, the monetarist orientation espoused by central banks in SSA countries to control inflation by constraining domestic credit, which exacerbates credit rationing arising from market imperfections, may have substantial adverse effects on the real sector.

The negative effects of contractionary monetary policy on private credit may be exacerbated by pressure from budget deficit financing. Contractionary monetary policy in the context of recurrent high budget deficits automatically creates a *captive market* for government debt. Given that government borrowing is outside of the control of the monetary authority, tight domestic credit is primarily reflected in reduced credit to the private sector,[10] which has negative effects on domestic investment.

4. Modeling the Effects of Bank Credit on Domestic Investment

There is a well established literature on the determinants of investment and methodologies for empirical investigation of investment behavior. A selected list includes Baddeley (2003), Chirinko (1993), Jorgenson (1971), Junankar (1973), and Nickell (1978). Fazzari et al. (1988) provide theoretical motivation and empirical evidence on the importance of credit constraints for investment at the firm level.[11] This study focuses on the implications of the links between

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[10] Indeed, it has been observed that even in countries that are members of a regional economic organization, as in the CFA zone, where monetary policy is delegated to a regional central bank, in practice the control over government borrowing is limited Du Plessis (2014). Governments can find indirect ways to borrow such as through parastatals.
[11] Also see Kaplan and Zingales (1997) and Fazzari et al. (2000).

monetary policy and bank credit for investment at the aggregate level. An empirical relationship between investment and monetary policy is derived to illustrate the effects of monetary policy on domestic investment through bank credit to the private sector. This relationship goes beyond the standard situations of credit rationing (Stiglitz & Weiss, 1981) and financial repression typically examined in the development finance literature (McKinnon, 1973). In the case presented in this paper, the monetary policy stance affects domestic credit, which affects private investment. In addition to the usual interest rate effects, monetary policy also affects investment through the quantity of credit and its overall effects on financial intermediation. By hampering financial intermediation, credit contraction is a constraint to business investment and overall economic activity.

The role of the 'state of credit' has been emphasized for a long time in the economic literature. Keynes (1973, p. 222) pointed out that 'the banks hold the key position in the transition from a lower to a higher scale of activity… The investment market can become congested through shortage of cash. It can never become congested through shortage of saving.'[12] Well-functioning domestic credit markets facilitate long-term investment by pooling resources, thus resolving the firm's problem of mismatches between revenue and expenditure flows. Credit markets also stimulate investment by facilitating risk sharing among investors. In particular, limited liability associated with credit financing makes investors more comfortable in undertaking large long-gestation investment projects. As a result, increased access to low-cost credit stimulates domestic investment. Therefore, the 'state of domestic credit' is an enhancing 'X-factor' in the capital accumulation process.

The foregoing discussion suggests that a good credit environment in the form of abundant and affordable credit is likely to be associated with faster capital accumulation and therefore higher optimal capital stock. This can be formalized by the following equation:

$$K_t^* = a + bX_t + \mathbf{Z}_t\theta \tag{7}$$

where X is the indicator of the state of credit and $\mathbf{Z}$ is a vector of other determinants of investment demand. The adjustment to optimal capital stock, K^*, is as follows:

$$\Delta K_t = \phi(K_t^* - K_{t-1}) \tag{8}$$

where ϕ is the flexible accelerator parameter assumed to be between 0 and 1. Gross domestic investment, which is the sum of net investment and replacement, is given by:

$$I_t = \Delta K_t + \delta K_{t-1} \tag{9}$$

where δ is the depreciation rate. Combining the above three equations yields investment as a function of the 'state of credit':

$$I_t = a\phi + b\phi X_t + \theta\phi\mathbf{Z}_t + (\delta - \phi)K_{t-1} \tag{10}$$

Monetary policy also has direct effects on domestic investment through the interest rates. This proposition will be tested empirically in the next section. The empirical analysis also takes into account the effects of other determinants of private investment, notably openness to international trade and political risk, as well as unobservable country specific effects.

Openness to international trade may have a positive or a negative effect on domestic investment. If the increase in trade is accompanied by a reduction in the cost of imported inputs and more access to export markets, then international trade will stimulate domestic

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[12] Also see Moore (1989) for further discussion of the role of credit for business operations.

investment in the import-dependent and export-oriented sectors. However, trade openness may depress domestic private investment due to foreign competition. A number of studies have found that trade openness exerts a positive effect on domestic investment (see Ndikumana (2000) for evidence on sub-Saharan African countries). However, an important empirical issue is the identification of the exact channels through which the effects of trade openness on investment actually operate. Another problem is measurement of trade openness. Due to the lack of consistent data on trade openness policy indicators, empirical studies typically rely on measures of trade outcomes (imports plus exports) as proxies for trade openness policy. In practice, however, a country may experience an increase in trade volume without any change in trade policy, as it may be the case for a resource-rich country during a commodity boom. Conversely, trade policy reforms aimed at promoting exports (e.g., reduction in export duties) may not necessarily result in expansion of exports, especially if a country's products are not price elastic as is the case for agricultural products. These caveats must be kept in mind while interpreting the results regarding the impact of trade openness on domestic investment.

Given that investment is inherently irreversible, undertaking a new investment project carries a certain degree of risk (Bernanke, 1983; Dixit & Pindyck, 1994). This risk will be higher the higher the level of economic and political uncertainty. Using various measures of economic and political instability, some studies have found that risk has a quantitatively significant negative effect on investment in African countries.[13]

5. Empirical Analysis

5.1. Specification and Estimation Methodology

Two empirical exercises are undertaken in this study. The first is an investigation of the impact of bank credit and monetary policy indicators on domestic investment. This is accomplished by estimating the following empirical investment model:

$$I_{it} = \alpha_0 + \alpha_1 X_{it} + \mathbf{Z}_{it}\beta + \varepsilon_{it} \tag{11}$$

where I is total domestic investment which includes public and private investment, measured as a percentage of GDP; X is alternatively domestic credit and indicators of monetary policy measured by the discount rate, the Tbill rate, and the lending interst rate; $\mathbf{Z}$ is a vector of other determinants of domestic investment; and ε is an error term. In this model we consider two factors that have been found to be significant determinants of domestic investment in the empirical literature. The fist is a measure of openness to international trade proxied by the sum of exports and imports, expressed as a percentage of GDP. As discussed in the previous section, international trade has both direct and indirect effects on domestic investment, notably through access to export markets and access to imported inputs. We would therefore expect a positive relationship between total trade and the level of domestic investment. The second factor is country specific risk, which is proxied by political and institutional stability using an index of political freedom.[14] The index is designed in such a way that a high score corresponds

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[13] Fielding (1997) finds that uncertainty has a larger effect on non-traded capital goods than on traded capital goods in the case of South Africa. His results suggest that higher economic risk encourages more investment in traded capital goods (p. 366).

[14] The political freedom index is a composite index that combines the political rights and civil liberty indexes and it ranges from 0 to 6, where a high score reflects more political freedom.

to more political freedom. We expect a positive relationship between domestic investment and this measure of political freedom.

GDP growth has also featured in the empirical literature as a determinant of domestic investment, notably illustrating the accelerator effect. In this study, it is left out of the model because of potential multicollinearity with instruments and outcomes of monetary policy which are the focus of investigation. Growth is also likely to be correlated with trade and political freedom, which would further aggravate the bias in the results due to multicollinearity.

The second empirical exercise is an assessment of the direct effects of monetary policy on domestic credit. This is done by estimating the following model:

$$c_{it} = \delta_0 + \rho_1 m_{it} + \mathbf{Z}_{it}\beta + \mu_{it} \qquad (12)$$

where c is bank credit to the private sector (as a percentage of GDP), m is an indicator of monetary policy (alternatively the discount rate, the Tbill rate, and the lending rate), and $\mathbf{Z}$ is a vector containing the same control variables as in equation 11.

The models in equations 11 and 12 are estimated using two alternative procedures. The first is the Arellano-Bover/Blundell-Bond dynamic panel data estimation methodology, specifically the general method of moments (system GMM) (Arelano & Bond, 1991; Arellano & Bover, 1995; Blundell & Bond, 1998). The dynamic formulation of the models is consistent with the nature of capital accumulation which is a long-gestation phenomenon. In the case of bank credit, lagged credit carries pertinent information on future bank behavior as well as the future state of demand for credit. The dynamic panel data estimation approach also allows us to account for potential endogeneity of regressors. In this particular model, credit and the lending rate are explicitly considered as endogenous.

The second procedure is the fixed-effects regression method. This procedure enables us to account for unobserved country-specific effects that may affect domestic investment and its relationship with credit and monetary policy. The fixed effects approach is also motivated by the fact that countries have had varied experiences in monetary policy over time that may affect the relationships explored in this paper. In particular, some countries have experienced episodes of hypterinflation due to demand and supply shocks, and in some cases due to political instability and institutional failure, as in the cases of the Democratic Republic of Congo and Zimbabwe. To account for this phenomenon, a dummy variable taking the value of one in years of hyperinflation and zero elsewhere is added in the model as an additional regressor. Various cutoff points for hyperinflation were experimented. In this paper 100% inflation rate is considered as the threshold for hyperinflation.

5.2. Highlights from the Data

The empirical analysis is based on a sample of 37 sub-Saharan African countries over the period 1980-2012. The data are obtained from the World Bank's World Development Indicators, the IMF's International Financial Statistics and the Freedom House database, all of which are publicly accessible online. The list of regression variables, the data sources, and the list of countries in the sample are provided in Table A.1 in the appendix. Summary statistics for regression variables are reported in Table A.2 in the appendix. One key highlight from the data is that bank credit to the private is generally low in sub-Saharan African countries in absolute terms and relative to other regions. To illustrate this fact, the average ratio of bank credit to the private sector over GDP for SSA countries is compared to that of a sample of 43 developing countries.[15] The decadal averages are depicted in Table A3 in the appendix. Sub-

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[15] The selection of countries in the sample was based on data availability.

Saharan African countries have systematically trailed behind other regions in bank lending to the private sector. In fact, the gap between SSA and countries has increased over time. In the 1970s, the average ratio of bank credit to GDP was 15% in SSA compared to 21% for non-SSA developing countries; that is 1.4 times higher for the latter group than SSA. Over the 2000-12 period the proportion was 2.3 times in favor of the non-SSA developing countries (42% compared to 18% for SSA). The low performance in bank lending may be one of the factors of the sluggish performance in domestic investment in SSA.[16] The econometric evidence presented in the next section points in the direction of this postulate.

5.3. Econometric Estimation Results

Two sets of econometric estimation results are presented and discussed in this section. The first set contains the results for the test of the impact of domestic credit and monetary policy indicators on domestic investment as formulated in equation 11. They are presented in Tables 1 and 2. Table 1 presents the results from GMM estimation and Table 2 contains the results from the fixed-effects estimation. Using the GMM and fixed-effects procedures enables us to assess whether the estimated relationships between domestic investment, credit, and monetary policy indicators are robust to potential endogeneity of regressors and unobservable country-specific factors. The second set contains the regression results for the test of the impact of monetary policy indicators on bank credit; they are presented in Tables 3 and 4. Table 3 presents the results from GMM estimation of equation 12, while Table 4 contains the results from the fixed-effects estimation of the same equation.

The results in Tables 1 and 2 systematically support the view that bank credit is an important driver of domestic investment in sub-Saharan African countries. In both the GMM and fixed-effects regression results, the coefficient on bank credit to the private sector is positive and statistically significant. The results suggest that a one dollar increase in credit is associated with 13 cents of additional domestic investment.

In addition to bank credit, monetary policy indicators also appear to have significant effects on domestic investment. In the GMM regression results, domestic investment is negatively and significantly related to all the three interest rates considered in this study, namely the discount rate, the Treasury bill rate and the bank lending rate. The results suggest that high policy rates and high market interest rates discourage domestic investment. Thus, contractionary monetary policy achieved by raising the interest rates hurts domestic investment. Furthermore, high lending interest rates resulting in part from high policy rates ultimately discourage domestic investment. The negative effect of the Treasury bill rate on domestic investment may reflect both a price effect and a substitution effect. First, a high Treasury bill rate is associated high market interest rates including the lending rate, which discourages domestic investment. Second, given a high remuneration rate on government debt, banks may prefer to invest in government securities and reduce lending to the private sector.

The negative effects of monetary policy instruments and bank credit on investment may also reflect the fact that firms in SSA countries have few alternatives to bank lending as a source of financing. Except for South Africa, equity markets remain underdeveloped or non-existent in sub-Saharan Africa. Furthermore, financial systems in the sub-continent lack long-term investment capital, which limits funding opportunities for large and long-gestation investment projects. As a result, a shortage of credit and a high cost of credit are associated with lower domestic investment.

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[16] See UNCTAD (2014) for comparisons of trends in investment performance between Africa and other regions over the past decades.

Table 1: Impact of credit and monetary policy indicators on domestic investment: 2-step GMM regression results.

Explanatory variables	(1)	(2)	(3)	(4)
Bank credit	0.135**			
	(0.024)			
Real discount rate		-0.0001***		
		(0.000)		
Real TBill rate			-0.0002***	
			(0.000)	
Real lending rate				-0.0002***
				(0.000)
Lagged investment	0.516***	0.596***	0.721***	0.704***
	(0.000)	(0.000)	(0.000)	(0.000)
Trade	0.320***	0.375***	0.341***	0.243***
	(0.000)	(0.000)	(0.000)	(0.000)
Political freedom index	0.040***	0.025	0.003	-0.024
	(0.000)	(0.687)	(0.716)	(0.593)
Hyperinflation dummy	-0.262***	-0.355***	-0.220***	-0.279***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant	-0.277	-0.389	-0.598	-0.139
	(0.174)	(0.319)	(0.230)	(0.182)
Observations	987	868	766	766
Number of countries	37	32	35	35
Sargan test: Chi2 (p>Chi2)	30.79	29.5	30.22	32.396
	(1.00)	(1.00)	(1.00)	(1.00)
AR(2) test: z (p>z)	0.611	-0.971	-0.437	-0.583
	(0.54)	(0.43)	(0.66)	(0.56)

The dependent variable is total domestic investment (% of GDP). Domestic investment, trade, and political freedom index are in logarithm. The p-values are given in parentheses; the asterisks indicate statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

Note however, that the results for the discount rate and the TBill rate are not robust to inclusion of unobserved country specific effects. This is depicted in Table 2 that reports the fixed-effects estimation results. While the coefficients on credit and the lending rate remain statistically significant and with the expected sign, the coefficients on the discount rate and the TBill rate are statistically insignificant. It therefore appears that domestic investment is primarily constrained by shortage of credit and high cost of credit, and that these effects persist even when unobserved country-specific effects are incorporated in the econometric model.

The control factors included in the empirical model have the expected effects on domestic investment. In particular, the regression results confirm that, as expected, political stability is an important factor of domestic investment, as illustrated in the positive and significant coefficient on the political freedom index. In addition, access to international markets for imports and exports affects domestic investment as indicated by the large positive and

Table 2: Impact of credit and monetary policy indicators on domestic investment: Fixed-effects regression results.

Explanatory variables	(1)	(2)	(3)	(4)
Bank credit	0.135*			
	(0.053)			
Real discount rate		0.00001		
		(0.194)		
Real TBill rate			-0.0001	
			(0.219)	
Real lending rate				-0.0001*
				(0.064)
Trade	0.667***	0.687***	0.659***	0.659***
	(0.000)	(0.001)	(0.000)	(0.000)
Political freedom index	0.083**	0.123*	0.068	0.068
	(0.036)	(0.076)	(0.321)	(0.320)
Constant	-0.295	-0.065	0.105	0.105
	(0.516)	(0.933)	(0.881)	(0.881)
Observations	1,087	887	785	785
Number of countries	37	32	35	35
Within R-squared	0.27	0.20	0.19	0.19
Between R-squared	0.36	0.31	0.42	0.42
Overall R-squared	0.31	0.25	0.29	0.29

The dependent variable is total domestic investment (% of GDP). Domestic investment, trade, and political freedom index are in logarithm. The p-values are given in parentheses; the asterisks indicate statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

statistically significant elasticity of investment with respect to total trade. Furthermore, the results show that very high inflation discourages domestic investment. The coefficient on the hyperinflation dummy variable is negative and statistically significant. The results suggest that the shortage of bank credit exacerbates the negative impact of other structural and institutional constraints to domestic investment in SSA countries.

Having established that bank credit has a positive and statistically significant impact on domestic investment, we now use the results in Tables 3 and 4 to answer the question of whether monetary policy has an effect on domestic credit. The robustness of the results varies depending on the indicator considered. In particular, while the discount rate appears to have a significant effect on bank credit, the result is not robust to inclusion of unobservable country-specific effects. The coefficient on the discount rate is significant in the GMM regression results, but it is insignificants in the fixed-effects regression results. In contrast, market interest rates have a negative impact on bank credit. Indeed both the GMM and the fixed-effects results show a negative and statistically significant coefficient on the Treasury bill and the bank lending rate.

The negative effect of the Treasury bill rate on bank credit may reflect the negative impact of the general level of interest rates in the markets on both demand and supply of credit, given the co-movement among interest rates. The result may also reflect bank preference for government securities over lending to the private sector in the context of high returns to Treasury bills.

Table 3: Impact of monetary instruments on bank credit - Twostep GMM.

Explanatory variables	(1)	(2)	(3)
Discount rate (nominal)	-0.081***		
	(0.005)		
TBill rate (nominal)		-0.085***	
		(0.000)	
Lending rate (nominal)			-0.209***
			(0.000)
Lagged bank credit	0.873***	0.767***	0.789***
	(0.000)	(0.000)	(0.000)
Trade	0.118	0.059***	0.014
	(0.113)	(0.000)	(0.762)
Political freedom index	0.027	-0.026	0.013
	(0.446)	(0.143)	(0.312)
Hyperinflation dummy	0.192	-0.156***	-0.077
	(0.587)	(0.002)	(0.128)
Constant	0.003	0.620***	1.110***
	(0.991)	(0.000)	(0.000)
Observations	859	761	761
Number of countries	32	35	35
Sargan test: Chi2 (p>Chi2)	29.53	22.49	21.04
	(1.00)	(1.00)	(1.00)
AR(2) test: z (p>z)	-0.057	-0.371	0.249
	(0.95)	(0.71)	(0.80)

The dependent variable is bank credit to the private sector (% of GDP). Bank credit, trade, and political freedom index are in logarithm. The p-values are given in parentheses; the asterisks indicate statistical significance: *** p<0.01, ** p<0.05, * p<0.1.

The regression results show that the lending rate has a substantially larger negative effect on bank lending to the private sector compared to that of the discount rate and the Treasury bill rate. This reflects demand and supply effects. From the demand side, a high lending interest rate discourages borrowing as it reduces the pool of investment projects that can generate sufficiently high rates of return to cover debt service. From the supply side, a high lending interest rate discourages lending as it increases the default risk.

Taken together, the estimation results presented in Tables 1-4 suggest that monetary policy has direct and indirect effects on domestic investment in SSA countries. A regime of high interest rates aimed at reducing inflation ultimately raises the cost of capital, which discourages domestic investment. This is reflected in the negative coefficient on interest rates in the domestic investment equation. Moreover, contractionary monetary policy reduces bank credit to the private sector, which in turn is a constraint to domestic investment. Therefore, the

Table 4: Impact of monetary instruments on bank credit: Fixed-effects regression results.

Explanatory variables	(1)	(2)	(3)
Discount rate (nominal)	-0.113		
	(0.211)		
TBill rate (nominal)		-0.299***	
		(0.000)	
Lending rate (nominal)			-0.437***
			(0.001)
Trade	0.315	0.314	0.404*
	(0.231)	(0.149)	(0.082)
Political freedom index	-0.131*	-0.084	-0.062
	(0.060)	(0.278)	(0.394)
Constant	1.504	2.109**	2.199**
	(0.163)	(0.041)	(0.045)
Observations	916	857	857
Number of countries	32	36	36
Within R-squared	0.055	0.14	0.14
Between R-squared	0.13	0.20	0.31
Overall R-squared	0.08	0.16	0.21

The dependent variable is bank credit to the private sector (% of GDP). Bank credit, trade, and political freedom index are in logarithm. The p-values are given in parentheses; the asterisks indicate statistical significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

impact of monetary policy on domestic investment may arise through a cost of capital effect (through the interest rates) and a financing constraint effect (through bank credit).

6. Conclusion

This study sought to investigate the real-sector implications of monetary policy in SSA countries, with a focus on domestic investment. The empirical evidence shows a positive link between bank credit and domestic investment, suggesting that monetary policy regimes that pursue contraction of domestic credit as a means of controlling inflation may have adverse effects on domestic investment. Moreover, the empirical results show a negative effect of monetary policy indicators on domestic investment and bank lending to the private sector. In particular, a high lending interest rate is associated with lower bank lending and lower domestic investment.

The results in this study suggest that monetary policy has direct and indirect effects on domestic investment. On the one hand, contractionary monetary policy discourages domestic investment because of the high interest rate regime that is maintained as a way of controlling inflation. On the other hand, high interest rates discourage bank lending, which further reduces investment. Therefore, contractionary monetary policy is a constraint to domestic investment both through high cost of capital and a shortage of bank credit. To the extent that such a

monetary policy stance effectively brings inflation under control, this may be achieved at substantial real-sector costs in terms of reduced domestic investment.

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Appendix

Table A.1: Regression variables and data sources.

Variable name	Definition	Source
Gross domestic investment	Gross capital formation (% of GDP)	WDI
Bank credit to private sector	Bank credit to private sector (% of GDP)	WDI
Trade	Imports + exports (% of GDP)	WDI
Lending interest rate	Lending interest rate (%)	WDI
Discount rate	Discount rate (%)	IFS
Treasury Bill rate	Treasury bill rate (%)	WDI
Inflation	Inflation rate (annual % change in the CPI)	WDI
Hyperinflation dummy	Dummy = 1 in years where inflation >100% and 0 otherwise	Constructed using WDI data
Political freedom	Average of political rights and civil liberty indexes	Freedom House

Acronyms: WDI = World Bank's World Development Indicators; IFS = IMF's International Financial Statistics. Sample: 37 Sub-Saharan African countries, over 1980-2012: Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Dem. Rep. of Congo, Rep. of Congo, Côte d'Ivoire, Ethiopia, Gabon, Gambia, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Table A.2: Summary statistics.

Variable	# Obs.	Mean	Std. Dev.	Min	Max
Gross domestic investment (% of GD)	1192	19.4	9.3	-2.42	74.8
Bank credit to private sector (% of GDP)	1156	16.6	14.2	0.7	100.7
Total trade (% of GDP)	1193	69.9	36.9	6.3	209.9
Nominal lending interest rate (%)	901	20.8	18.5	6.0	278.9
Real lending interest rate (%)	815	-2.9	164.5	-3927	62.6
Real lending interest rate (%) – excluding hyperinflation years*	792	8.1	11.8	-52.8	62.6
Nominal Treasury bill rate (%)	901	16.9	16.2	0.1	217.9
Real Treasury bill rate (%)	815	-6.9	164.6	-3927	62.6
Real Treasury bill rate (%) – excluding hyperinflation years*	792	4.3	11.8	-60.3	62.6
Nominal discount rate (%)	969	16.6	43.6	2.0	975.0
Real discount rate (%)	922	-69.7	1118.3	-23628	237.9
Real discount rate (%)– excluding hyperinflation years*	888	1.7	11.2	-59.3	69.7
Inflation rate (%)	1100	78.4	1049.6	-13.1	24411
Inflation rate (%)– excluding hyperinflation years*	1051	11.6	13.9	-13.1	98.2
Political freedom index (min 0 not free to max 6 most free)	1213	2.2	1.6	0.0	6.0

Source: World Development Indicators; International Financial Statistics; Freedom House.
Note: * hyperinflation defined here as inflation rate above 100% in a given year.

Table A3: Bank credit to the private sector by decade: SSA vs. other developing regions (decadal averages, % of GDP).

	SSA	Developing non-SSA	Ratio: developing non-SSA / SSA
1970s	15.0	21.4	1.4
1980s	16.9	28.6	1.7
1990s	14.3	36.1	2.5
2000s	18.2	42.4	2.3

Source: World Bank, World Development Indicators (online).

Note: SSA = sub-Saharan Africa. The 'developing non-SSA' group contains 43 developing countries (following the World Bank's income-based classification).