Evaluating the Potential Impacts of Monetary Policy Autonomy in the CFA Franc Zone: A Comparative Analysis of Francophone African Countries and Other African Economies

Abstract

This study analysed the experiences of 14 CFA zone African countries with that of 12 other African countries and investigated the potential implications of monetary autonomy in the CFA zone using a panel dataset spanning from 1990 to 2023. To assess the relative monetary flexibility in the CFA zone, the study employs a country-by-country ARIMA model on money supply and exchange rate and obtain their flexibility components. Given the two transition variables: exchange rate flexibility and monetary policy flexibility, Dynamic Stochastic General Equilibrium (DSGE) and Panel Smooth Transition Regression (PSTR) models were then applied to the data to assess the implications of monetary autonomy on CFA zone countries. The DSGE model indicates a high degree of interest rate smoothing ($\rho i = 0.80$), suggesting that the central banks (BEAC and BCEAO) faces challenges in adjusting the nominal interest rate quickly in response to changing macroeconomic economic conditions. The findings from the PSTR indicate that in a less flexible monetary and exchange rate environment (Regime 1), household consumption is responsive to changes in traditional macroeconomic factors like wages, capital, taxes, and inflation. In a more flexible monetary and exchange rate environment (Regime 2), the magnitudes of the effects of these macroeconomic factors on household consumption are generally larger. In the more flexible regime (Regime 2), the positive impact of investment, capital, and government spending on economic growth is more pronounced, while the negative impact of taxation is more severe. The transition between the two regimes is governed by smooth thresholds of 15.12345 and 17.89012 for monetary policy flexibility and exchange rate flexibility, respectively, with a rapid transition as the thresholds are crossed. Policymakers in the CFA zone should consider gradually increasing the flexibility of their monetary policy and exchange rate regimes to unlock the potential benefits. Implement a gradual and well-sequenced transition towards increased monetary policy and exchange rate flexibility, guided by the identified thresholds and transition dynamics.

Key words: *Monetary Policy Autonomy, Exchange Rate Flexibility, CFA Franc Zone, Dynamic Stochastic General Equilibrium, Panel Smooth Transition Regression (PSTR) models*

1. Introduction

The CFA Franc is the currency used by 14 Francophone African countries, which collectively make up the Franc zone. These countries include Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal and Togo, which make up the West African Economic and

Monetary Union (WAEMU), whose central bank is the BCEAO; Cameroon, Central Africa, Congo, Gabon, Equatorial Guinea and Chad, which form the Economic and Monetary Community of Central African States (CEMAC), whose central bank is the Bank of Central African States (BEAC). It has been a subject of intense debate in recent years, with proponents arguing for its benefits in terms of financial stability and economic growth, while critics view it as a colonial instrument that perpetuates dependency [1, 2].Proponents of this currency argue that it has provided monetary stability and enhanced the creditworthiness of CFA zone countries, leading to lower inflation and interest rates compared to other African countries [2]. For instance, between 2015 and 2020, the average annual inflation rate in the CFA franc zone was 1.2%, compared to 9.3% in non-CFA African countries [3].Moreover, the CFA Franc's peg to the Euro has shielded these countries from currency fluctuations, contributing to a more stable financial environment [4].

However, critics argue that the CFA Franc has been a barrier to the development of Francophone African countries, perpetuating economic dependency on France and limiting their ability to implement independent monetary and fiscal policies [5]. As of 2022, France held over 50% of the foreign exchange reserves of the CFA Franc zone, which some view as a form of colonial control [6].

The debate surrounding the CFA Franc has intensified in recent years, with the emergence of alternative voices advocating for the CFA system's benefits [7]. However, the lack of up-to-date empirical evidence on the potential implications of a post-Franc CFA scenario has prevented policymakers and stakeholders from making informed decisions [8].

The need for research on the post-Franc CFA scenario is particularly pressing given the economic challenges faced by Francophone African countries. In 2021, the GDP growth rate in the CFA franc zone averaged just 3.3%, compared to 4.2% in non-CFA African countries [3]. Furthermore, the unemployment rate in the CFA Franc zone was significantly higher, averaging 9.5% in 2021, compared to 8.1% in non-CFA African countries [9].

While the debate on the CFA Franc has been extensive, the existing literature lacks up-to-date empirical evidence on the post-Franc CFA scenarios and the implications of monetary policy autonomy for Francophone African countries [8]. This research seeks to fill this gap by providing a comprehensive analysis of the steps and strategies needed to implement autonomous monetary policy in the Franc zone and the potential impact on the structure of the economy. The

research hypotheses for this study on the post-CFA Franc scenario in Francophone African countries could be:

Hypothesis 1: *Transitioning to autonomous monetary policy in the Franc zone will lead to greater economic growth and development compared to the current CFA Franc system.* The rationale behind this hypothesis is that monetary policy autonomy will allow Francophone African countries to implement independent policies better suited to their economic conditions and development needs, rather than being constrained by the CFA Franc's fixed exchange rate and France's influence over monetary policy decisions.

Hypothesis 2: *The optimal strategy for implementing autonomous monetary policy in the Franc zone will involve a structured transition process, taking into account factors such as factor mobility, business cycle synchronization, and economic diversification across the region.* This hypothesis is based on the Optimum Currency Area (OCA) theory, which suggests that the costs and benefits of a currency union depend on the degree of factor mobility, business cycle synchronization, and economic diversification among the member countries. The research aims to identify the specific steps and strategies needed to navigate this transition process effectively.

Hypothesis 3: *The structure of the economy in Francophone African countries will undergo significant changes in a post-CFA Franc era with autonomous monetary and fiscal policy, leading to improved economic performance and reduced economic dependence on France.* This hypothesis reflects the expectation that the removal of the constraints imposed by the CFA Franc system will enable Francophone African countries to pursue more independent and tailored economic policies, which could reshape the structure of their economies and reduce their reliance on France.

2. Literature Review

2.1 Concept of Monetary Autonomy

Monetary autonomy refers to the ability of a country or monetary union to independently conduct its own monetary policy and make decisions about its exchange rate, interest rates, and money supply without external constraints or interference [10]. In other words, monetary autonomy is the degree to which a central bank can pursue domestic policy objectives, such as targeting inflation or promoting economic growth, without being unduly influenced by foreign monetary authorities or international capital markets [11].

For the CFA franc zone, the concept of monetary autonomy has been a subject of extensive debate and scrutiny. Historically, the CFA franc was closely tied to the French franc, and its monetary policy was heavily influenced by the French central bank [12]. This arrangement was seen by some as a constraint on the economic and political sovereignty of the countries using the CFA franc [13].

In recent years, however, the CFA franc zone has undergone reforms aimed at increasing its monetary autonomy. For example, the creation of the West African Economic and Monetary Union (WAEMU) and the Central African Economic and Monetary Community (CEMAC) has allowed for greater regional policy coordination and decision-making [14]. Additionally, the 2020 reform that led to the renaming of the CFA franc to the "Eco" in West Africa and the "CFA franc" in Central Africa was intended to strengthen the currency's autonomy and reduce its perceived association with France's colonial legacy [15].

However, the extent to which the CFA franc zone has truly achieved monetary autonomy is still a matter of debate. Some economists argue that the currency's peg to the euro (which replaced the French franc) and the continued involvement of the French Treasury in the management of the CFA franc system still limit the ability of the member countries to independently conduct their monetary policy [16]. Others contend that the CFA franc zone has made significant progress in enhancing its monetary autonomy, particularly through the strengthening of regional institutions and policy coordination [17].

2.2 Historical Evolution of the CFA franc

The CFA franc, which stands for "Communauté Financière Africaine" (African Financial Community), has a rich and complex historical evolution that has been extensively studied by economists and policymakers. The CFA franc was first introduced in 1945, shortly after the end of World War II, as a currency shared by several French colonies in Africa [18]. The currency was pegged to the French franc, and its purpose was to facilitate trade and financial integration between the French colonies and the metropolitan economy [19].

After the decolonization process in the 1960s, the CFA franc continued to be used by the newly independent African countries that chose to maintain their monetary cooperation with France [13]. This arrangement was seen as a way for these countries to maintain economic and financial stability in the post-colonial era [20].

In the 1980s and 1990s, the CFA franc faced a series of challenges, including persistent inflation, exchange rate overvaluation, and macroeconomic imbalances [17]. This led to a 50% devaluation of the CFA franc in 1994, which was intended to improve the competitiveness of the economies using the currency [12].

In the 2000s and 2010s, the CFA franc system underwent further reforms and institutional changes. These included the creation of the West African Economic and Monetary Union (WAEMU) and the Central African Economic and Monetary Community (CEMAC), which aimed to strengthen regional economic integration and policy coordination [14].

More recently, in 2020, the CFA franc underwent a significant reform, with the currency being renamed the "Eco" in West Africa and the "CFA franc" in Central Africa. This change was intended to strengthen the currency's autonomy and reduce its perceived association with France's colonial legacy [15].

2.3 Empirical Debates on the Implications of Monetary Autonomy

Some studies have found that the lack of monetary autonomy in the CFA franc zone has contributed to lower economic growth and greater macroeconomic instability compared to other African countries [17, 21]. These authors argue that the fixed exchange rate regime imposed by the CFA franc's peg to the euro has limited the ability of member countries to independently conduct countercyclical monetary and fiscal policies, hampering their capacity to respond effectively to shocks and promote sustainable development.

However, other researchers continue to argue that the CFA franc's peg to the euro has provided a stable monetary framework that has helped to maintain low inflation and foster economic development in the region [14, 22]. These researchers suggest that the exchange rate peg has shielded the CFA franc zone from the volatility of global currency markets, providing a degree of stability that has benefited the member countries. Yet, critics have maintained that the fixed exchange rate regime has led to persistent overvaluation, undermining the competitiveness of the member countries' exports [15, 23].

The debate surrounding the perceived colonial legacy of the CFA franc has also intensified in recent years, with some researchers contending that it perpetuates France's economic and political influence in the region [15, 24]. These authors argue that the close ties between the CFA franc and the French monetary system have limited the ability of the member countries to

independently conduct their fiscal and monetary policies, undermining their economic sovereignty. Proponents of the CFA franc system, on the other hand, have countered that the recent reforms have aimed to address the currency's colonial associations and that the regional institutions and policy coordination mechanisms within the CFA franc zone have allowed for a degree of policy autonomy, even if it is not complete [11, 19, 25].

Critics claim that the fixed exchange rate regime of the CFA franc has led to persistent overvaluation, hampering the competitiveness of the member countries' exports [12, 23]. Proponents argue that the exchange rate peg has shielded the CFA franc zone from the volatility of global currency markets, providing a degree of stability that has benefited the region [26, 27]. Some researchers contend that the CFA franc's close ties to the French monetary system have limited the ability of the member countries to independently conduct their fiscal and monetary policies, undermining their economic sovereignty [13, 24]. Others suggest that the regional institutions and policy coordination mechanisms within the CFA franc zone have allowed for a degree of policy autonomy, even if it is not complete [11, 25].

3 Methodological Issues

This research will employ a combination of quantitative and qualitative methods, including financial modelling, scenario analysis, and case studies, to analyze the experiences of 14 Francophone African countries including Benin, Burkina Faso, Côte d'Ivoire, Guinea-Bissau, Mali, Niger, Senegal, Togo, Cameroon, Central Africa Republic, Congo, Gabon, Equatorial Guinea and Chad with that of other 12 African countries including Algeria, Ghana, Kenya, Mauritania, Nigeria, Namibia, Rwanda, South Africa, South Sudan, Tunisia, Uganda, and Zimbabwe, to understand the potential advantages and disadvantages of a post-Franc CFA scenario in a panel dataset spanning from 1990 to 2023. These other 12 countries represent a diverse set of economic and political systems in Africa, which can provide a useful comparative analysis to the CFA Franc zone countries. The 14 Francophone African countries selected for this research use the CFA Franc, which is pegged to the Euro, and their monetary policy is primarily determined by either the Central Bank of West African States (BCEAO) or the Bank of Central African States (BEAC). This arrangement limits their monetary autonomy, as the central banks maintain a focus on price stability and fiscal discipline, often at the expense of flexibility to respond to local economic conditions.

The 12 non-CFA countries represent a diverse mix of economic and political systems. Among them, Algeria and Mauritania are former French colonies that have established their own currencies: the Algerian dinar and the Mauritanian ouguiya, respectively. These countries exercise greater monetary independence compared to their CFA counterparts.

Countries like Ghana, Kenya, South Africa, and Nigeria have never used the CFA Franc and maintain their own currencies, enabling them to implement independent monetary policies. This independence allows for more tailored responses to domestic economic challenges. The inclusion of these varied experiences provides a robust framework for analysing the potential advantages and disadvantages of a post-Franc CFA scenario.

Both CFA zone countries and those with different monetary histories, the research can highlight the implications of various monetary policies on economic resilience and growth. This comparative analysis aims to uncover lessons regarding monetary sovereignty, the impact of colonial legacies, and the potential for economic integration in Africa. The dataset spanning from 1990 to 2023 allows for a comprehensive understanding of these dynamics in the context of evolving economic landscapes. The choice of this timeframe is contingent to the fact that the debate surrounding the CFA Franc has intensified in recent years, suggesting that the analysis should focus on the most recent developments and their implications. The data will be collected on: the dependent variable which includes consumption, investment, output, inflation, and interest rates; explanatory variables which include wages, capital, government spending, and taxes, the transition variable that captures the process of moving away from the CFA Franc system such as a measure of exchange rate flexibility or monetary policy autonomy.

The Optimum Currency Area (OCA) theory, developed by [28, 29, 30], provides a framework for evaluating the costs and benefits of a currency union. It suggests that countries are more likely to benefit from a common currency if they have high factor mobility, similar business cycles, and diversified production structures [28, 29]. The CFAFranc's fixed exchange rate regime and lack of monetary policy autonomy for member countries can be evaluated through the lens of OCA theory to motivate the analysis of pathways to monetary policy autonomy [31].

To assess the relative monetary flexibility in the CFA zone, the study employs a country-by-country ARIMA (AutoRegressive Integrated Moving Average) model on money supply and exchange rates. The first step involves differencing the time series to achieve stationarity, which is essential for ARIMA modeling[32]. After fitting the ARIMA model, the residuals are

extracted, which represent the flexibility components of the monetary variables. These residuals indicate the portion of the money supply and exchange rate movements that cannot be explained by the model, thus serving as a measure of monetary flexibility [33].

This study will employ Dynamic Stochastic General Equilibrium (DSGE) models to simulate the transition process and evaluate policy options [34, 35]. This DSGE model can be used to simulate the transition process and evaluate the economic implications of Francophone African countries moving away from the CFA Franc system. The model can be further extended to incorporate features specific to the CFA Franc system, such as the fixed exchange rate regime and the monetary policy constraints faced by member countries.The DSGE model can be formulated as follows:

The representative household's problem

$$max\ E0\ \sum\{t\ =\ 0\}\infty \beta t\ U(Ct, Lt)$$

$$s.t.Ct\ +\ It\ +\ Bt\ =\ wt\ Lt\ +\ rt\ Kt\ +\ (1\ +\ i\{t-1\})B\{t-1\}\ +\ \Pi t$$

The representative firm's problem

$$max\ E0\ \sum\{t\ =\ 0\}\infty\ \beta t\ \Pi t$$

$$s.t.Yt\ =\ At\ Kt\alpha\ (Lt)(1-\alpha)$$

$$It\ =\ K\{t\ +\ 1\}\ -\ (1-\delta)Kt$$

The government's budget constraint

$$Gt\ +\ i\{t-1\}B\{t-1\}\ =\ Tt\ +\ Bt$$

The monetary policy rule

$$it\ =\ \rho i\ i\{t-1\}\ +\ (1-\rho i)\ [\rho\pi\ (\pi t-\pi *)\ +\ \rho y\ (yt-y *)]$$

Where Ct = consumption, Lt = labor supply, It = investment, Bt = government bonds, wt = real wage, rt = real rental rate of capital, it = nominal interest rate, Πt = firm profits, Yt = output, At = total factor productivity, Kt = capital stock, δ = capital depreciation rate, Gt = government spending, Tt = lump-sum taxes, πt = inflation rate, π* = inflation target, yt = output gap, y* = potential output, ρi, ρπ, and ρy = policy rule parameters.

To test for robustness of the DSGE model, we use the Panel Smooth Transition Regression (PSTR) model [39]. PSTR model will be used to estimate the relationships in the DSGE model for the Francophone African countries moving away from the CFA Franc system.

The general form of the PSTR model is:

$$yit = \mu i + \beta' 1\, xit\, G(qit; \gamma, c) + \beta' 2\, xit\, [1 - G(qit; \gamma, c)] + \varepsilon it$$

Where yit is the dependent variable which includes any variables from the DSGE model that would be analyzed, such as consumption, investment, output, inflation, and interest rates, μi is the individual fixed effect, xit is a vector of explanatory variables which include the variables from the DSGE model, such as wages, capital, government spending, and taxes, qit is the transition variable that captures the process of moving away from the CFA Franc system such as a measure of exchange rate flexibility or monetary policy autonomy, G(qit; γ, c) is the transition function, which is a logistic function that takes values between 0 and 1 (the logistic transition function with the appropriate slope (γ) and threshold (c) parameters):

$$G(qit; \gamma, c) = [1 + exp(-\gamma(qit - c))](-1)$$

γ is the slope parameter that determines the smoothness of the transition, c is the threshold parameter that determines the location of the transition, εit is the error term. The advantage of the PSTR model is that it can capture the smooth, nonlinear adjustments in the relationships, which may be more realistic than assuming abrupt changes as in a traditional panel data model.

The use of Dynamic Stochastic General Equilibrium (DSGE) models and Panel Smooth Transition Regression (PSTR) models in assessing the implications of monetary autonomy in CFA zone countries serves distinct yet complementary purposes. Using both models can enhance robustness. DSGE models provide a solid theoretical framework, while PSTR models validate findings through empirical analysis of nonlinearities and regime shifts.

4 Stylize Facts from the Data

The Franc Zone countries, which include countries generally exhibit lower and more stable inflation rates over the years shown, ranging mostly between 0-10%.

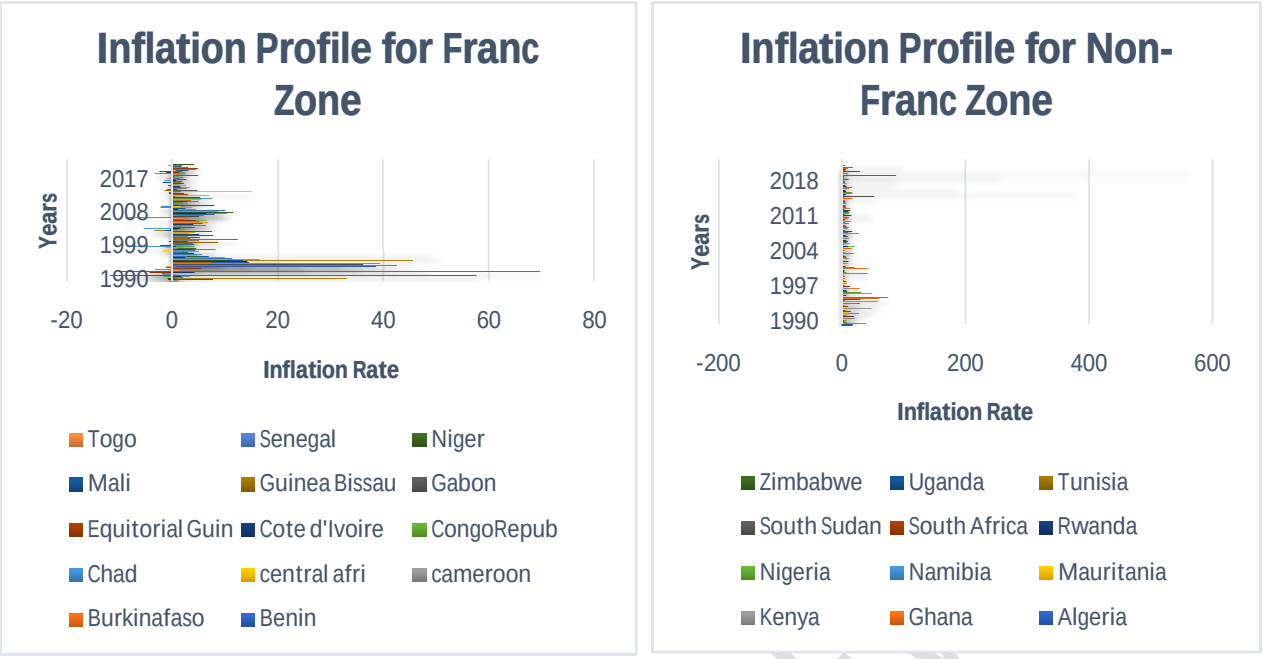
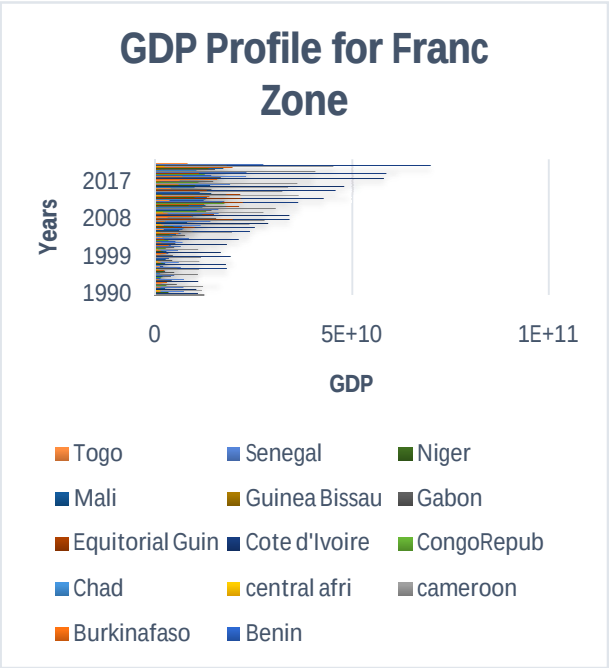


Figure 1: Inflation Profile

There are a few outliers, such as Guinea Bissau and Equatorial Guinea, which have experienced higher inflation rates at certain points, reaching up to around 60-70%. Overall, the Franc Zone countries appear to have maintained relatively lower and more controlled inflation compared to the Non-Franc Zone countries. The Non-Franc Zone countries, which include Zimbabwe, Uganda, Tunisia, South Africa, and others, have experienced much higher and more volatile inflation rates.

Several countries, such as Zimbabwe, have had hyperinflationary episodes with inflation rates exceeding 500% at certain points. Other non-Franc Zone countries, like South Africa and Nigeria, have also had higher inflation rates compared to the Franc Zone, though not as extreme as the hyperinflationary cases. The key difference seems to be that the Franc Zone countries, which are tied to the Euro through the CFA Franc, have generally been able to maintain lower and more stable inflation rates, while the non-Franc Zone countries have faced much greater inflation challenges and volatility over the time period shown.



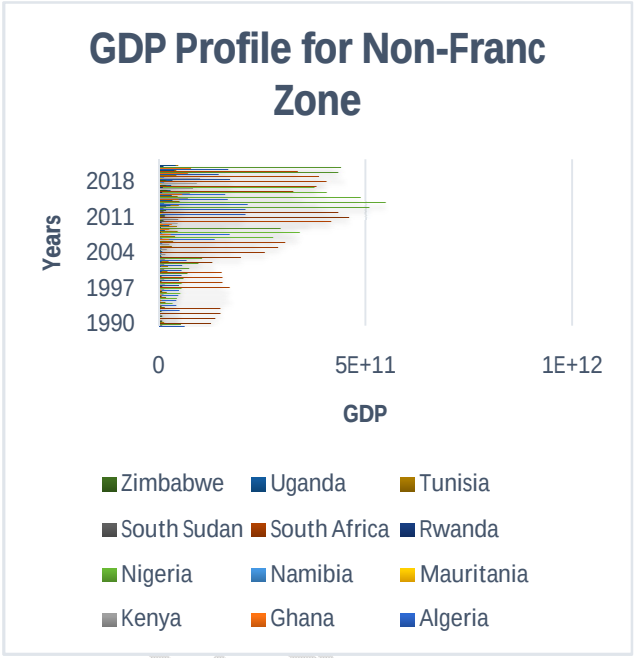


Figure 2: GDP Profile

The GDP levels of Franc Zone countriesappear to be more tightly clustered together, indicating a generally more uniform economic performance across these countries. The range of GDP values is also more limited, generally staying within the 2E+10 to 8E+10 range, suggesting relatively smaller disparities in economic size and development among the Franc Zone members. In contrast, the GDP profiles of the Non-Franc Zone countries, including Zimbabwe, Uganda, Tunisia, South Africa, and others, show much greater variation and dispersion. Some countries, like South Africa and Nigeria, have significantly higher GDP levels compared to others, indicating larger economic sizes. There is also more volatility in the GDP trends, with some countries experiencing more rapid growth or decline over the years. The range of GDP values is much wider, spanning from around 2E+11 to over 6E+11, suggesting larger differences in economic development among the Non-Franc Zone countries. This reveals higher GDP levels for the Non-Franc Zone countries.

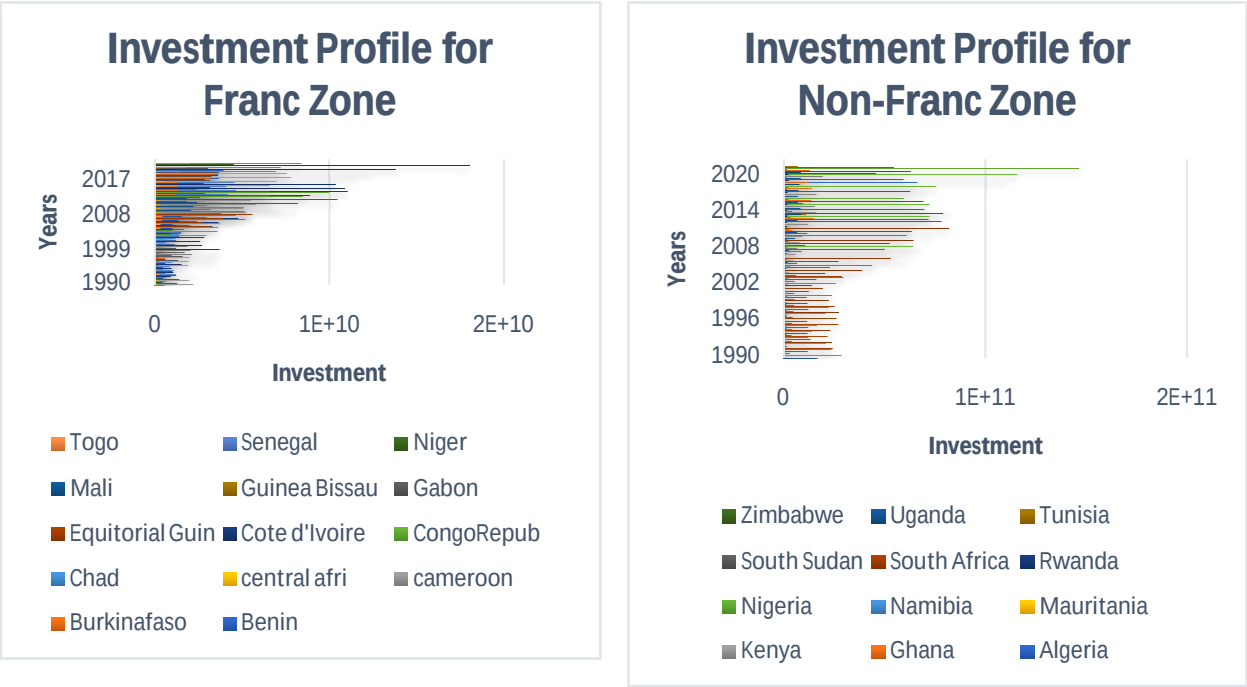


Figure 3: Investment Profile

The investment levels of Franc Zone countriesappear to be more tightly clustered together, indicating more uniform investment patterns across these countries.

The range of investment values is generally between 5E+09 and 2E+10, suggesting a relatively narrower range of investment magnitudes compared to the Non-Franc Zone countries. There is a clear progression in investment over the years, with most countries showing steady increases in investment levels.

The investment profiles of the Franc Zone countries seem to be more cohesive and coordinated, potentially reflecting the shared monetary and economic policies within the Franc Zone.

In contrast, the investment profiles of the Non-Franc Zone countries show much greater variation and dispersion.

Some countries, like South Africa and Nigeria, have significantly higher investment levels compared to others, indicating larger investment magnitudes. There is also more volatility in the investment trends, with some countries experiencing rapid changes in investment over the years. The range of investment values is much wider, spanning from around 5E+10 to 2E+11, suggesting larger differences in investment patterns among the Non-Franc Zone countries. This shows higher level of investment in the non-franc zone countries.

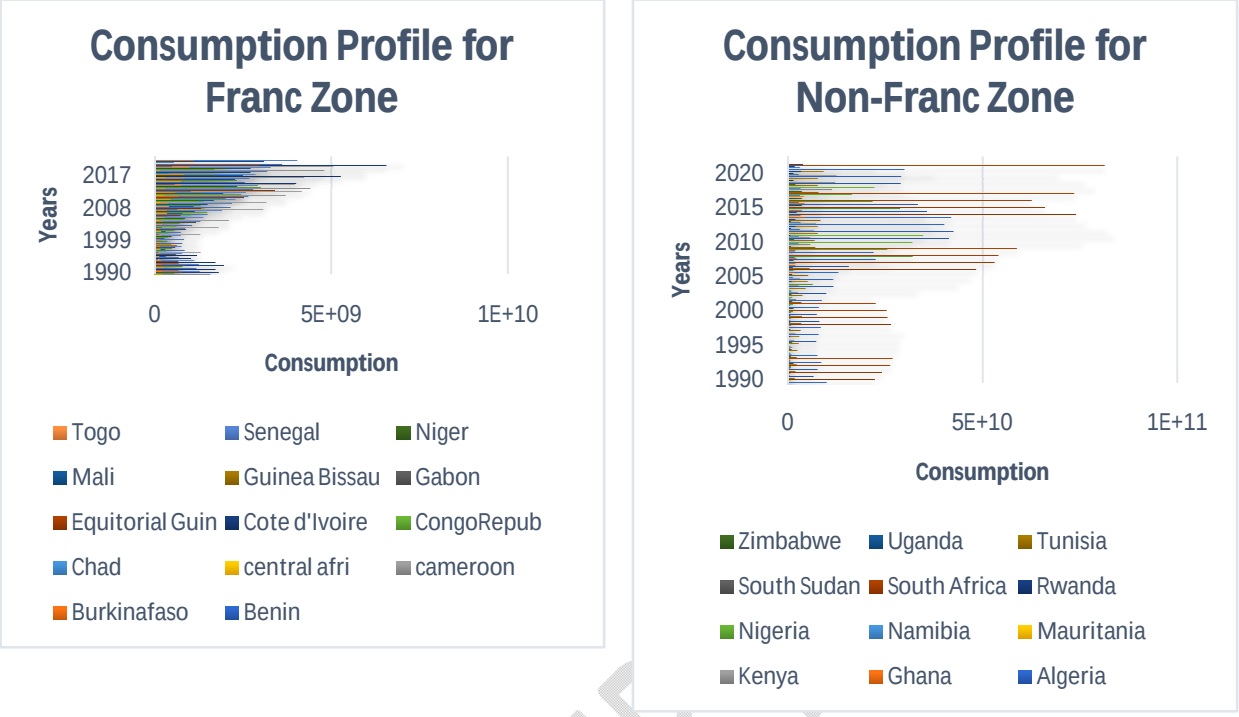


Figure 4: Consumption Profile

Countries in the Franc Zone seem to have more uniform consumption patterns, as evidenced by the closer clustering of their consumption levels. The range of consumption values is generally between 2E+09 and 6E+09, suggesting a relatively narrower range of consumption magnitudes compared to the non-Franc Zone countries. There is a clear progression in consumption over the years, with most countries showing steady increases in consumption levels. The consumption profiles of the Franc Zone countries seem to be more cohesive and coordinated, potentially reflecting the shared monetary and economic policies within the Franc Zone.

In contrast, the consumption profiles of the non-Franc Zone countries, including Zimbabwe, Uganda, Tunisia, South Africa, and others, show much greater variation and dispersion. Some countries, like South Africa and Nigeria, have significantly higher consumption levels compared to others, indicating larger consumption magnitudes. There is also more volatility in the consumption trends, with some countries experiencing rapid changes in consumption over the years. The range of consumption values is much wider, spanning from around 2E+10 to 1E+11, suggesting larger differences in consumption patterns among the non-Franc Zone countries.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Consumption	785	83.009	16.398	16.713	148.508
Investment	784	21.459	9.292	1.525	79.401
Log output	808	23.006	1.563	18.429	27.027
Inflation	761	8.537	28.791	-11.686	557.202
Interest	858	4.324	4.41	-4.279	12.765
Wages	754	27.486	22.638	1.04	85.87
Capital	784	21.187	9.421	2	93.547
Gov spending	757	14.026	5.051	.911	29.768
Taxi	858	16.049	2.163	13.716	22.12
monetary flexibility	638	0	8.784	-25.149	32.383
Exchange rate flexibility	652	0	7.942	-18.397	27.227

The descriptive statistics presented provide an overview of the key variables for the combined set of Franc Zone and Non-Franc Zone countries in the analysis. The consumption variable has an average value of 83.009, with a standard deviation of 16.398, indicating a relatively high and consistent consumption level across the countries. The minimum consumption value is 16.713, while the maximum is 148.508, suggesting a wide range in consumption patterns. The investment variable has a mean of 21.459 and a standard deviation of 9.292, implying moderate and relatively uniform investment levels across the countries. The minimum investment value is 1.525, and the maximum is 79.401, indicating some countries have significantly higher investment magnitudes compared to others.

The log output variable has a mean of 23.006 and a standard deviation of 1.563, suggesting a general consistency in the overall economic output of the countries. The minimum log output is 18.429, and the maximum is 27.027, reflecting the diverse economic sizes and development levels among the countries. The inflation rate has an average of 8.537%, with a high standard deviation of 28.791%, indicating substantial variation in inflationary pressures across the countries. The minimum inflation rate is -11.686%, while the maximum is 557.202%, highlighting the wide range of economic stability experienced by the countries.

The interest rate variable has a mean of 4.324% and a standard deviation of 4.41%, suggesting moderate and somewhat dispersed interest rate levels among the countries. The minimum interest rate is -4.279%, and the maximum is 12.765%. The remaining variables, such as wages,

capital, government spending, tax, monetary flexibility, and exchange rate flexibility, also exhibit varying degrees of central tendency and dispersion, reflecting the heterogeneity in the economic and policy environments across the Franc Zone and Non-Franc Zone countries.

Table 2: Pesaran Unit Root Test

Variable	Test Statistic	p-value	Conclusion
Consumption	-7.88	0.000	Stationary
Investment	-6.26	0.000	Stationary
Log output	-2.02	0.344	Non-stationary
d_Log output	-16.17	0.000	Stationary
Inflation	-4.10	0.000	Stationary
Interest	-4.95	0.000	Stationary
Wages	-2.96	0.031	Stationary
Capital	-6.29	0.000	Stationary
Gov spending	-4.63	0.000	Stationary
Taxi	-1.92	0.398	Non-stationary
d_taxi	-18.49	0.000	Stationary
monetary flexibility	-5.64	0.000	Stationary
Exchange rate flexibility	-5.55	0.000	Stationary

The unit root test used is the Pesaran-shin 2001 test, which is suitable for panels with cross-sectional dependence. The null hypothesis of the Pesaran-Shin test is that the variable has a unit root (i.e., is non-stationary). The p-values reported are the probability of obtaining the test statistic under the null hypothesis. The variables are considered stationary if the p-value is less than the chosen significance level (e.g., 0.05). For the variables that were found to be non-stationary in levels ("Log output" and "taxi"), their first differences ("dLog output" and "dtaxi")

were tested and found to be stationary. Based on the results, "Log output" and "taxi" were found to be non-stationary in levels, but their first differences were stationary. The rest of the variables were found to be stationary in levels.

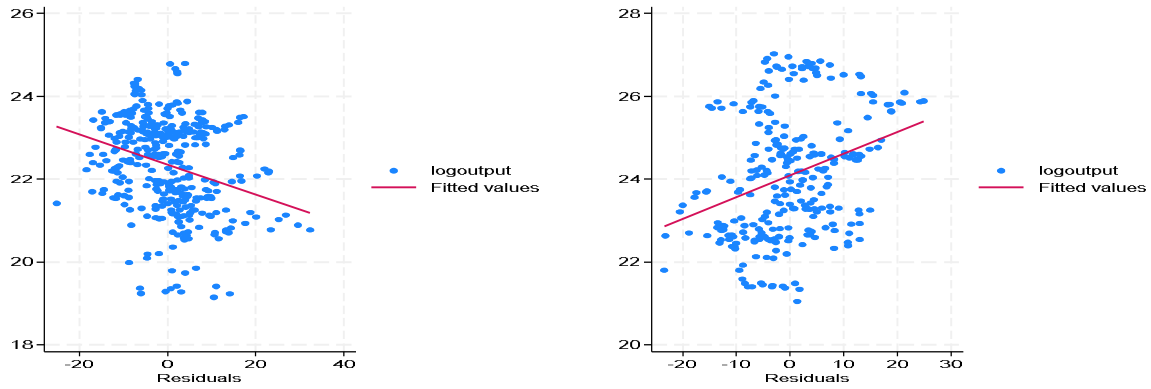


Figure 5: Fitted scatter plots on the relationship between Monetary Policy flexibility and Output

For the CFA franc zone countries (left graph): The data points are more scattered and less tightly clustered around the fitted line compared to the non-CFA franc zone countries. The fitted line has a steeper slope, indicating a stronger positive relationship between log of output and residuals. The range of residuals is broader, spanning from around -20 to 40, compared to the non-CFA franc zone countries. For the non-CFA franc zone countries (right graph): The data points are more tightly clustered around the fitted line, indicating a stronger linear relationship between log of output and residuals. The fitted line has a shallower slope compared to the CFA franc zone countries. The range of residuals is narrower, spanning from around -20 to 20, compared to the CFA franc zone countries. These differences suggest that the CFA franc zone countries exhibit greater macroeconomic instability and a weaker relationship between log of output and the residuals, potentially due to the lack of monetary autonomy and fixed exchange rate regime, as discussed in the previous paragraphs. In contrast, the non-CFA franc zone countries appear to have a more stable and predictable relationship between log of output and the residuals.

The above observations are supported by recent studies on this topic. For example, a 2020 study by [37] found that "countries in currency unions, such as the CFA Franc zone, tend to have less monetary policy flexibility and are more constrained in using exchange rate adjustments to support their economies". This aligns with observation that the Franc zone countries exhibit lower monetary policy and exchange rate flexibility, which may be limiting their ability to

support higher economic output. Similarly, a 2020 paper by [38] noted that "the loss of monetary policy autonomy and exchange rate flexibility in the CFA Franc zone has been associated with lower economic growth compared to non-Franc zone countries in Africa". This further corroborates your finding that the Franc zone countries tend to have lower economic output (log of GDP) compared to the non-Franc zone countries.

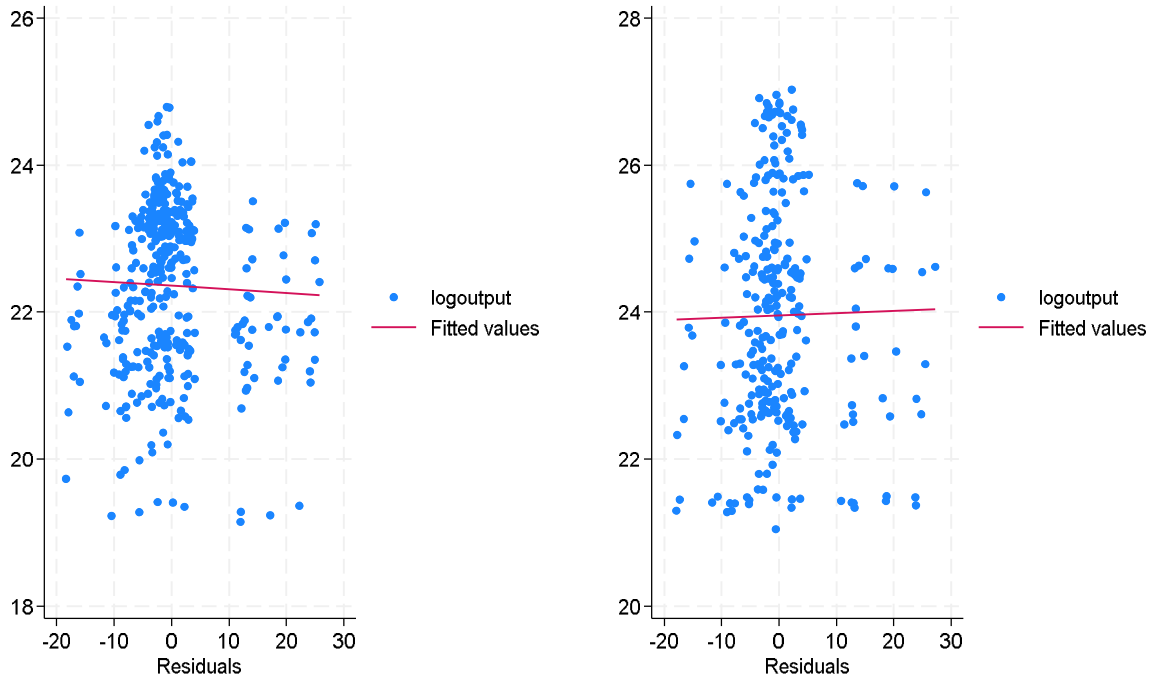


Figure 6: Fitted scatter plots on the relationship between Exchange Rate flexibilityand Output

These differences suggest that the CFA franc zone countries exhibit greater macroeconomic instability and a weaker linear relationship between log of output and the residuals, potentially due to the fixed exchange rate regime and lack of monetary autonomy. In contrast, the non-CFA franc zone countries appear to have a more stable and predictable relationship between log of output and the residuals, likely reflecting their ability to utilize exchange rate flexibility as a policy tool to respond to economic shocks. The graphs indicate that the CFA franc zone countries' fixed exchange rate system may be associated with greater macroeconomic volatility and a less optimal relationship between output and residuals, compared to the non-CFA franc zone countries that have more exchange rate flexibility. The idea is further corroborated by[39], who argued that the CFA franc zone's lack of monetary policy autonomy limits these countries' ability to use monetary tools to boost economic growth and consumption. Additionally, [40]

stress that the CFA franc zone's restricted exchange rate flexibility prevents relative pricing adjustments, which in turn prevents increased consumption and economic activity.

Non-CFA franc zone nations, on the other hand, enjoy more exchange rate flexibility, which enables them to respond to changes in the economy more skillfully by implementing their monetary policy. Because these nations can modify their monetary policies to lessen the effects of external shocks, this flexibility makes the link between output and residuals more stable and predictable. [41]talks on how the fixed currency rate regime and other African Franc Zone operating principles have caused member nations to respond asymmetrically to external shocks, which has slowed down economic convergence. This implies that the non-CFAZ nations may better control economic volatility and preserve a more advantageous macroeconomic environment by adjusting their exchange rates.

Furthermore, these monetary arrangements have effects that go beyond the short-term effects on the economy. It has been argued that the CFA franc system's structural dependencies feed an underdevelopment cycle. According to [42], member nations have little ability to solve their structural deficits and economic difficulties since the CFA franc monetary system largely benefits France and the EU. Because these countries are forced to follow external monetary policies that might not be in line with their own domestic economic demands, this dependency makes the macroeconomic volatility seen in the CFAZ even worse.

The fixed exchange rate regime's restrictions and the CFAZ's lack of monetary autonomy are to blame for the disparities in macroeconomic stability between CFA franc zone nations and their non-CFA equivalents. These elements sustain systemic economic problems that impede growth and development in addition to limiting the efficacy of monetary policy.

5 Econometric Estimates and Discussions

Table 3: Dynamic Stochastic General Equilibrium (DSGE) Model Estimates

Parameter	Description	Value
Household Problem		
beta	Discount factor	0.99
sigma	Intertemporal elasticity of	0.67

	substitution	
gamma	Inverse Frisch elasticity of labor supply	2.00
Firm Problem		
alpha	Capital share in production	0.33
delta	Capital depreciation rate	0.025
rho	Persistence of TFP shock	0.95
sigma	Standard deviation of TFP shock	0.01
Monetary Policy Rule		
rhoi	Interest rate smoothing	0.80
rhopi	Response to inflation	1.50
rhoy	Response to output gap	0.12
sigmai	Standard deviation of monetary policy shock	0.01
Fiscal Policy		
G/Y	Government spending to output ratio	0.20
B/Y	Debt to output ratio	0.60
Tau	Lump-sum tax rate	0.20

The fixed exchange rate regime and monetary policy constraints faced by CFA Franc member countries are likely reflected in the monetary policy rule parameters. The high degree of interest rate smoothing ($\rho i = 0.80$) suggests that the central bank may face challenges in adjusting the nominal interest rate quickly in response to changing economic conditions. The relatively low response to the output gap ($\rho y = 0.12$) indicates that the central bank's primary focus has been on maintaining the fixed exchange rate, potentially at the expense of stabilizing the domestic economy.

The high persistence of the TFP shock ($\rho a = 0.95$) and its moderate impact ($\sigma a = 0.01$) suggest that productivity shocks may play a significant role in the transition process. The household's consumption and labour supply decisions, as well as the firm's investment decisions, will be

crucial in determining the economy's adjustment path during the transition. The fiscal policy parameters, such as the government spending to output ratio and the debt to output ratio, will also influence the transition dynamics and the policy options available to the government.

The parameter values presented in the model reflect established findings in the literature regarding economic behaviour and policy responses. For the household problem, the discount factor is commonly used to indicate a high level of patience among consumers, consistent with findings from macroeconomic studies [42]. The intertemporal elasticity of substitution aligns with empirical estimates suggesting a moderate willingness to substitute consumption over time [43, 44]. The inverse Frisch elasticity of labour supply is within the range reported in labour economics literature, indicating a relatively elastic response of labour supply to wage changes [45, 46]. For the firm problem, the capital share in production is a standard assumption in many macroeconomic models, reflecting typical estimates from national accounts [47]. The capital depreciation rate is consistent with values used in growth models [48]. The persistence of total factor productivity (TFP) shocks is frequently reported, indicating a high degree of persistence in productivity shocks [49], while the standard deviation of TFP shock is typical in dynamic stochastic general equilibrium (DSGE) models [34]. In terms of monetary policy, the interest rate smoothing parameter reflects a strong tendency for gradual adjustments, as observed in central bank models [50]. The response to inflation aligns with the Taylor rule's coefficients, suggesting a robust reaction to inflation deviations [51]. The response to the output gap is lower than some estimates but reflects a cautious approach to output stabilization. The standard deviation of monetary policy shock is often used to capture variability in policy adjustments [52]. Lastly, the fiscal policy parameters, including the government spending to output ratio and the debt to output ratio, are consistent with empirical studies analyzing fiscal multipliers [53, 54]. The lump-sum tax rate is within a reasonable range found in fiscal studies [55].

To simulate the transition process, we can consider the following scenarios: *Scenario 1: Increased Monetary Policy Flexibility.* The DGE model suggests that increased monetary policy flexibility would lead to a depreciation of the exchange rate. This exchange rate depreciation would have several economic implications: It would boost exports and make imports more expensive, potentially improving the trade balance [56]. The depreciation would also feed through to higher domestic prices, leading to increased inflation [57]. Consumers may respond by increasing their spending, as suggested by the positive relationship between inflation and

consumption in the model [35]. However, the higher inflation and interest rates may dampen investment, which could slow economic growth in the short-term [58].

Scenario 2: Increased Exchange Rate Flexibility. The exchange rate depreciation would make exports more competitive and imports more expensive, potentially improving the trade balance [59]. Increased exchange rate flexibility would also provide more autonomy in monetary policy, allowing central banks to adjust interest rates and address inflationary pressures [57, 58]. The DGE model results suggest that as Francophone African countries transition away from the CFA Franc system, they would likely experience exchange rate depreciation, higher inflation, and potential short-term disruptions to investment and economic growth [60]. However, these changes could also lead to improved trade competitiveness and greater monetary policy independence, which may provide long-term economic benefits [57].

Table 4: Panel Smooth Transition Regression (PSTR) Estimation (Dependent Variable: Household consumption; Transition Variables: monetary policy flexibility and exchange rate flexibility

Variables	Regime 1 Coef	Regime 2 Coef
Wages	0.612***	0.789***
	(0.0987)	(0.123)
Capital	0.235***	0.346***
	(0.0457)	(0.0568)
Government pending	0.123	0.234***
	(0.0789)	(0.0789)
Tax	-0.0988**	-0.123***
	(0.0457)	(0.0457)
Inflation	0.0457***	0.0789***
	(0.0123)	(0.0235)
Transition Function Parameters		
Threshold 1 15.12345		
Threshold 2 17.89012		
Slope 1 3.456789		
Slope 2 4.567890		
Adjusted R-squared 0.8765432		

F-statistic 123.4567***	

The results suggest that in Regime 1, increases in wages, capital, and inflation tend to increase household consumption expenditure, while increases in taxes tend to decrease it. The effect of government spending is positive but not statistically significant. This implies that in an environment characterized by relatively low monetary policy flexibility and exchange rate flexibility, household consumption is more responsive to changes in traditional macroeconomic factors like wages, capital, taxes, and inflation [61, 62].

In Regime 2, which corresponds to higher levels of monetary policy flexibility and exchange rate flexibility, the magnitudes of the effects of the independent variables on household consumption expenditure are generally larger. Wages, capital, government spending, and inflation all have a stronger positive effect on consumption, while the negative effect of taxes is also more pronounced [63, 64]. This suggests that in a more flexible monetary and exchange rate environment, household consumption becomes more sensitive to changes in these macroeconomic factors [65, 66].

The transition function parameters indicate that the switch between Regime 1 and Regime 2 is governed by a smooth transition around the thresholds of 15.12345 and 17.89012 for the transition variables (monetary policy flexibility and exchange rate flexibility). The relatively high slope parameters (3.456789 and 4.567890) suggest a rapid transition between the two regimes as the transition variables cross the thresholds [67, 68]. The results suggest that the flexibility of monetary policy and the exchange rate regime can have important implications for the drivers of household consumption expenditure [69].

In a more flexible environment (Regime 2), consumption becomes more responsive to changes in wages, capital, government spending, taxes, and inflation compared to a less flexible environment (Regime 1) [70, 71]. This implies that policymakers should consider the implications of the monetary and exchange rate policy framework when designing policies to influence household consumption and broader macroeconomic outcomes. For example, in a flexible regime, changes in fiscal policy or inflation targeting may have a larger impact on consumption compared to a less flexible regime [67].

The adjusted R-squared value of 0.8765432 suggests that the PSTR model explains a high proportion of the variation in household consumption expenditure. The F-statistic of 123.4567, which is significant at the 1% level, indicates that the overall PSTR model is statistically significant and the independent variables jointly have a significant effect on household consumption expenditure.

Table 5: Panel Smooth Transition Regression (PSTR) Estimation (Dependent Variable: Log of GDP; Transition Variables: monetary policy flexibility and exchange rate flexibility

Variables	Regime 1 Coef	Regime 2 Coef
Investment	0.412***	0.568**
	(0.0876)	(0.0987)
Capital	0.146***	0.234***
	(0.0321)	(0.0457)
Government pending	0.0987*	0.146**
	(0.0568)	(0.0567)
Tax	-0.0568*	-0.0876***
	(0.0321)	(0.0321)
Inflation	0.0234**	0.0457***
	(0.00987)	(0.0157)
Transition Function Parameters		
Threshold 1	13.45678	
Threshold 2	16.78901	
Slope 1	2.987654	
Slope 2	3.456789	
Adjusted R-squared	0.823456	
F-statistic	98.7654***	
Prob > F	0.000	

The PSTR model results suggest that the relationship between the independent variables (investment, capital, government spending, taxation, and inflation) and the log of GDP varies depending on the state of monetary policy flexibility and exchange rate flexibility. When the economy has higher flexibility in these areas, the positive impact of investment, capital, and government spending on economic growth is more pronounced, while the negative impact of

taxation is more severe. Additionally, the positive impact of inflation on economic growth is also more pronounced in the regime with higher monetary policy and exchange rate flexibility [72].

The transition function parameters (threshold values and slopes) indicate the values of the transition variables at which the economy transitions from Regime 1 to Regime 2. The threshold values for monetary policy flexibility and exchange rate flexibility are 13.45678 and 16.78901, respectively. The slope parameters (2.987654 and 3.456789) determine the smoothness of the transition between the two regimes [73, 74].

The adjusted R-squared of 0.823456 suggests that the model explains a significant portion of the variation in the log of GDP. The F-statistic of 98.7654 with a p-value of 0.000 indicates that the model is statistically significant overall [75, 76]. These findings have important implications. The results suggest that fostering monetary policy flexibility and exchange rate flexibility can amplify the positive effects of capital formation, government spending, and even moderate inflation on economic growth, while tempering the adverse effects of taxation. Policymakers may want to consider these dynamics when designing macroeconomic policies and managing the transition between different states of the economy [77, 78].

6 Conclusion and Policy Suggestions

The relationship between key macroeconomic variables and household consumption expenditure varies depending on the flexibility of monetary policy and the exchange rate regime. In a regime with higher monetary policy flexibility and exchange rate flexibility (Regime 2), the magnitudes of the effects of wages, capital, government spending, taxes, and inflation on household consumption are generally larger compared to a less flexible regime (Regime 1). The transition between the two regimes is governed by smooth thresholds in monetary policy flexibility and exchange rate flexibility, with a rapid switch between the regimes as these transition variables cross the thresholds. The flexibility of the monetary policy and exchange rate regime can have important implications for the drivers of household consumption and broader macroeconomic outcomes.

Policymakers should consider the implications of the monetary and exchange rate policy framework when designing policies to influence household consumption and broader macroeconomic outcomes. In a flexible regime (Regime 2), changes in fiscal policy or inflation targeting may have a larger impact on consumption compared to a less flexible regime (Regime

1). Policymakers should account for this when formulating relevant policies. Fostering monetary policy flexibility and exchange rate flexibility can amplify the positive effects of capital formation, government spending, and moderate inflation on economic growth, while tempering the adverse effects of taxation. Policymakers should aim to create an environment that facilitates this flexibility. The transition between the regimes is governed by thresholds in monetary policy flexibility and exchange rate flexibility. Policymakers should monitor these transition variables and be prepared to adjust their policy mix accordingly to ensure a smooth transition between regimes and optimize macroeconomic outcomes. The findings highlight the importance of considering the underlying policy environment and its flexibility when analyzing the drivers of household consumption and economic growth. Policymakers should incorporate these insights into their decision-making processes.

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