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The Impact of Central Bank Independence on Inflation: Evidence from Developing Countries

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Abstract

The study investigates how variations in Central Bank Independence (CBI) affect inflation dynamics in developing countries. While theoretical arguments suggest that an independent central bank may reduce inflationary bias caused by political interference and time-inconsistent monetary policies, empirical evidence for developing countries remains limited and inconclusive. Employing a two-step System GMM, we identify that higher CBI significantly reduces both inflation levels and fluctuations, supporting its role as a crucial institutional mechanism for sustaining price stability. Moreover, the results indicate that money supply acts as the transmission link in which CBI reduces inflation. These findings underscore the importance of strengthening central bank autonomy to enhance macroeconomic stability in developing countries.

Keywords: Central Bank Independence (CBI), Inflation Rates, Inflation Fluctuations, Transmission Channel of CBI, and Monetary Expansion.
JEL Classification: E31, E32, E51, E52, E58

1. Introduction

Maintaining price stability remains a core responsibility of a central bank. Broad consensus suggests that central bank independence works as a crucial institutional safeguard for ensuring stable prices and curbing inflation. Over the past two decades, Central Bank Independence (CBI) has attracted growing attention from both scholars and policymakers, as many governments have introduced frequent reforms to central banking legislation (Bodea & Hicks, 2015a; Garriga, 2016). It is widely recognized that central banks, guided by long-term objectives, must remain insulated from political pressures tied to short-term economic and electoral considerations.

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By shielding monetary policy from such political interference, central banks are better able to focus on their main objectives—most notably, containing inflation and maintaining price stability. The autonomy of central banks might support to from credibility and public confidence in monetary policy, which, in turn, enhances its effectiveness and overall macroeconomic outcomes. Many studies showed that greater CBI is associated with lower inflation in advanced economies (e.g., Alesina & Summers, 1993; Arnone & Romelli, 2013; Cukierman, 1992; Klomp & de Haan, 2010a, 2010b; Persson & Tabellini, 1990). Nonetheless, in the case of developing nations, the link between legal CBI and inflation remains limited and inconclusive (Bagheri & Habibi, 1998; Crowe & Meade, 2007; Cukierman, 1992; Desai et al., 2003; Klomp & de Haan, 2010b).

There remains significant research vacuum for developing nations in confirming whether higher CBI is systematically associated with lower inflation levels. Furthermore, according to Svensson's (1997), it is also valuable to examine how CBI influences inflation variability. High inflation volatility can distort output stability, purchasing power, and efficient resource allocation. Thus, this study focuses on both the levels and variability of inflation.

Additionally, this paper explores how CBI relates to monetary expansion. The underlying rationale is that independent central banks are less subject to political incentives for expansionary monetary policy. Consequently, they are less likely to pursue expansionary money growth without sound economic reasoning and instead prioritize maintaining their credibility. These central banks may tend to adopt relatively higher interest rates to control inflation, which typically achieved through reduced money supply. Hence, greater central bank independence is expected to coincide with restrained monetary expansion, mitigating the time-inconsistent policy decisions.

According to De Haan and Eijffinger (2016), enhancing central bank independence can reduce the likelihood of politically motivated monetary manipulation, particularly around elections. Such autonomy also promotes steady monetary expansion, leading to more stable inflation dynamics. Therefore, if empirical results show a significant negative effect of CBI on money growth, this would imply that money supply serves as one of the transmission mechanisms in

which higher CBI reduces inflation. Thus, the paper seeks to address three research questions by analyzing how central bank independence (CBI) influences inflation from multiple perspectives. First, it examines whether higher levels of CBI may reduce inflation levels. Second, it explores whether stronger independence contributes to lower inflation fluctuations. Finally, the study examines the transmission mechanism in which CBI affects inflation.

The empirical analysis demonstrates that CBI acts as an effective institutional arrangement for maintaining low inflation in developing countries, similar to its established role in developed ones. These findings may contribute to the expanding body of literature on the inflation-moderating effects of legal CBI in developing countries (Acemoglu et al., 2008; Bodea & Hicks, 2015a; Jacome & Vazquez, 2008; Klomp & de Haan, 2010a; Landstrom, 2011). Moreover, the study reveals that CBI also plays a stabilizing role in managing inflation fluctuations.

2. Literature Review

Rogoff (1985) proposed that assigning monetary policy authority to an independent central bank can reduce the inflationary bias resulting from the time-inconsistent problem.[1] Since that time, many theoretical and empirical works have examined the relationship between inflation and the degree of central bank independence. Grilli et al. (1991), Cukierman et al. (1992), Alesina and Summers (1993), Jonsson (1995), and Eijffinger et al. (1998) provided empirical support for the argument that independent central banks are more effective in controlling inflation in developed countries.

The theoretical foundation of CBI rests on mitigating the inflationary bias that arises when monetary authorities lack autonomy (Fischer, 2015; De Haan & Eijffinger, 2016). Political motivations often encourage governments to pursue short-term expansionary policies to stimulate output before elections and finance large fiscal deficits through money creation (Bodea & Hicks, 2015a; De Haan & Eijffinger, 2016; Acharya, 2018). Such practices can compromise long-term price

[1] Rogoff (1985): See more details about the time inconsistency problem in Kydland and Prescott (1977) and Barro and Gordon (1983).

stability. Consequently, insulating central banks from political influence may enhance policy credibility and foster sustained control over inflation.

Earlier studies mainly concentrated on the relationship between CBI and inflation rates. Svensson (1997) expanded this discussion by highlighting how the time inconsistency problem can generate an inflationary bias, leading to a stabilization bias. This condition occurs when policymakers, attempting to stabilize output, tolerate greater fluctuations in inflation. His analysis implies that higher central bank independence can mitigate inflation variability by reducing this bias and reinforcing commitment to price stability.

Cukierman et al. (1992) are the first researchers to make efforts to test this theoretical argument by empirical study, aiming to measure central bank independence (CBI) and explore its relation with inflation. They first developed the CBI index, based on four dimensions and sixteen indicators. Their findings showed that legal independence is inversely related to inflation in developed nations but not in developing ones. In the latter group, the written rules often vary to actual practice, making the de jure measure less reliable. Loungani and Sheets (1997) and Walsh (2005) similarly argued that differences between legal provisions and practical implementation can distort the assessment of true independence.

Alternatively, several researchers have examined de facto measures of independence, most notably the turnover rate of central bank governors (TOR) (Cukierman & Webb, 1995; De Haan & Siermann, 1996). The TOR index assumes that frequent changes in central bank leadership reflect lower independence. However, long tenures might indicate compliance with political agendas rather than genuine autonomy. This ambiguity complicates the causal interpretation of the relationship between CBI and inflation by de facto based index.

Arnone and Romelli (2013) as well as Masciandaro and Romelli (2015) observed that focusing solely on the governor's tenure while ignoring the independence of other board members can distort measurement—potentially overstating or understating overall CBI. Furthermore, as Walsh (2005) noted,

causality can run both ways: high inflation could lead to more dismissals of central bank officials, or weak performance could justify their removal. Given these limitations of the de facto approach, we utilize the legal CBI index, which provides a more consistent and institutional measure of autonomy.

Evidence from developed economies suggests that higher legal independence leads to lower inflation rates (e.g., Alesina & Summers, 1993; Arnone & Romelli, 2013; Cukierman, 1992; Klomp & De Haan, 2010a, 2010b). In contrast, findings for developing economies remain limited and inconclusive (Bagheri & Habibi, 1998; Crowe & Meade, 2007; Cukierman, 1992; Desai et al., 2003; Klomp & De Haan, 2010b). Moreover, empirical evidence on whether CBI effectively reduce inflation fluctuations is scarce.

3. Data and Methodology

3.1. Measurement of Central Bank Independence (CBI)

Most empirical research on Central Bank Independence (CBI) generally relies on two main indicators: one derived from central bank legislation and another based on the Turnover Rate of central bank governors (TOR). The legal or de jure measure evaluates CBI according to statutory provisions. The most widely adopted measure of this index was developed by Cukierman et al. (1992). Alternative legal measures were proposed by Alesina (1988), Grilli et al. (1991), and Arnone et al. (2006).

This study used the legal CBI index constructed by Garriga (2016), which builds on the framework of Cukierman et al. (1992). It incorporates more recent reforms affecting central bank legislation. Garriga's dataset offers broader coverage and accounts for most legal reforms influencing institutional independence. The index is calculated using a weighted composite of sixteen indicators grouped into four dimensions: personnel, objectives, policy, and financial independence. The resulting scores range from 0 to 1, where higher values indicate greater independence. Details of the variables and their corresponding weights are presented in Appendix-1.

The legal measure of CBI has some criticisms (de Haan & Kooi, 2000; Klomp & de Haan, 2010b). Since, the legal measure of CBI (de jure) does not always reflect actual CBI (de facto). The Turnover Rate of the central bank governor (TOR), as an alternative de facto measure of CBI, relates the central bank's independence to the governor's autonomy (Cukierman & Webb, 1995; de Haan & Siermann, 1996). However, Arnone and Romelli (2013) and Masciandaro and Romelli (2015) argue that such consideration might over or underestimate the degree of CBI. In addition, the TOR-based index suffers from reverse causality since the central bank governor may be replaced when it fails to control inflation well (Dreher et al., 2008). To overcome these limitations, legal measures of CBI is employed in this study.

3.2. Data

The study includes 67 developing countries observed over a 33-year period from 1980. Since the legal CBI index compiled by Garriga (2016) is available only up to 2012, this study collected data for this period. Compared with other datasets, Garriga's index includes a broader set of developing countries, captures more reform measures, and spans a longer timeline, making it particularly appropriate for examining the effects of CBI on inflation. The sample selection of 67 countries is based on the availability of the other control variables. This time span is adequately long enough to capture both structural transitions and major global shocks such as the crises of the early 1990s and the 2008 financial crisis, thereby providing robust variation for dynamic panel estimation.

The list of sample countries appears in Appendix-2. The dependent variable is the inflation rate, defined as the annual percentage change in the inflation rate (following Aisen & Veiga, 2006). Since many countries experienced exceptionally high inflation, the logarithm of the inflation rate is used. Otherwise, countries with high inflation may influence the estimation process (Klomp & de Haan, 2010b). Klomp and de Haan's (2010b) meta-analysis showed that using the logarithm of inflation instead of inflation does not impact the significance of the CBI coefficient. This transformation reduces heteroscedasticity and outliers (as in Aisen and Veiga, 2006).

To deal with negative inflation rates, we transform all inflation rates by adding a constant value to ensure all inflation rates are positive. Then we take the logarithm on transformed inflation rates. We take inflation data from World Bank Global Inflation Database (2023). We also use Hodrick–Prescott (HP) filter to get inflation trends and inflation cycles (fluctuations). This filter is a widely recognized method for separating the business cycle from the trend component (Hodrick & Prescott, 1997). This HP filter is applied to logged inflation (level) rates for decomposing inflation into trends and cycles. The trend captures long-term inflation behavior, whereas the cycle represents short-term fluctuations related to business cycles. These help us to understand the effectiveness of central bank independence for managing both short and long-term dynamics of inflation. As our objective is to measure the degree of fluctuations, we use the absolute value of inflation cycles. The money-growth rate (M2Growth) is taken as another dependent variable used to explore the transmission channel between CBI and inflation. The data for this variable is obtained from the World Development Indicators, World Bank (2023).

Among control variables, democracy is included because political institutions shape central bank autonomy and macroeconomic performance (Acemoglu et al., 2008; Bodea & Hicks, 2015a; Fazio et al., 2018). Stronger democratic governance tends to reflect higher institutional quality, checks and balances, and improved economic outcomes. Krieger (2019) similarly finds that democracy enhances the quality of monetary institutions. To find the actual effects of CBI, democracy is proxied by the Polity2 score (Marshall & Jaggers, 2012), which ranges from −10 (full autocracy) to +10 (complete democracy).

Capital movement and the exchange rate regime of a country are related to monetary policy and affect inflation (Fleming, 1962; Mundell, 1961). Accordingly, we incorporate the Chinn–Ito (2008) index of capital-account openness, capturing cross-country differences in financial integration and policy choices that may influence the anti-inflationary effects of CBI. The study focuses on developing countries with broad variance in capital controls (Aizenman, 2019; Aizenman et al., 2010; Obstfeld et al., 2005; Rey, 2015).

In addition, the study controls Real GDP per capita and Trade openness (sum of exports and imports as a share of GDP) by following Daniels et al. (2005). To account for global price spillovers, the analysis also controls for world inflation, measured as the median annual percentage change in CPI across all World Bank-reporting countries (Bodea & Hicks, 2015a; Lin & Ye, 2012; Neely & Rapach, 2011). These data are collected from the World Bank (2023). The HP filter is applied to the world-inflation rate to isolate its cyclical component, and the absolute value of this cycle is used. Table-1 reports descriptive statistics, and Table-2 summarizes variable and data sources.

Table 1: Descriptive Statistics

Variable	Observation	Mean	Std. dev.	Min	Max
Inflation (log) Level	2,211	1.95	0.21	-1.96	4.12
Inflation (log) Cycle	2211	0.03	0.10	0.00	3.04
$Inflation_{-1}$ (log) Level	2,211	1.95	0.21	-1.96	4.12
$Inflation_{-1}$ (log) Cycle	2211	0.03	0.10	0.00	3.03
CBI	2,201	0.47	0.17	0.10	0.91
M2Growth (log)	2,134	1.91	.19	.26	4.10
$M2Growth_{t-1}$ (log)	2,129	1.91	.19	.26	4.10
GDP Per Capita (log)	2,085	3.38	0.48	2.49	5.06
Capital Account Openness	2,149	0.38	0.33	0.00	1.00
Trade Openness	2,000	64.90	36.44	6.32	251.14
Democracy	2,181	1.10	6.58	-10.00	10.00
World $Inflation_{-1}$ (Level)	2,211	6.72	2.91	2.94	13.52
World $Inflation_{-1}$ (Cycle)	2211	0.68	0.73	0.05	3.63

Table 2: Summary of Variables with Data Sources

Type of Variable	Name of Variable	Unit of Measurement	Source
Dependent Variable	Inflation (Level) Inflation (Cycle) M2Growth	Logarithm	Global Database of Inflation by World Bank (2023); WDI (2023)
Main Independent Variable	Central Bank Independence (CBI)	Index	Garriga (2016)
	Inflation$_{-1}$ (Level) Inflation $_{t-1}$ (Cycle)	Logarithm	Global Database of Inflation by World Bank (2023)
	M2Growth $_{t-1}$	Logarithm	WDI (2023)
	Capital Account Openness	Normalized Index	Chin and Ito's (2008)
	Polity2index	Index	Marshall and Keith Jaggers (2012)
Control Variables	GDP Per Capita	Logarithm	WDI (2023)
	Trade Openness	Percentage (Sum of exports and imports as % of GDP)	WDI (2023)
	World Inflation $_{t-1}$ (Level) World Inflation $_{t-1}$ (Cycle)	Percentage	Global Database of Inflation by World Bank (2023)

3.3. Model

Considering the dynamic relationship, the study utilizes a two-step system GMM approach to examine how central bank independence affects both inflation levels and inflation fluctuations.

3.3.1. Two-Step System GMM Model

Several earlier studies relied on fixed-effects models to estimate the impact of CBI on inflation, yet failed to account for the lagged dependent variable, which exhibits high persistence. Some studies included lagged dependent variables in

the fixed effect model but could not completely remove Nickell's bias (Nickell, 1981) due to a small number of time series (T). While the fixed-effects model accounts time invariant unobserved heterogeneity, it cannot address time-varying unobserved factors, which may lead to potential endogeneity. Additionally, including a highly persistent lagged dependent variable as a regressor introduces bias into fixed-effects estimates.

Considering these limitations of the fixed effect model, this study utilizes a two-step system GMM model. Arellano and Bond (1991) introduced the difference GMM model, utilizing lagged first differences as the chosen instruments. Later, Arellano and Bover (1995) and Blundell and Bond (1998) enhanced the application of the two-step system GMM by including lagged differences and levels as instruments. Thus, the study employs the two-step System GMM model using both levels and lagged differences as instruments.

The first step of the two-step system GMM model involves estimating a system of equations that includes both the level equation and the first-difference equation. This allows for using both lagged levels and lagged differences of the variables as instruments. The rationale behind using both types of instruments is to exploit the information contained in both the levels and changes of the variables. In the next step, the system of equations is estimated jointly using the GMM approach, incorporating additional moment conditions derived from the system of equations. This ensures consistent and efficient parameter estimates.

The baseline specification of the two-step system GMM model used to estimate the impact of CBI on inflation levels is formulated as follows

$$Y_{l,it} = \beta_0 Y_{l,it-1} + \beta_1 CBI_{it} + \beta_2 X_{it} + \eta_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

The baseline specification of the two-step system GMM model used to estimate the impact of CBI on inflation cycle is formulated as follows

$$Y_{c,it} = \beta_0 Y_{c,it-1} + \beta_1 CBI_{it} + \beta_2 X_{it} + \eta_i + \varepsilon_{it} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

where $Y_{l,it}$ is the inflation rate (level) for the country *i* at the time *t*, $Y_{l,it-1}$ is the inflation rate (level) for the country *i* at the time *t-1*, $Y_{c,it}$ is the inflation rate

(cycle) for the country *i* at the time *t*, $Y_{c,it-1}$ is the inflation rate (cycle) for the country *i* at the time *t-1,* CBI_{it} is the measure of central bank independence, X_{it} is a set of control variables changing over time, η_i is the country-specific fixed effects that capture the time-invariant unobserved factors affecting the inflation, and $\mathcal{E}_{it}$ is the error term.

The specification of the two-step system GMM model used to find the association between CBI and money growth is formulated as follows

$$M2Growth_{it} = \beta_0 M2Growth_{it-1} + \beta_1 CBI_{it} + \beta_2 X_{it} + \eta_i + \mathcal{E}_{it} \ldots\ldots\ldots\ldots (3)$$

where $M2Growth_{it}$ is the Money growth rate for country *i* at the time *t,* and $M2Growth_{it-1}$ is the Money growth rate for country *i* at the time *t-1*, CBI_{it} is the measure of central bank independence, X_{it} is a set of control variables changing over time, η_i is the country-specific fixed effects that capture the time-invariant unobserved factors affecting the Money growth, and $\mathcal{E}_{it}$ is the error term.

Following the estimation, we conduct serial correlation and over-identifying restriction tests to verify the validity of the instruments. The serial correlation test is particularly important for capturing the model's dynamic structure by assessing the adequacy of the included lags. Specifically, we employed the AR (1) and AR (2), the Arellano and Bond (1991) test, with the null hypothesis for both tests being "H0: No Autocorrelation." The validity of instruments in the system GMM estimator critically depends on the absence of second-order autocorrelation, since its presence yields inconsistent estimates. Hence, obtaining an insignificant AR (2) z-statistic is essential.

In addition, the Hansen test is employed to assess the validity of the over-identifying restrictions implied by the instrument sets. As recommended by Lillo & Torrecillas (2018) for two-step System GMM estimation, this test is essential to check over-identification. The null hypothesis for the Hansen test is "H0: All the restrictions of over-identification are valid", and we should fail to reject this hypothesis. A desirable range for the p-value of the Hansen test, according to Lillo & Torrecillas (2018), is between 0.05 and 0.80. Furthermore, following Roodman's (2009b) suggestion, we keep the instruments smaller than the total number of groups to avoid instrument proliferation.

4. Results and Discussion

4.1 Impact of CBI on Inflation Level

Table 3 reports the estimation results based on Equation (1). Column (1) excludes world inflation as a control variable. Column (2) introduces world inflation but omits time dummies to prevent multicollinearity. Column (3) incorporates world inflation along with decade dummies, rather than year dummies, to address multicollinearity and capture broader time effects. Though we have not included year dummies, we use world inflation and decade dummies for the same control. Including many-year dummies may increase the number of parameters and instrument proliferation in the system GMM model. Decade dummies provide a more parsimonious model, capturing long-term structural changes and major economic events. Additionally, world inflation accounts for global economic conditions that affect national inflation rates, serving as a proxy for international factors.

As reported in Column (1), CBI exerts a negative and statistically significant impact on inflation levels, with a magnitude of 69% at the 10% significance level. This estimate reflects the unconditional impact of CBI on the inflation levels. This finding is consistent with Bodea and Hicks (2015a), Garriga (2020), and Loungani and Sheets (1997). In Column (2), the results reveal a similar negative effect of CBI on inflation levels. However, the magnitude of this effect increases and becomes more statistically significant after controlling for world inflation. Specifically, CBI leads to 72% reduction in inflation level, significant at the 5% level.

Column (3) presents the results including control variables for World inflation and decade dummies. The findings again reflect a negative impact of CBI on inflation levels, consistent with Columns (1) and (2). In this specification, CBI corresponds to 71% reduction in inflation levels, statistically significant at the 5% level. The coefficients associated with Democracy, Capital account openness, Lagged Inflation, GDP per capita, Trade openness, World inflation, and Decade dummies are not statistically significant in all specifications.

Table 3: Two-Step System GMM Estimation for Inflation Level

Inflation Level	(1)	(2)	(3)
CBI	-0.699*	-0.726**	-0.712**
	(0.370)	(0.333)	(0.345)
Democracy	0.004	0.003	0.005
	(0.009)	(0.010)	(0.012)
Capital account openness	-0.099	-0.085	-0.073
	(0.108)	(0.118)	(0.132)
$Inflation_{t-1}$	0.287	0.291	0.293
	(0.315)	(0.324)	(0.321)
GDP per capita	0.217	0.215	0.217
	(0.175)	(0.168)	(0.155)
Trade Openness	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
World $Inflation_{t-1}$		-0.001	-0.001
		(0.003)	(0.002)
Decade_1981-1990			0.011
			(0.038)
Decade_1991-2000			0.001
			(0.009)
Observations	1,892	1,892	1,892
Number of Group/Instrument	67/64	67/64	67/64
Hansen test (p value)	0.32	0.30	0.26
AR (2) test (p-value)	0.50	0.50	0.50

Note: *p<0.1; **p<0.05; ***p<0.01; denotes statistical sig.; Robust Standard errors in parentheses.

Across all three specifications, the main independent variable, CBI, remains statistically significant and continues to exert a negative effect on inflation. Though initially insignificant, lagged inflation becomes significant after decomposing inflation into trends and cycles, which is demonstrated in the next section. The control variables yield similar and consistent results across all three specifications. The estimates satisfy the AR (2) test, confirming the absence of second-order serial correlation, and the Hansen test, validating the over-identifying restrictions of the instrument set. In each case, the number of instruments remains below the total number of groups, and robust standard errors (reported in parentheses) are used. Overall, these results suggest that central bank independence serves as an effective institutional mechanism for controlling inflation in developing countries.

4.2 The Impact of CBI on Inflation Fluctuations

To address the second research question, the study further explores inflation dynamics by decomposing inflation into its trend and cyclical components. The Hodrick–Prescott (HP) filter is applied to the log of inflation rates to obtain these components, as described in the data section. The same model specifications used in Columns (1)–(3) of Table-3 are employed, along with the corresponding control variables. The cyclical components of log inflation, log lagged inflation, and lagged world inflation are then used to examine the effect of CBI on inflation fluctuations.

Table-4 reports the estimation results from equation (2), examining the impact of CBI on inflation fluctuations. The analysis evaluates how effectively CBI mitigates inflation fluctuations. Column (1) indicates that CBI exerts a negative and statistically significant effect on inflation fluctuations, reducing them by approximately 34% at the 10% significance level. The lagged inflation cycle is also highly significant, influencing 35% of current-year inflation fluctuations at the 1% level. In Column (2), when world inflation fluctuations are included as an additional control variable, CBI remains statistically significant at the 5% level and continues to display a negative impact, corresponding to a 31% reduction in inflation fluctuations. The lagged inflation cycle again shows a strong and significant relationship, contributing to a 35% change in current inflation fluctuations at the 1% level.

Column (3) presents the results incorporating control variables for world inflation and decade dummies. The findings again reveal a negative impact of CBI on inflation fluctuations, consistent with columns (1) and (2). The coefficient on CBI remains statistically significant at the 10% level, indicating a 31% reduction in inflation fluctuations even after adding these additional controls. The lagged inflation cycle continues to exert a strong and significant influence, accounting for 35% of current inflation fluctuations at the 1% significance level. The world inflation cycle has a negative effect on domestic inflation fluctuations, though the coefficient is small and significant only at the 10% level. Other control variables—such as Democracy, Capital account openness, GDP per capita, Trade openness, and the Decade dummies—are not statistically significant across any of the three specifications.

Table 4: Two-Step System GMM Estimation for Inflation Fluctuation

Inflation Cycle	(1)	(2)	(3)
CBI	-0.340*	-0.318**	-0.315*
	(0.181)	(0.158)	(0.164)
Democracy	0.002	0.002	0.002
	(0.004)	(0.004)	(0.005)
Capital account openness	-0.007	-0.025	-0.027
	(0.066)	(0.061)	(0.058)
Inflation $Cycle_{t-1}$	0.358***	0.358***	0.358***
	(0.078)	(0.083)	(0.087)
GDP per capita	0.163	0.193	0.170
	(0.122)	(0.126)	(0.114)
Trade Openness	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)
World Inflation $Cycle_{t-1}$		-0.004	-0.004*
		(0.002)	(0.002)
Decade_1981-1990			-0.001
			(0.016)
Decade_1991-2000			-0.002
			(0.007)
Observations	1,892	1,892	1,892
Number of Group/Instrument	67/64	67/64	67/64
Hansen test (p value)	0.56	0.53	0.44
AR (2) test (p-value)	0.39	0.39	0.39

Note: *p<0.1; **p<0.05; ***p<0.01; denotes statistical sig.; Robust Standard errors in parentheses.

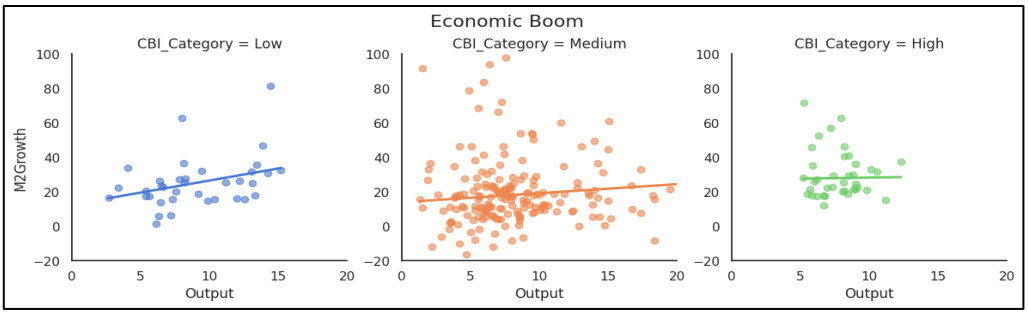
Across all three specifications, CBI remains negatively and significantly associated with inflation fluctuations, suggesting that greater central bank independence can serve as an effective tool for managing inflation fluctuations. The lagged inflation cycle consistently exerts a positive and statistically significant effect on inflation fluctuations in each specification. Other control variables are statistically insignificant, except for the world inflation cycle in Column (3). These findings satisfy the AR (2) test for absence of second-order serial autocorrelation and the Hansen test for the validity of over-identification restrictions.

4.3 Impact of CBI on Money Growth

To address the third research question and explore the transmission channel, the study examines the impact of CBI on money growth. At first, we try to determine the relationship between money growth and output at different levels of CBI and economic conditions. We categorize central bank independence into low, medium, and high levels. Then, we also categorize economic conditions

based on economic boom and slump. When the economy is in a boom, the relationship between output and money growth shows a positive slope across all levels of CBI (as shown in Figure-1). However, central banks use more expansionary monetary policy at a low level of independence. Central banks adjust the money supply slowly in response to economic growth in medium-level independence. When the central bank is highly independent, output does not significantly affect the money supply. This indicates that highly independent central banks maintain a consistent monetary policy that does not react strongly to the change in output, even during a boom.

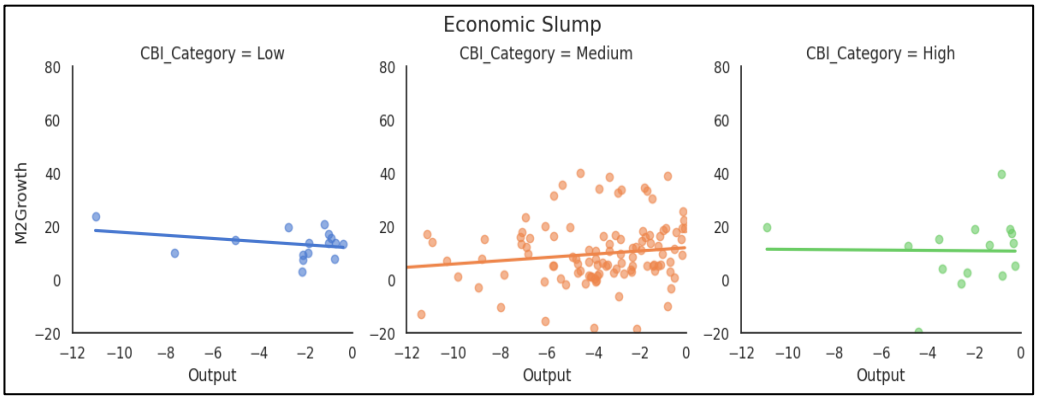
Figure 1: Correlation During Economic Boom



However, monetary policy response during economic slump varies differently depending on the level of CBI (as shown in Figure-2). In the low level of CBI, there is a negative slope between output and money growth. This means that during economic downturns, a low level of CBI is associated with expansionary monetary policy and tends to lower output. This implies that monetary policy is less effective under a lower level of CBI during downturns.

However, in the case of medium CBI, the slope is positive. The monetary policy response of the central bank in terms of increasing money supply is associated with higher growth. In the case of higher CBI, output does not significantly affect money growth. Central banks follow a more predictable and stable monetary policy regardless of economic conditions. This highlights the stabilizing effect of a highly independent central bank during adverse economic condition. At the same time, we see the asymmetric response of the central bank for different levels of independence.

Figure 2: Correlation During Economic Slump



This suggests that lower independence is associated with more counter cyclical monetary policy responses, while higher independence leads to a more consistent and potential focus on long-term price stability over economic stabilization during slumps. In both economic conditions, money growth tends to be high when the central bank is less independent. During the recession, central banks with less independence use more expansionary monetary policy leading to lower output. This evidence indicates that a more symmetric monetary policy is needed.

Secondly, if the central bank is more independent, it may face fewer time inconsistency problems being free from political pressure. It can make monetary policy decisions based on economic fundamentals rather than short-term political considerations. In this case, independent central banks prioritize maintaining their credibility by keeping inflation low. Consequently, they will be less inclined to pursue expansionary monetary policies without sound economic justification. Then the monetary policy of the central bank is likely to be more symmetric.

Most central bank target interest rates as a means to achieve low inflation. Higher interest rates are typically attained by reducing the money supply. Accordingly, greater central bank independence is associated with less reliance on expansionary monetary policies, as lower money supply helps sustain higher interest rate targets. Within this transmission mechanism, central bank independence functions as a policy discipline that maintains low inflation through

controlled money growth. If CBI exerts a strong negative effect on money growth, we can claim money growth serves as the transmission channel by which greater independence leads to lower inflation.

The impact of CBI on money growth is estimated using Equation (3) within a two-step system GMM framework. In this specification, the dependent variable is the M2 growth rate, with its first lag included as the lagged dependent variable. The same set of regressors is employed since political and economic considerations remain same. Table-5 reports the estimation results for the effect of CBI on money growth.

Column (1) indicates that CBI exerts a strong negative effect on money growth. The results suggest that greater CBI is associated with a 104% reduction in money growth, which is statistically significant at the 5% level. The Lagged Money Growth variable is also highly significant, with a 1% level of significance, affecting 43% of current-year money growth. In Column (2), the findings are consistent with those in Column (1), showing a similar negative and statistically significant relationship between CBI and money growth. In this specification, CBI is associated with a 116% reduction in Money Supply, significant at the 5% level. The Lagged Money Growth variable again shows a strong positive relationship, accounting for around 42% of current Money Growth at the 1% significance level.

Table 5: Two-Step System GMM Estimation for Money Growth

M2Growth	(1)	(2)	(3)
CBI	-1.047**	-1.166**	-1.060**
	(0.482)	(0.516)	(0.510)
Democracy	0.007	0.004	-0.003
	(0.010)	(0.009)	(0.014)
Capital account openness	-0.037	0.003	-0.071
	(0.119)	(0.117)	(0.130)
$M2Growth_{t-1}$	0.430***	0.421***	0.423***
	(0.100)	(0.102)	(0.101)
GDP per capita	0.634	0.602	0.474
	(0.396)	(0.386)	(0.403)
Trade Openness	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)
$World\ Inflation_{t-1}$		-0.004	-0.004
		(0.002)	(0.002)
Decade_1981-1990			-0.049
			(0.044)
Decade_1991-2000			-0.013
			(0.019)
Observations	1,897	1,897	1,897
Number of Group/Instrument	67/64	67/64	67/64
Hansen test (p-value)	0.26	0.26	0.25
AR (2) test (p-value)	0.88	0.83	0.76

Note: *p<0.1; **p<0.05; ***p<0.01; denotes statistical sig.; Robust Standard errors in parentheses.

Column (3) presents the results incorporating control variables for world inflation and decade dummies. The findings once again reveal a negative and statistically significant effect of CBI on money growth, consistent with Columns (1) and (2). The coefficient on CBI remains significant at the 5% level, indicating a 106% reduction in money growth even after the inclusion of additional controls. The Lagged Money Growth variable continues to exert a strong positive influence, accounting for 42% of current Money Growth at the 1% significance level. All other control variables remain statistically insignificant across the three specifications.

In all specifications, CBI has a significant negative impact on money growth. Thus, higher central bank independence leads to a more predictable monetary policy environment. Central banks are less susceptible to political pressures. They are more likely to stick to their announced policy paths, which mitigates time

inconsistency problems. Thus, by linking higher central bank independence to a stable and predictable monetary policy environment and observing the asymmetry in monetary policy, we find how central bank independence can mitigate the adverse effects of time inconsistency on economic outcomes.

These findings support the argument that money growth serves as the transmission channel through which higher CBI leads to lower inflation. This result carries important policy implications related to the time-inconsistency problem faced by central banks. Once political interference is curtailed, central banks tend to adopt a more disciplined approach, implementing symmetric monetary policies aimed at maintaining stable inflation.

5. Conclusion and Policy Implications

Central bank credibility plays a crucial role in anchoring inflation expectations at low and stable levels. When a central bank is perceived as credible and independent, it signals to the public that monetary policy decisions are insulated from political pressures and excessive monetary expansion will be avoided. Within the time inconsistency framework, such independence helps mitigate the inflationary bias that arises when monetary authorities prioritize short-term political gains over long-term economic stability due to political pressure.

Previous studies on developed countries have established a strong and inverse association between central bank independence and inflation levels. However, findings for developing countries remains limited and inconclusive. To address this gap, this study empirically measures how central bank independence affects inflation levels in developing countries. Moreover, since limited research explores whether central bank independence can moderate inflation volatility, the analysis extends to examining inflation fluctuations as well. Finally, the study examines the monetary transmission mechanism by which central bank independence influences inflation.

The results show that greater central bank independence is associated with reduced inflation levels. It negatively affects the inflation levels, and this effect is statistically significant. Upon incorporating various control variables across

many specifications, we observe robust evidence. Moreover, this study finds that central bank independence adversely and significantly affects inflation fluctuations. Although the effect on inflation fluctuations is diminished relative to the inflation level, it remains noteworthy, substantial, and robust across many specifications. Finally, we identify that the money supply serves as a conduit in which independence results in reduced inflation.

These findings indicate several important policy implications. First, they confirm the claim that greater independence of central bank serves as an essential institutional safeguard for maintaining targeted inflation levels. Second, the results indicate that greater independence not only reduce inflation levels but also mitigates its fluctuations in developing countries. Furthermore, the results suggest that when central banks enjoy higher independence, they face less political pressure to pursue expansionary policies for short-term gains. The observed link between independence and restrained money growth supports this argument and provides additional insight into the mechanism through which autonomy contributes to macroeconomic stability. These findings provide empirical support to the time inconsistency theory in explaining how institutional design influences inflation outcomes.

Finally, there exists potential scope for future study to investigate additional benefits of central bank independence, such as its role in attracting foreign direct investment and enhancing financial stability. Because greater independence may strengthen policy credibility, predictability, and investor confidence, which may serve as a broader catalyst for long-term economic growth. Future studies could also apply alternative CBI datasets with different weighting measures and methodologies to derive more unified and conclusive results.

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Appendices

Appendix 1:Variables and Their Weight to Construct the CBI Index

Components (weight in the index)	Variables	(weight in the component)
CEO (0.20)	1. Term of office of CEO	(0.25)
	2. Who appoints the CEO	(0.25)
	3. Provisions for dismissal of CEO	(0.25)
	4. CEO allowed to hold another office in government	(0.25)
Objectives (0.15)	5. Central bank objectives	(1)
Policy formulation (0.15)	6. Who formulates monetary policy	(0.25)
	7. Government directives and resolution of conflicts	(0.50)
	8. Central bank given active role in formulation of government's budget	(0.25)
Limitation on lending to the government (0.50)	9. Limitations on advances	(0.30)
	10. Limitations on securitized lending	(0.20)
	11. Who decides control of terms of lending to (0.20) government	
	12. Beneficiaries of central bank lending	(0.10)
	13. Type of limits when they exist	(0.05)
	14. Maturity of loans	(0.05)
	15. Restrictions on interest rates	(0.05)
	16. Prohibition on central bank lending in primary market to Government	(0.05)

Source: Sourced from Garriga & Rodriguez (2023) based on Cukierman et al. (1992). Value assigning criteria for CBI is taken from Cukierman et al. (1992).

Appendix 2. Countries Included in the Analysis

Algeria	Honduras	Papua New Guinea
Angola	Hungary	Paraguay
Argentina	India	Peru
Bahrain	Indonesia	Poland
Bangladesh	Iran	Russia
Benin	Jamaica	Saudi Arabia
Bolivia	Jordan	Senegal
Botswana	Kenya	Solomon Islands
Brazil	Kuwait	South Africa
Burkina Faso	Lebanon	Sri Lanka
Cameroon	Madagascar	Sudan
Central African Republic	Malaysia	Suriname
Chad	Mauritania	Tanzania
Chile	Mauritius	Thailand
China	Mexico	The Philippines
Colombia	Morocco	The United Arab Emirates
Comoros	Nepal	Togo
Costa Rica	Nicaragua	Tunisia
Egypt	Niger	Turkey
El Salvador	Nigeria	Uganda
Gabon	Pakistan	Zambia
Ghana	Panama	Zimbabwe
Guatemala		