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Central Bank Independence and Effectiveness of Monetary Policy in Sub-Saharan Economies: Which Mechanism?

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ABSTRACT

What appears to be a macroeconomic performance as far as inflation is concerned in Sub-Saharan economies in the last decades has coincided with an increased autonomy of monetary authorities when it comes to the conduct of monetary policy. This paper aims at assessing the potential effect of central bank independence on the effectiveness of monetary policy in term of inflation control. Starting with the theoretical foundations that put forth the notions of creditability, reputation, and electoral constraints, the paper suggests an extended empirical approach that distinguishes among various measures of *de jure* and *de facto* independence on one hand, and the mechanisms through which the effect might occur on the other. Results based on a panel data model of inflation clearly indicate that greater independence does indeed translate into increased effectiveness of the monetary policy. More specifically, *de jure* independence tends to matter more than *de facto* independence. The results also indicate that the manipulation of the amount of liquidity in circulation and fiscal deficit is an important channel through the relationship between independence and inflation plays out. These results could further convince political authorities in the sub-continent about the necessity of less interference with the monetary authorities for the benefit of more stable dynamics of their economy.

Keywords: Central Bank Independence, effectiveness of monetary policy, monetary and fiscal mechanism

1. INTRODUCTION

The high levels of inflation in the 1970s coupled with the failures of the rules of management of the money supply led the authorities to find other means to ensure monetary stability. It is in this context that the need for increased autonomy of monetary institutions appears. The concept of independence as applied to the central bank refers to direct and indirect autonomy of the monetary authorities with respect to political authorities in the design and implementation of the monetary policy (Cukierman et al, 1992). It spread widely in the early 1990s around the world, in both developed and developing countries. Sub-Saharan African (SSA) countries have also embarked into institutional reforms, as documented by Arnone et al, 2006; Kempf and Lanteri, 2008; Ajakaiye and O'Connell, 2012. These authors indicated a significant improvement of central banks independence in these countries.

These general trends towards greater central bank autonomy are based on a theoretical argument, which stipulates the conduct of the monetary policy is ineffective when it is in the hand of political authorities (Kydland and Prescott, 1977; Barro and Gordon, 1983). For instance, at the venue of elections, governments may be tempted to engage in monetary expansion to stimulate the economic activity in the short run at the expense of more likely long term inflation. Therefore, countries in which monetary authorities are free from such political contingencies in terms of greater central bank independence are more likely to enjoy stable, low inflation which appears to be indicative of an effectiveness of monetary policy.

This theoretical consensus that the institutional framework in which central bank operates is a determinant of the effectiveness of monetary policy has paved the way for a large body of empirical researches. The first empirical studies undertaken in developed countries tend to suggest the existence of an inverse relationship between the degree to which those responsible for monetary policy are independent and the level of inflation observed (Grilli et al. 1991; Cukierman et al. 1992; Alesina and Summers, 1993; among others). In other words, increased autonomy is associated with low levels of inflation in these countries. However, empirical researches in developing economies have come to mixed conclusions (Barro, 1995; Campillo and Miron, 1997; De Haan and Sturm, 2001; among others). In the particular context of SSA countries, it would be interesting to see how this relationship behaves since we observe that the trend towards independence of central banks has coincided with a relative stability of inflation which remains for these countries the ultimate objective of the monetary authorities.

This paper sets out to analyze the relationship between central bank independence and effectiveness of monetary policy in terms of inflation control in SSA economies. More specifically, it asks whether greater independence is translated into more effectiveness of the monetary policy which main objective is to control inflation. Also it seeks to determine the channel through which any positive effect might occur.

The empirical methodology adopted differs from previous studies in two points. The first point concerns the use of three measures of central bank independence. One is a *de facto* measure and is based on the turnover of governors. Two *de jure* measures are also used: one developed by Cukierman et al. (1992) which focuses on the legal aspects of independence; another one constructed by Grilli, Masciandaro and Tabellini (1991) and which encompasses broader economic and political aspects. The second point concerns the inclusion of an interaction term in the model in order to examine the existence of conditional marginal effects which informs the mechanisms by which an increased autonomy of central banks in SSA is translated into effectiveness of monetary policy in terms of inflation control.

The estimation results clearly indicate that central bank independence matters for the effectiveness of monetary policy in terms of inflation control. There is also a clear indication that *de jure* independence is more relevant than *de facto* independence, and that the notion of independence needs to be approached in its broader sense by accounting for all of its economic, political, and legal components. However, this effect of the degree of independence on inflation requires better management of the monetary and fiscal instruments.

The remainder of the paper is organized as follows. Section 2 discusses both the theoretical and the empirical literature. Section 3 details the empirical methodology. Section 4 discusses the results. Section 5 offers a conclusion.

2. LITERATURE REVIEW

This section first offers some theoretical foundations of central bank independence and its effects on the economic activity, in particular on inflation. It then discusses a series of empirical exercises that aimed to test the relationship between central bank autonomy and inflation.

2. 1. Theoretical foundations of central bank independence

The starting point of the theoretical analysis of central bank independence is based on the study of Kydland and Prescott (1977) in the issue of the temporal inconsistency and the will to resolve the latter within the framework of monetary policy. There is a time inconsistency when, for the same question, the public authority does not take the same decision at two different times. In other words, over time, public authority deviates from the political decision initially announced.

This conclusion of Kydland and Prescott (1977) has been applied in the context of monetary policy by Barro and Gordon (1983) by using the Phillips curve framework augmented with the rational expectations à la Lucas. They showed that any potential effect of a discretionary monetary policy will be cancelled out by rational individuals. This discretionary behavior would go as far as to generate inflation.

Various mechanisms have been suggested with the aim to tie government's hands. Kydland and Prescott (1977) favored setting rule in the conduct of monetary policy. Barro and Gordon (1983) went further by suggesting another criterion, that is, reputation. The more the government abides by the rule, the greater its credibility and reputation get. For authors such as Rogoff (1985), credibility and reputation are not enough. The solution would be to appoint a conservative central bank governor who would significantly commit to fight inflation.

Walsh (1995) considers that the appointment of a conservative central bank governor is not applicable and proposes a principal-agent model in which the government would be the principal, and a central banker, the agent under control. A contract is concluded between both parties. It sets a target in terms of inflation. In the event of breach of contract, the principal may reprimand the agent.

All these solutions proposed to solve the problem of temporal inconsistency would gain more effective if they were reinforced by an institutional separation between the central banker and the government. This is where the independence of the bank central appears to be a solution to the problem of temporal inconsistency but also as a means of last resort to tie "the hands of political authorities". This response to the problems of temporal inconsistency is accompanied

by empirical work highlighting the existence of a relationship between the degree to which a central bank is independent and the inflation observed.

2. 2. Empirical literature

The literature on central bank independence and inflation has suggested various indicators. These indicators can be classified as *de jure* and *de facto* indicators. The *de jure* indicator is based on the interpretation of legal text of the central bank and the *de facto* indicator attempts to grasp the effective independence of a central bank as translated into reality. Empirical studies undertaken in developed countries show an inverse relationship between the degree of independence of central bankers and inflation based on *de jure* indicators (Grilli et al. 1991, Cukierman et al 1992, Neyapti, 2003; Diana and Sidiropoulos, 2003; Down, 2004, Beju et al, 2017).

Some authors purpose an extension of the empirical studies by taking account developing countries. They point out that the independence measured by *de jure* indicators does not seem to play a significant role in inflation (Barro 1995, Campillo and Miron 1997, Mangano 1998). Other authors come to a conclusion that the independence measured by the *de facto* indicators makes it possible to obtain convincing results in terms of controlling inflation. This suggests that *de jure* indicators are more reliable for measuring the degree of autonomy of monetary authorities for developed countries. However, recent studies, based on an update of the *de jure* independence indicators taking into account the latest amendments to central bank legal texts, has established a negative relationship between the degree to which a central bank is autonomous and inflation in developing economies (,De Haan and Sturm 2001, Jacom and Vazquez 2005, Brum 2006, De Haan and Klomp;2010).

The empirical studies undertaken in the particular context of SSA countries exist in a limited number (Presnak, 1996; Fouda 1998; Wessels 2006; Kasseeah et al 2012; Agoba et al, 2017).They cover a small sample of countries in generally very short periods of study. Fouda (1998) and Kasseeah et al (2012), using turnover as an index of independence for Sub-Saharan African countries, find a positive relationship between this indicator and inflation respectively in a sample of 10 and 20 countries.

Wessels (2006) limits itself to classifying central banks according to their degree of *de jure* autonomy, while Presnak (1996) concludes that central bank independence (CBI) has no effect on inflation. Agoba et al (2017), after accounting for various control variables and introducing inflation targeting as an additional explanatory variable, they show that, unlike in developed countries, CBI is not sufficient in achieving lower inflation in Africa and the developing world. This paper attempts to go beyond the direct effect of degree of autonomy over inflation as assumed by previous studies. It tries to show the channels through which increased independence is translated into inflation control.

3. METHODOLOGY

The empirical approach consists of two parts, and builds on the empirical literature developed so far. First, we consider various measures of central bank independence. Second, a regression model is developed to analyze the extent to which the degree of independence could translate into lower inflation. Two series of measures are considered which capture two broad approaches of central bank independence: *de jure* indices developed by Cukierman (1991) and

Grilli et al. (1992), and *de facto* indices. Most of the studies in the SSA context tend to favor the latter measure, which is simply the turnover of governor. A high frequency is viewed an indication of low level of independence. While this measure could tell how far various reforms have gone to actually endow monetary authorities, it does not tell about the reforms themselves.

This is similar in the trade-growth literature to measuring openness by looking at the ratio of trade volume to GDP (*de facto* measure) instead of trade restrictiveness based on actual protectionist policies (an equivalent to *de jure* measure). In this analysis, both measures will be used to tell about the extent of the institutional reforms as well as their effectiveness.

An important methodological point which departs from the literature is the way we model the relationship between independence and inflation. A simple regression equation that relates often fails to reveal the channel through which the effect might occur, if any. Instead, we use interaction terms to test the strength of any indirect effect. For instance, a more autonomous central bank will be more successful in stabilizing inflation through an effective control of, for instance, the amount of liquidity in circulation and the level of fiscal deficit in the economy than its less independent counterpart.

The econometric approach starts with equation (1), which represents the non-monetary determinants of inflation derived to De Haan and Sturn (2001).

$$Y_{it} = \beta_0 + \beta_1 TRN_{it} + \beta_2 GMT_{it} + \beta_3 CUK_{it} + \beta_4 M_{it} + \beta_5 FD_{it} + \sum_{k=4}^K \beta_k X_{k,it} + \varepsilon_{it} \quad (1)$$

Y_{it} is a measure of inflation, namely $Y_{it} = \frac{\pi_{it}}{\pi_{it+1}}$ with π_{it} the inflation rate measured by consumer price index. The ratio addresses issues associated with non-spherical disturbance in the regression error term (heteroskedasticity) and extreme values (Cukierman et al., 1992). TRN_{it} is the turnover rate of central bank governors. This *de facto* measure of independence is the number of governors over a given time period. A value of 0 (no renewal over the considered period) is an indication of greater autonomy of the monetary authority. Then there is the *de jure* measure developed by Grilli, Masciandaro and Tabellini (1991) or GMT_{it} . As mentioned above, it encompasses broad political and economic aspects of independence. Finally, there is another *de jure* measure which focuses more on legal aspects and was developed by Cukierman et al. (1992), that is, CUK_{it} . Both these measures can be found in Arnone et al. (2008) and in De Haan and Klomp (2010). M_{it} represents the monetary aggregate and FD_{it} is an indicator of fiscal discipline measured by the primary deficit as a percentage of GDP. X_{it} represents the vector of control variables in the econometric specification. It is: Fixed Exchange Regime (FER), GDP per capita, Debt-GDP ratio and Openness.

Equation (1) as specified above allows testing the direct effect of increased independence of central banks on inflation in ASS. However, we consider that the effect could also be indirect, assuming that the degree of autonomy of the monetary authorities would act on inflation by two mechanisms:

A first mechanism called monetary mechanism could be the management of monetary policy instruments. We assume that greater independence involves effective management of monetary policy instruments that translates into significant results in terms of controlling inflation. Thus, we introduce interaction between an instrument of monetary policy variable (monetary aggregate) and each measure of independence. This monetary mechanism will be considered by examining the partial derivatives of equation (2).

$$Y_{it} = \beta_0 + \beta_1 TNR_{it} + \beta_2 GMT_{it} + \beta_3 CUK_{it} + \beta_4 M_{it} + \beta_5 FD_{it} + \beta_6 TRG_{it} * M_{it} + \beta_7 GMT_{it} * M_{it} + \beta_8 CUK_{it} * M_{it} + \sum_{k=5}^K \beta_k X_{k,it} + \varepsilon_{it} \quad (2)$$

$$\frac{\partial Y_{it}}{\partial TNR_{it}} = \beta_1 + \beta_6 M_{it} \quad (2.1)$$

$$\frac{\partial Y_{it}}{\partial GMT_{it}} = \beta_2 + \beta_7 M_{it} \quad (2.2)$$

$$\frac{\partial Y_{it}}{\partial CUK_{it}} = \beta_3 + \beta_8 M_{it} \quad (2.3)$$

The second mechanism, named fiscal mechanism, is that a greater autonomy of the monetary authorities affects the inflation through fiscal discipline. In other words, when budget deficits reach high levels, indicating a lack of fiscal discipline, the degree of autonomy of the monetary authorities will not affect the dynamics of prices. We introduce interaction term between the indicator of fiscal discipline and each measure of independence. The partial derivative of the equation (3) with respect to indicators of independence tells us about the existence of this fiscal mechanism.

$$Y_{it} = \beta_0 + \beta_1 TRG_{it} + \beta_2 GMT_{it} + \beta_3 CUK_{it} + \beta_4 M_{it} + \beta_5 DEF_{it} + \beta_6 TRG_{it} * DEF_{it} + \beta_7 GMT_{it} * DEF_{it} + \beta_8 CUK_{it} * DEF_{it} + \sum_{k=5}^K \beta_k X_{k,it} + \varepsilon_{it} \quad (3)$$

$$\frac{\partial Y_{it}}{\partial TNR_{it}} = \beta_1 + \beta_6 FD_{it} \quad (3.1)$$

$$\frac{\partial Y_{it}}{\partial GMT_{it}} = \beta_2 + \beta_7 FD_{it} \quad (3.2)$$

$$\frac{\partial Y_{it}}{\partial CUK_{it}} = \beta_3 + \beta_8 FD_{it} \quad (3.3)$$

4. RESULTS AND DISCUSSIONS

A series of tests regarding the specification of the effects point to the superiority of the random- effect GLS estimation. In addition, a relatively high degree of correlation between the measures of independence (especially between CUK and GMT: 0.65) suggests that such variables have to be included in the regression one at a time.

When it comes to the direct effect of central bank independence inflation, only GMT appears to have a significant effect: greater independence, materialized by the increase in the index, is translated into lower inflation.

Table 1. Direct effect of Central Bank independence on inflation

Inflation	Estimation of equation (1)		
	(1)	(2)	(5)
CUK index	-0,238 (0,1291)*		
TNR index		0,068 (0,0433)	
GMT index			-0,336 (0,0926)***
M2	0,001 (0,0003)**	0,001 (0,000)	0,001 (0,0003)***
FD	0,001 (0,0011)	-0,001 (0,0010)	0,001 (0,0011)
Fix-Ex-Reg	0,060 (0,0503)	0,069 (0,0587)	0,035 (0,0470)
OPEN	0,056 (0,0241)**	0,052 (0,0243)**	0,049 (0,0230)**
DEBT-GDP ratio	0,014 (0,0138)	0,024 (0,0117)**	0,0125 (0,1116)
LogGDPpc	-0,021 (0,0069)**	-0,027 (0,0075)***	-0,015 (0,0066)**
Constant	1,107 (0,0895)***	1,073 (0,0839)***	1,110 (0,0746)***
N	21	25	23
N*T	409	488	451
R	0,57	0,41	0,69
Prob>F	0,000	0,000	0,000

Note: The standard errors are between parentheses, and significance at 1, 5, and 10% are indicated by ***, **, and *, respectively.

The other measures have also a negative direct effect, but they are not associated with a significant reduction in the inflation rate. These results indicate two important points. First, independence has to be driven by political, economic, and legal reforms to lead to real effectiveness of the monetary policy, rather than just some observed turnover of the governors. In fact, it could well be the case that a loyal governor may try to win the favor of the government,

and last relatively longer in her post. The corresponding low turnover rate would be associated with greater independence, which in reality may not be the case if one were to look at the underlying legal and political framework. Furthermore, as indicated by the results when comparing both *de jure* measures, the notion of independence needs to be approached in its broad sense. The GMT measure encompasses many more aspects of the institutional framework in which a central bank operates than the CUK measure. In effect, while the latter focuses solely on the legal side, the former includes political and economic elements, and is therefore more able to reveal the true extent of central bank independence. This result is very much in line with the empirical literature. It is also important to identify the existence of an indirect effect of the degree of autonomy on inflation that is the channels through which a greater independence of the monetary authorities affects the inflation.

Table 2. Indirect effect of Central Bank Independence on inflation

Inflation	Estimation of equation (2)			Estimation of equation (3)		
TNR index	0,077 (0,05)			0,046 (0,04)		
CUK index		-0,202 (0,17)			- 0,198 (0,13)	
GMT index			-0,324 (0,01)***			-0,351 (0,08)***
M	0,001 (0,00)*	-0,001 (0,00)	-0,002 (0,00)*			
FD				0,001 (0,00)	0,016 (0,00)	-0,007 (0,00)
TNR*M	-0,001 (0,00)*					
CUK*M		0,003 (0,01)				
GMT*M			0,007 (0,00)***			
TNR*FD				-0,007 (0,004)		
CUK*FD					0,035 (0,01)**	
GMT*FD						0,016 (0,007)***
OPEN	0,058 (0,02)**	0,055 (0,02)**	0,050 (0,02)**	0,052 (0,02)**	0,044 (0,02)*	0,050 (0,02)**
LogGDPpc	-0,014 (0,01)**	-0,013** (0,01)	-0,012 (0,01)**	-0,027 (0,00)***	-0,024 (0,00)***	-0,017 (0,00)**
Fixed-Ex-Reg	-0,097 (0,03)**	-0,081** (0,03)	-0,047 (0,04)	-0,061 (0,05)	0,073 (0,05)	-0,026 (0,03)

Debt-GDP ratio	0,032 (0,01)**	0,024 (0,01)	0,031 (0,02)**	0,022 (0,01)**	0,018 (0,01)	0,009 (0,00)
Constant	0,930 (0,07)	1,014 (0,11)	1,085 (0,09)***	1,076 (0,08)***	1,146 (0,09)***	1,166 (0,05)***
N	25	21	22	25	21	23
N*T	467	415	430	511	427	469
R	0,53	0,70	0,73	0,40	0,43	0,64
Prob>F	0,000	0,000	0,000	0,000	0,000	0,000

Note: The standard errors are between parentheses, and significance at 1, 5, and 10% are indicated by ***, **, and *, respectively.

This requires the construction of the conditional marginal effects based on the examination of the interaction terms. According to Brambor et al. (2005), the coefficients must be significant at least at the 10% threshold to be able to interpret the interaction terms. When that one is interested in the monetary mechanism, we note that the marginal effect measured by the TRN on the inflation is not significant according to the levels of the money supply. Therefore, the effect of *de facto* independence measured by TRN on inflation does not depend on the monetary channel. However, the marginal effect of independence measured by GMT index on inflation is significant. This marginal effect is significant for very low levels of the money supply exactly at the threshold of 20%. Beyond this threshold, the marginal effect is not significant. It means that *de jure* independence affect inflation through effective management of the instrument of monetary policy. When we consider the fiscal mechanism, we find that the marginal effect measured by the CUK index is not significant for any level of the primary deficit as a percentage of GDP. However, with the GMT index, the marginal effect of independence on inflation is significant. This marginal effect becomes not significant when the primary deficit as a percentage of GDP exceeds the threshold of 10%. This result implies that *de jure* independence affect inflation by the establishment of the fiscal discipline.

5. CONCLUSIONS

Two key elements of the improved macroeconomic environment in the recent decades in Sub-Saharan Africa have been more stabilized price inflation and institutional reforms aiming at providing greater autonomy to central banks. Going beyond this historical correlation, the paper has asked whether there were true underlying mechanisms that could relate both elements. The results suggested so. In effect, greater independence of the monetary authority has been translated into increased effectiveness of the monetary policy. This effectiveness in terms of lower price dynamics comes in the form of a better monetary instrument management and a fiscal discipline, thanks to low political contingencies. The results also indicate that the way one approaches the concept of independence does matter. In particular, *de jure* measures tend to matter the most that *de facto* measure of independence. In addition, a broader perspective of

the concept should be in order. More specifically, all economic, political, and legal aspects should be factored in when envisioning reforms towards greater autonomy of monetary authorities and a more stable macroeconomic environment. While there is still room for African countries to further make their central bank more immune to any political pressure from governments, one need however to ask whether more and more independence will still do good to the economy. The recent global financial and economic crisis, originating mainly from countries which are far ahead when it comes to central bank autonomy, could offer a basis for hypothesizing about a non-linear relationship between independence and inflation. Such hypothesis could be a fruit for thought for further research, which could also explore additional mechanisms that underlie any significant effect, namely the manipulation of interest rate or the advent of new monetary policy instruments (for instance quantitative easing).

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ANNEXES

Timeline of reforms of central bank statutes in SSA

Central banks	Promulgated date	Lastest revision
National bank of Angola	1975	1997
Bank of Botswana	1975	1996
National of Ethiopia	1963	2008
Central Bank of Ghana	1957	2002
Central of Kenya	1966	1997
Reserve bank of Malawi	1964	2002
Central of Bank of Mauritania	1973	1994
Central Bank of Nigéria	1958	2007
Banque Nationale du Rwanda	1964	1997
Réserve bank of south africa	1921	2000
Banque du Soudan	1960	2002
Central Bank of Tanzani	1965	2006
Banque de l'Uganda	1966	1993
Reserve Bank of Zimbabwe	1956	2001
Bank Central Zambie	1985	1996
BCEAO	1962	2010
BEAC	1972	---