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DO MONETARY POLICY FRAMEWORKS MATTER IN LOW INCOME COUNTRIES?

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ABSTRACT

Microeconomic evidence indicates a very high frequency of price adjustment in low income countries (LICs), raising the question of whether LICs may be reasonably characterized as exhibiting monetary neutrality. To address this question, we analyze a cross-country panel dataset of 79 LICs over the period 1990 to 2015 to assess the impact of external shocks on real GDP growth, and we find highly significant differences between LICs where the central bank targets monetary aggregates or inflation compared to LICs that maintain rigid nominal exchange rates. We also conduct an event study of the surprise devaluation of the Central African Franc (CFA) in January 1994 and find that it had highly significant effects on the output growth of 10 CFA countries relative to 18 similar countries outside the CFA zone. Consequently, the hypothesis of monetary neutrality is decisively rejected, and these findings provide strong support for the role of monetary policy frameworks in fostering price stability and macroeconomic stability in LICs.

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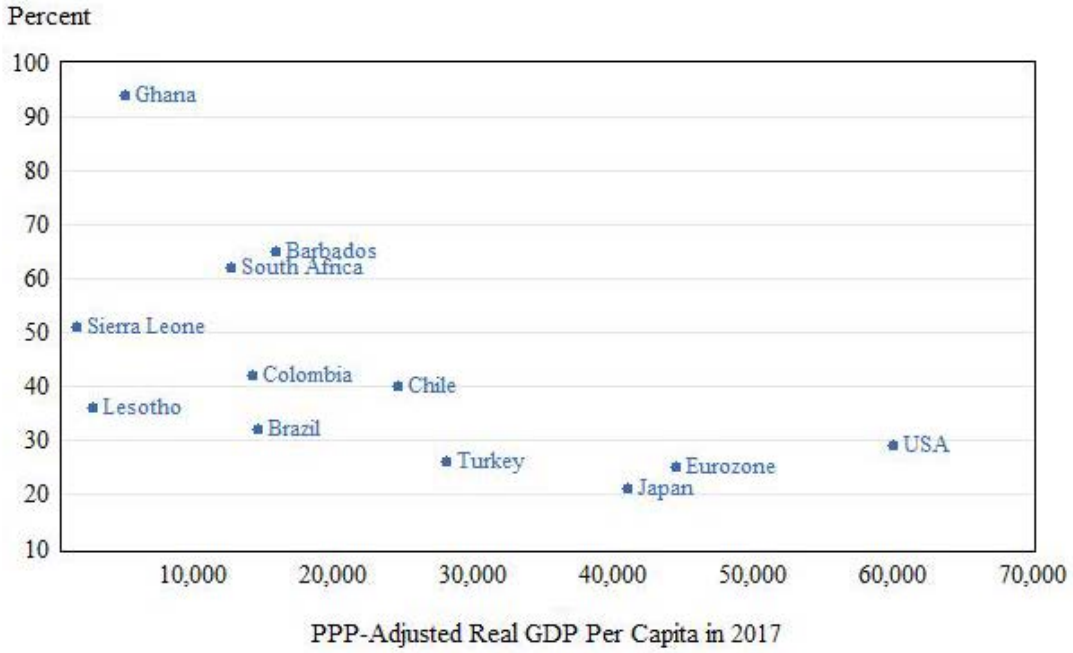
Figure 1: Monthly Frequency of Price Adjustment and Levels of Development



Sources: See Appendix I.

1. Introduction

In recent years, numerous low-income countries (LICs) have been engaged in substantial reforms to strengthen their monetary policy frameworks, with technical support from the International Monetary Fund and other policy institutions in higher-income economies.[1] In particular, many LICs have been moving towards frameworks that foster price stability while allowing for greater exchange rate flexibility. Nonetheless, the analytical and empirical basis underpinning these efforts has remained relatively unclear.

Indeed, one plausible view is that LICs could be characterized by monetary neutrality. As shown in Figure 1, the available evidence suggests a much higher frequency of price adjustment in LICs compared to advanced countries or emerging market economies (EMEs). Thus, as in the earlier literature on real business cycle (RBC) models, one might simply presume that economic and financial transactions in LICs are conducted in spot markets with flexible prices.[2] Under that

[1] International Monetary Fund (2015).

[2] Aguiar and Gopinath (2007) suggested that macroeconomic data for developing countries could be interpreted in terms of an RBC model driven primarily by productivity shocks, whereas García-Cicco, Pancrazi, and Uribe (2010) found that such a model could not explain key patterns in macroeconomic data for Argentina and Mexico.

assumption, changes in money or nominal interest rates would be fully reflected in the domestic price level, while the determination of real economic activity in LICs would be unrelated to the choice of nominal anchor or other characteristics of the monetary policy framework.[3]

In this paper, we conduct empirical analysis to assess whether the characteristics of monetary policy frameworks in LICs have significant effects on real economic activity. We follow a two-pronged strategy: (i) reduced-form regression analysis of the impact of external shocks in a large cross-country panel dataset, and (ii) event study analysis of the surprise devaluation of the Central African Franc (CFA) in January 1994. Both aspects of our analysis are aimed at estimating and testing reduced-form relationships, thereby avoiding any structural assumptions about the type and degree of nominal rigidities in LICs.

Our regression methodology follows Jorda (2005) in estimating the lagged effects of external shocks on real GDP growth. For this purpose, we use a cross-country panel dataset of 79 LICs over the period from 1990 to 2015, and we focus on three types of external shocks that are highly relevant for LICs and that can reasonably be viewed as exogenous with respect to domestic developments in LICs: unanticipated changes in world GDP, shifts in the terms of trade, and fluctuations in the price of oil.[4] Next, we compare the estimated coefficients in the reduced-form regressions to determine whether the impact of these external shocks is linked to the monetary policy framework. In particular, we interact the impact of the shock with a dummy constructed based on the classification based on the IMF's AREAER database, to reflect the difference in impact in economies that *de facto* targeting monetary aggregates or inflation with the ones targeting exchange rate (in different degrees) to ensure price stability. Failure to find a statistically different impact across alternative monetary policy frameworks would be consistent with the money neutrality hypothesis.

Our event study analysis of the CFA devaluation encompasses 28 Sub-Saharan African (SSA) LICs. That event can be interpreted as an unanticipated monetary policy shock and hence provides an ideal "natural experiment" for assessing the hypothesis of monetary neutrality, because that

[3] See Kydland and Prescott (1980) and Long and Plosser (1981).

[4] IMF (2005) shows that country specific shock contributed the most to output growth volatility until 2000, and that output growth volatility declined over time in developing countries. IMF (2011) emphasizes that there is mixed evidence on the relative importance of external versus idiosyncratic shocks in explaining output volatility in LICs, and that external shocks contribute to large output losses and protracted growth slowdowns in LICs.

hypothesis implies that the CFA devaluation would have a negligible impact on real GDP growth. Thus, we use a difference-in-difference approach to test whether the shock had a significant effect on real GDP growth of 10 countries within the CFA zone compared to a control group of 18 SSA countries with broadly similar characteristics apart from maintaining their own independent currencies and monetary policy frameworks.

Our findings decisively reject the hypothesis of monetary neutrality and provide strong support for the role of monetary policy frameworks in fostering macroeconomic stability in LICs. Surprises in global GDP, shifts in the terms of trade, and fluctuations in the price of oil all have a significant real output effect in countries with rigid nominal exchange rates, and the magnitude of those effects is significantly larger than in LICS that target monetary aggregates or inflation. These results are robust to various specifications, control variables, and subsamples of countries used. Moreover, similar results are evident for the subsample of very low income LICs, indicating that monetary policy frameworks matter in those economies as well. Similarly, our event study indicates a highly significant differential between the real GDP growth rates of countries in the CFA zone compared to the control group over the two-year period following the devaluation of the CFA franc.

Our regression analysis builds on the seminal work of Broda (2004), who analyzed the economic impact of terms of trade shocks using a panel dataset of 75 developing countries (including 30 LICs) over the period from 1973 to 1996 and found highly significant differences between regimes with fixed vs. flexible exchange rates.[5] The results of our event study analysis are broadly consistent with the findings of Hoffmaister et al. (1998), who estimated a structural vector autoregression (VAR) using panel data for sub-Saharan African countries from 1971 to 1993 and found that external shocks contributed to greater output volatility in the eight CFA zone members compared to the other fifteen countries in their sample.

[5] Edwards and Levy Yeyati (2005) analyzed terms of trade shocks in a larger panel dataset but did not report disaggregated results for LICs. Kose et al. (2003), Raddatz (2007) and Barrot et al. (2018) used panel data to analyze the influence of external shocks but did not assess the role of monetary policy frameworks. Calderón and Fuentes (2014) analyzed business cycles in advanced economies and EMEs but their sample did not include any LICs. Rose (2014) studied the impact of the global financial crisis in a large panel dataset but did not report disaggregated results by level of development; see also Terrone (2020).

Finally, our empirical approach is complementary but distinct from other recent studies that have used structural VAR models or dynamic stochastic general equilibrium (DSGE) models to analyze macroeconomic data for developing economies.[6]

The remainder of our paper is organized as follows. Section 2 describes the methodology of our reduced-form regression analysis. Section 3 summarizes the characteristics of the panel dataset. Sections 4, 5, and 6 provide the results for global demand shocks, terms of trade shocks, and oil price shocks, respectively. Section 7 presents our event study analysis of the January 1994 CFA devaluation. Section 8 concludes.

2. Methodology

Given the wide variation in the frequency of monthly price changes in LICs, we set up a research strategy allowing us to be agnostic about the degree of price stickiness in LICs. The null hypothesis we are testing is that external shocks would have the same impact on domestic output growth in every LIC once we control for differences in their real economic structure. This hypothesis is consistent with an absence of, or much smaller, nominal rigidities (price stickiness, information setting, incomplete knowledge). By contrast, under the alternative hypothesis that monetary policy frameworks matter for LICs, we would expect to find that the domestic impact of external shocks differs across LICs depending on the characteristics of each country's monetary policy framework.

To estimate the dynamic response of GDP growth to specific shocks, we use a parsimonious, single equation model. This approach, like Jordà (2005), is a flexible alternative to VARs to estimating impulse-response functions without imposing the dynamic restrictions embedded in VAR specifications. It is particularly suited to capture nonlinearities in dynamic responses. In particular, our analysis is focused on *reduced-form shocks*, which are a composite of the underlying *structural shocks* and don't require any identifying assumptions, and as opposed to most of the literature we do not rely on any specific economic theory or macro model. By construct, an approach that focused on *structural shocks* would require a set of identifying assumptions, which might be particularly problematic for LICs where the existing set of macro models may not be very suitable.

[6] For structural analysis of monetary transmission mechanisms in LICs, see Mishra and Montiel (2012), Portillo et al. (2016), Barajas et al. (2018), Berg and Portillo (2018), and Li et al. (2019). For structural analysis of the effects of government spending in LICs, see Shen et al. (2018).

Our strategy is to uncover the effect of innovations in the real GDP growth, according to the monetary policy framework, through the following equation:

$$y_{i,t+k} - y_{i,t} = \alpha_{i,k} + \gamma_{t,k} + \beta_k * \theta_1 * FE(x_{i,t}) * MP\_ER_{i,t} + \beta_k * \theta_2 * FE(x_{i,t}) * (1 - MP\_ER_{i,t}) + \varphi z_{i,t} + e_{i,t,k}$$

where $y_{i,t}$ is the logarithm of real GDP for country i in year t, and $y_{i,t+k} - y_{i,t}$ is the percent change in real GDP from year t to year $t+k$. The country-specific and time-specific effects are denoted by $\alpha_{i,k}$ and $\gamma_{t,k}$, respectively. $FE(x_{i,t})$ denotes the forecast error for a specific exogenous variable $x_{i,t}$. The vector of control variables is denoted by $z_{i,t}$.[7] The binary indicator $MP\_ER_{i,t}$ denotes the monetary policy framework, i.e., $MP\_ER_{i,t} = 1$ if country i has a rigid exchange rate during year t, and $MP\_ER_{i,t} = 0$ if country i targets monetary aggregates or inflation during year t. The pair of coefficients β_k $(k=1,2)$ allow us to construct the impulse response function (IRF) of real GDP $y_{i,t+k}$ to a specific shock $x_{i,t}$ at a horizon of k years. Since forecast error variance increases rapidly with the forecast horizon, considering values of k exceeding 2 years would add unnecessary noise and diminish the prospect of obtaining any statistically significant or economically meaningful results.

In this analysis, we use specific shocks that are highly relevant for LICs, namely, surprise changes in global demand, terms of trade, and oil prices.[8] If there is a significant response in the impact (coefficient of the monetary policy framework dummy interacted with the shock), for certain type of frameworks, and if the difference in impact is statistically significant according to the monetary policy framework used, then the design of the monetary policy framework matters in LICs.

The vector of control variables is specified as follows. First, we control for the impact of wars, because output growth volatility in LICs, especially sub-Saharan African LICs, depends a lot of internal or external conflicts, and we want to ensure that the results do not reflect this causality rather than a different growth impact due to the monetary policy framework employed. Second, when we test for terms of trade and oil price shocks, we control for the role of the external demand, to ensure we identify only the impact of these shocks on output growth, and not of a change in external demand. Third, to ensure that certain characteristic of the countries do not determine endogenously the choice of a certain monetary policy regime, and therefore alter the impact of the

[7] Introducing lag domestic GDP growth as a control variable would reduce autocorrelation in the error term at the expense of making more difficult to disentangle the difference in the impact of the shock relative to the monetary policy framework. To account for the possibility of autocorrelation in residuals we used robust standard errors.

[8] We ensure that we capture in each estimation a country that has the same framework at year t, and $t+1$.

shocks on output growth, we also control for those characteristics. Moreover, we control for outliers, and in the case of the world GDP shock we also show the results for the poorest LICs.

Wald tests are used first to assess the statistical difference between the effect of $x_{i,t}$ on $y_{i,t}$ across different monetary policy frameworks. In other words, we test to see if $\theta_1 \neq \theta_2$. Afterwards, we test our baseline hypothesis, that the monetary policy framework does not have a differentiated impact of the shock on growth. In other words, we test to see if $\theta_1 = 0$, $\theta_2 = 0$ and $\theta_1 - \theta_2 = 0$.

Table 1: List of Low-Income Countries (LICs)

Afghanistan	Albania	Angola	Armenia
Azerbaijan	Bangladesh	Benin	Bhutan
Bolivia	Burkina Faso	Burundi	Cabo Verde
Cambodia	Cameroon	Central African Republic	Chad
Comoros	Congo, Democratic Republic of the	Congo, Republic of	Côte d'Ivoire
Djibouti	Dominica	Eritrea	Ethiopia
Gambia, The	Georgia	Ghana	Grenada
Guinea	Guinea-Bissau	Guyana	Haiti
Honduras	India	Kenya	Kiribati
Kyrgyz Republic	Lao P.D.R.	Lesotho	Liberia
Madagascar	Malawi	Maldives	Mali
Mauritania	Moldova	Mongolia	Mozambique
Myanmar	Nepal	Nicaragua	Niger
Nigeria	Pakistan	Papua New Guinea	Rwanda
Samoa	São Tomé and Príncipe	Senegal	Sierra Leone
Solomon Islands	Sri Lanka	St. Lucia	St. Vincent and the Grenadines
Sudan	Tajikistan	Tanzania	Timor-Leste
Togo	Tonga	Uganda	Uzbekistan
Vanuatu	Vietnam	Yemen	Zambia

3. Data

Our analysis encompasses all countries that were classified as LICs at any point during the period 1990 to 2015; these countries are listed in Table 1. However, our panel dataset only includes observations for the years in which each country was classified as a LIC. Therefore, the panel is not fully balanced, and its cross-sectional dimension evolves over time, with 79 countries as of 1990 and only 60 countries as of 2015.[9]

Our monetary policy framework indicator distinguishes between (a) regimes that rely primarily on the exchange rate as the nominal anchor and (b) regimes that target monetary aggregates or

[9] The sources for the series used in our panel data analysis are indicated in Appendix II.

inflation.[10] The first group includes countries defined in the Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER, an IMF database) as following a monetary policy framework where the exchange rate serves as the nominal anchor.[11] For about one-third of the observations in our sample, the monetary policy framework is focused on targeting money or inflation; for all other observations, the monetary policy framework is focused on exchange rate stability.[12] We have verified that our key conclusions are robust to alternative classifications, and more granular results, varying for inflation versus monetary versus exchange rate targeting are available on request from the authors. As customary in the literature one observation is constituted by the framework of a country for a given year, as listed in the AREAER.

The AREAER classification of monetary policy frameworks uses a transparent and consistent methodology that incorporates judgments of the national authorities as well as Fund country teams. Of course, occasional misclassifications could occur; for example, Nigeria has been classified as a monetary targeting regime even though it was regularly intervening in the foreign exchange market. Such misclassifications would add noise to the data and tend to reduce the statistical significance of the results. Consequently, our results may be reasonably viewed as providing a lower bound for the true importance of monetary policy frameworks in LICs.

To construct the shock series, we use forecast errors for different horizons for selected "driver" variables. We use the *k*-year-ahead forecast published in the fall issue of the IMF's *World Economic Outlook* (WEO). We use this approach for computing forecast errors because the WEO covers the entire global economy and reflects rigorous analysis as well as the expert judgment of Fund staff. An alternative approach would be to use forecasts generated mechanically by a statistical model such as a VAR, but such forecasts would necessarily rely on specific technical assumptions (e.g., linearity or stationarity).

[10] It would be ideal to distinguish between monetary targets and inflation targeting, but only a single LIC (Ghana) initiated an inflation targeting framework prior to 2010.

[11] These include Hard Pegs (no separate legal tender, currency boards and conventional pegged arrangements), Soft Pegs (stabilized arrangements, crawling pegs, craw-like arrangements, pegged exchange rates within horizontal bands, and other managed arrangements), and a few other countries where the exchange rate serves as the intermediate anchor of monetary policy.

[12] See Appendix III for a detailed tabulation of observations according to monetary policy framework. For example, if the category of fixed exchange rate regimes was limited to Hard Pegs and Soft Pegs, that re-classification would only affect about 4 percent of the observations in our sample.

Table 2 displays some stylized facts regarding the LICs considered in our sample, summarized in selected descriptive statistics for the various control variables used (trade openness, capital account openness, financial depth and fiscal policy).[13] As the theory would predict, we observe that countries using exchange rate as an intermediate target to achieve price stability tend to be more open to trade. We also observe that we have roughly an equal amount of countries in both groups, over time, and no other characteristic that could be interpreted as driving the results is strongly statistically significant.

Table 2: Descriptive Statistics of Panel Dataset, 1990-2015

	Mean over sample		**Significance**
	Monetary and Inflation Targeting	**Exchange Rate Targeting**	**Equality of Means**
1. Trade openness			
Exports / GDP (X, in US$, percentage)	29	31	0.01
Imports / GDP (M, in US$, percentage)	42	47	0.00
(X + M) / GDP (in US$, percentage)	71	78	0.00
2. Capital account/financial openness			
Financial Account: Inflows / GDP (in US$, percentage)	6.1	5.3	0.20
Financial Account: Outflows / GDP (in US$, percentage)	2.3	2.7	0.33
Financial Account: Inflows + Outflows / GDP (in US$, percentage)	8.3	7.8	0.54
Financial Openness index	-0.3	-0.5	0.00
3. Financial depth			
Financial depth	14	25	0.00
4. Governance			
Corruption	2.1	2.3	0.00
Composite Risk rating	58.1	58.2	0.76
Economic Risk rating	29.8	31.0	0.00
Fincial Risk rating	31.5	31.1	0.44
Political Risk rating	54.8	54.3	0.39
5. GDP per capita US$			
All LICs *(79 countries)*	848	1498	0.00
LICs with GDP per capita below US$800	428	436	0.48
6. Central bank independence			
Component 1: CB CEO (0.20)	0.5	0.6	0.00
Component 2: CB objectives (0.15)	0.6	0.6	0.00
Component 3: Policy formulation (0.15)	0.6	0.6	0.03
Component 4: CB lending (0.50)	0.5	0.5	0.05
CBI Cukierman	0.5	0.4	0.00

[13] Measures of price flexibility were not included as control variables, since they are generally not available across time and countries.

Source: IMF World Economic Outlook.

4. Global Demand Shocks

For many developing countries that embrace an export-led growth strategy, external demand is crucial. Indeed, Rand and Tarp (2002) find that shocks originating from OECD economies are critically important drivers of short-run output fluctuations in developing economies.

To compute our measure of external demand shocks, we compare actual and forecast data from country-specific world GDP growth, which is weighted by trade flows from all trading partners. The difference between actual data, measured at year *t*, and the WEO forecast of the same variable made at year *t-1* for realization at year t, (i.e., the one-year and two-year ahead forecast error realized at year *t*) is interpreted as the unanticipated shock to world GDP growth. We test to see if the effect of 1 percent shock to the world GDP[14] on domestic output growth rate would be the same regardless of the monetary policy framework employed.

The intuition is that a positive unanticipated external demand shock increases aggregate demand, pushing up money demand and prices. Since the shock was unanticipated, and money supply was set up ex ante, interest rates rise. In frameworks where the nominal exchange rate should remain unchanged, the central bank offsets this decline in real money balances and lowers interest rates to maintain the exchange rate parity. Aggregate demand increases further, but interest rates remain unchanged. In countries where the exchange rate is not kept fixed to achieve price stability, the change in real money balances can be offset, and the nominal exchange rate would adjust to bring aggregate demand back in equilibrium. As a result, interest rates change (especially if inflation forecast deviated from target), but aggregate demand may not change.[15]

This is what we observe in Table 3 where we present the results. In response to an unanticipated positive one-percent shock to the world GDP, there is a positive effect on domestic output growth (by about 0.5 percentage points) only in frameworks maintaining price stability through fixed exchange rates. Moreover, this effect is highly statistically significant (mostly at 1 percent level) in the year when the shock occurs (horizon 0), and, also in the subsequent year. And there is a

[14] This is a reasonable normalization, as commonly used in the literature. The forecast errors of the world GDP vary from -3.6 to +1.9 percent, and the standard deviation is 1.1 percent.

[15] Standard case of perfect capital mobility and no impediments to transmission mechanism, like dollarization.

statistically significant difference between the effects in frameworks based on countries targeting the exchange rates versus monetary or inflation targeting frameworks.

For the inflation or monetary targeting economies to respond in the way we described above, prices would need to adjust relatively slowly. Otherwise the response to the shock would occur relatively fast through prices.[16]

Table 3: Effect of a One-Percent Shock to World GDP on Domestic Output Growth

Sample: All LICs *(79 countries, 1578 observations)*		
MP Framework	*k* (horizon in years)	
	0	1
Exchange Rate	0.49***	0.54***
Inflation or Monetary Targeting	0.16	-0.09
Difference	0.33*	0.63***
Sample: LICs with GDP Per Capita below US$800 *(62 countries, 870 observations)*		
Exchange Rate	0.43**	0.86***
Inflation or Monetary Targeting	-0.18	-0.03
Difference	0.62**	0.88***

Note: The regression is estimated using Panel Least Squares. The asterisks ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively. The regression variables are specified as follows:

Dependent : domestic real GDP growth rate at time *t+k,* (100*(log GDPt+k - log GDPt+k-1))

Independent: (i) country fixed effects, (ii) forecast error world GDP at time t, interacted with monetary policy framework dummy coefficients (exchange rate versus inflation or money targeting), and (iii) battle-related deaths (war)

In principle, such results could differ according to relative income levels. For example, one could presume that in countries with preponderant agricultural sectors and small manufacturing sectors (the lowest income countries) prices and wages might be particularly flexible and hence global demand shocks might have different effects compared to moderately more developed LICs.

[16] Anand and others (2015) show that in a small open developing economy with incomplete markets and food expenditures representing a high share of total consumption expenditures; a central bank, can maximize welfare by replicating the flexible price equilibrium, under certain conditions (e.g. targeting core inflation).

Thus, we can check the robustness of the results by testing this hypothesis for a sub-sample of the poorest LICs. The intuition is that those are the countries that have the largest share of the economy operating as a self-subsistence economy, and if there is employment outside the house it will be largely informal. In these cases, intertemporal contracts will be non-existent, and prices for the basic goods in the consumer basket will adjust faster.

To undertake this analysis, we select the observations below the median GDP per capita. To ensure robustness, we calculate the median using two different statistics, and report the results for both subsamples as follows. First, with a subsample containing countries that in 1990 were below the median GDP per capita calculated across the sample (US$800), and second, with a subsample containing countries that in 1990 were below the cross-country median for 1990 (US$541). The country has to remain in this category for at least a year to be in subsample of the poorest LICs. About sixty percent of our sample are in the first subsample.

We show the results in the first case in Table 3 and observe that the results are stronger than the average for the sample. For example, the impact of the shock in frameworks centered around more rigid exchange rates, is stronger by up to sixty percent in the year following the shock (horizon 1) than in the case of our entire sample of LICs, and the difference in impact among the two types of frameworks almost doubles in the year of the shock.[17]

The results are also robust according to a variety of methods and controls used. Table 4 reports the difference in coefficients for various monetary policy frameworks when controlling for various factors (outliers, and one control variable at a time, as follows). First, the difference in coefficients associated with the monetary policy framework remains significant at 1 percent when we use different ways to eliminate outliers. Second, the control variables are statistically significant and introducing these controls weaken the results somewhat: (i) the results at the impact of the shock (horizon 0) are now insignificant (they remain significant at 1-year horizon), and (ii) introducing the controls lower the impact of shocks at horizon 1 for financial depth. This is in line with other results found in the literature.[18]

[17] The results hold including for the poorest LICs (with income below US$540.7), especially in the year following the shock. For countries above the median the results still hold, and the impact is stronger in the year of the shock; results available by request.

[18] Broda (2004) finds that trade openness is the only systematically significant control, and that introducing such a control makes the difference among regimes less significant.

Table 4: Sensitivity Analysis of World GDP Shocks on Domestic Output Growth

Difference in Coefficients between Monetary Policy Frameworks

Sample: All LICs; *(79 countries 1552 observations)*		
Horizon	*k* (horizon in years)	
	0	1
Baseline, controling for outliers	0.19	0.66***
Additional Controls:		
Trade Openness	0.20	0.60***
Capital Openness (Inflows + Outflows / GDP)	0.19	0.62***
Capital Openness (Ito's index)	0.20	0.48***
Financial Depth (Bank assests / GDP)	0.17	0.52***
Financial Depth (Credit to private sector / GDP)	0.14	0.59***
Fiscal Policy	0.15	0.34**

Note: In each regression, outliers are excluded using the studentized residual method. The regressions are estimated using Panel Least Squares. The asterisks ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively. The regression variables are specified as follows:

Dependent: domestic real GDP growth rate at time *t+k,* (100*(log GDPt+k - log GDPt+k-1))

Independent: (i) country fixed effects, (ii) forecast error world GDP at time *t*, interacted with monetary policy framework dummy coefficients (exchange rate versus inflation or money targeting), (iii) battle-related deaths (*war*) and (iv) one control variable at a time, listed above

The introduction of such control variables ensures that correlations between the monetary policy framework and other characteristics of that country are not captured by the monetary policy framework variable. A number of control variables are also included in the regressions, as commonly used in the literature: trade openness (the share of trade in the country's output, defined as the sum of nominal exports and imports divided by the nominal GDP), capital account openness (measured as the sum of capital inflows and outflows as a share of GDP), financial depth (measured as deposit money bank assets as a percent of GDP), and the overall fiscal balance for central government (also as a percent of GDP).

To summarize, we find strong and robust evidence the effect on domestic output growth of unanticipated surprises to external demand depends on the monetary policy framework used. This implies that even in monetary policy frameworks targeting inflation and money, prices adjust

relatively slowly to allow for the exchange rate to act as a shock absorber.[19] The results hold even for the poorest LICs. The source and size of this nominal rigidity (price stickiness, informational friction, etc.) needs to be further studied to properly assess impacts of shocks on LICs, and the appropriate policy response, especially as many of these LICs are modernizing their monetary policy frameworks.

5. Terms of Trade Shocks

Developing countries (which include LICs) tend to have growth strategies centered on integrating their economies into the global supply chain and developing through exports growth. Therefore, understanding the effects of a terms of trade shock[20] on domestic growth and how it varies with the monetary policy framework used is also very important.

To the extent that LICs are price takers in the commodity markets, the monetary policy framework affects the impact of a change in terms of trade on domestic output growth.[21] A rise in the value of a country's currency lowers the domestic prices of its imports but may not directly affect the prices of the commodities it exports. As some countries could be price makers, we expect weaker results than in the previous case of an external demand shock.

The shock is defined as before, the difference between the actual variable (here a country's terms of trade) and its forecast at horizon *k*. We consider a typical shock size of 10 percent.[22] Such an unanticipated improvement to a country's terms of trade should expand its net exports and hence raise its aggregate demand. The intuition is similar as before. In the monetary policy framework centered around a fixed exchange rate, the rise in aggregate demand puts pressure on interest and

[19] In frameworks with fixed exchange rates, liquidity management becomes crucial. In such a case an exogenous external shock induces fluctuations in foreign exchange reserves that may generate greater volatility in the liquidity of the banking system, and the central banks' effective use of various tools—including the policy rate, reserve requirements and other sterilization instruments— can dampen the transmission of exogenous shocks to the real economy (see El Hamiani and Veyrun, 2019).

[20] The terms of trade are the relative price of imports in terms of exports in domestic currency. An improvement of a nation's terms of trade benefits that country; it can buy more imports for any given level of exports.

[21] There are some cases where a particular country has a dominant role in the production of a specific commodity. For example, in 2012 Cote d'Ivoire produced about one-third of the world's supply of cocoa and Madagascar accounted for about one-fifth of the global supply of bourbon vanilla.

[22] The standard deviation of the forecast error of the terms of trade is about 15 percent.

exchange rates. Since the value of the exchange rate should remain fixed, the central bank would offset this effect. If we observe a distinct response of this shock in a monetary policy framework targeting money or inflation, it would be because the exchange rate would be able to adjust, *and* other prices do not adjust instantaneously.

The top panel of Table 5 confirms this intuition. In response to an unanticipated ten-percent shock to the terms of trade, there is a positive effect on domestic output growth (about 0.2 percentage points) mainly in frameworks maintaining price stability through rigid exchange rates. This effect is statistically significant at the 5 percent level in the year when the shock occurs (horizon 0), and at 10 percent in the subsequent year. Moreover, there is a highly statistically significant difference between the effects in frameworks with rigid exchange rate versus monetary or inflation targeting frameworks (1 percent at 1-year horizon).

The lower panel of Table 5 examines the robustness of these results when we eliminate the influence of outliers and control for other characteristics of the countries studied. Indeed, the precision and statistical significance of our key results is generally strengthened by doing so.

Our sensitivity analysis also highlights potential interactions between monetary and fiscal policy in determining the propagation of shocks. In principle, accommodative fiscal policy could offset restrictive monetary policy, in which case the effects of monetary policy framework might not be readily apparent from the reduced-form impact on economic growth. However, as shown in the final row of Table 5, such interactions are not strong enough to mask the difference in the growth impact of a global demand shock across monetary policy frameworks. By contrast, as shown in the final row of Table 4 (inclusion of fiscal policy), it does not allow us to pinpoint the role of the monetary policy framework in the propagation of terms of trade shocks on GDP growth.[23]

[23] Broda (2014) finds that when including all control variables results weaken. Furthermore, Catao and Chang (2015) show that when imported food price shocks are substantial, in the presence of sticky prices and incomplete international risk sharing, the real exchange rate and terms of trade can move in opposite directions and there are trade-offs between (monetary) policy rules.

Table 5: Effect of a 10 Percent Terms of Trade Shock on Domestic Output Growth

Sample: All LICs *(76 countries, 1504 observations)*		
MP Framework	*k* (horizon in years)	
	0	1
Exchange Rate	0.28**	0.16*
Inflation or Monetary Targeting	-0.17	-0.16*
Difference	0.45***	0.32***
Sensitivity analysis: Difference in monetary policy framework coefficients		
Sample: All LICs *(76 countries, 1484 observations)*		
Baseline, controling for outliers	0.44**	0.29**
Additional Controls:		
Trade Openness	0.44**	0.29**
Capital Openness (Inflows + Outflows / GDP)	0.40**	0.27**
Capital Openness (Ito's index)	0.47**	0.37**
Financial Depth (Bank assests / GDP)	0.52***	0.37***
Financial Depth (Credit to private sector / GDP)	0.45***	0.37***
Fiscal Policy	0.13	0.04

Note: The regressions are estimated using Panel Least Squares. The asterisks ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively. In the sensitivity analysis regressions, outliers are excluded using the studentized residual method. The regression variables are specified as follows:

Dependent: domestic real GDP growth rate at time *t+k,* (100*(log GDPt+k - log GDPt+k-1))

Independent: (i) country fixed effects, (ii) forecast error world GDP at time *t*, interacted with monetary policy framework dummy coefficients (exchange rate versus inflation or money targeting), (iii) battle-related deaths (*war*), and (iv) country specific external demand (to control for world GDP). Results available by request for introducing one additional control variable at a time, as in Table 2

6. Oil Price Shocks

Next, we turn to the impact of oil price shocks. In a monetary policy framework that targets inflation, a central bank would respond to such shock only to the extent that the second-round effects will push the expected inflation at the targeting horizon to deviate from the inflation target. As before, a difference in the impact on the domestic output growth according to the monetary policy framework used would be present only to the extent to which prices do not adjust immediately, and the exchange rate adjust to buffer the economy instead.

Previous research analyzing the effects of oil price shocks in LICs find that the effect of the most recent oil price shock (starting in 2014) on the output growth of oil importing countries has been muted; see Obstfeld et al. (2016) and Cerdeiro and Plotnikov (2017). One explanation is that most countries, especially the LICs, use oil price subsidies. Since their economy was somewhat insulated when the prices were high, then the aggregate demand did not expand when the prices collapsed, if they were importers. That is the case regardless of the monetary policy framework used.

We also find that the impact of a ten percent oil price shock (the shock defined as before, unanticipated surprises between the forecast of the prices at a year horizon and the actual price) does not differ across monetary policy frameworks for oil importing countries. [24] The results are not reported here but are available on request from the authors.

For big oil exporters (countries that have crude oil production exceeding 5% of their nominal GDP in at least one year of our sample), an unanticipated 10 percent change in oil prices leads to an increase in net exports, and therefore aggregate demand.[25] In the presence of rigidities and frictions, the exchange rate would adjust to buffer the economy from the shock, rather than the prices. As such, we expect a significantly different impact of such shock on domestic output growth across different monetary policy frameworks.

[24] Specifying the magnitude of the oil price shock at 10 percent is conventional in the literature. The forecast error of oil price varies in our sample between -60 and +40 percent, the median of the oil price forecast error is 12 percent.

[25] We converted the IEA measure (in metric ton) into barrels using the standard conversion factor of 7.33 bbl/ton, then we computed the US$ value of crude oil production by multiplying oil price, and then computed the ratio to nominal GDP. While this is a relatively low threshold, given the size of the sample, it is useful.

Table 4 supports this intuition. In response to an unanticipated ten-percent shock to global oil prices, there is a positive effect on domestic output growth (by about 0.45 percentage points in the year of the shock and higher in the subsequent year) only in frameworks maintaining price stability through rigid exchange rates. The impact is statistically significant at the 99 percent confidence level, especially one year after the shock, and there is a statistically significant difference between the effects in frameworks with rigid exchange rate versus monetary or inflation targeting frameworks in the year after the shock.

These findings are robust to removing outliers and adding other control variables, especially in the year following the shock. These results are broadly consistent with the findings of Grigoli et al. (2017), who found that the 2014 oil price shock affected disproportionately the oil exporters targeting an exchange rate. This strong and robust statistical difference in the effect on domestic output growth of an oil price shocks for big oil exporters, implies that big oil exporters using a fixed exchange rate as a nominal anchor have a very volatile domestic output growth. They benefit tremendously when oil prices increase and suffer a lot when oil prices plunge.

Good demand management, as well as a consistent policy mix, adjustment strategies, and strong built-in automatic stabilizers and safety nets are needed to best take advantage of natural resources, if the LICs choose a monetary policy framework geared towards achieving price stability by maintaining a rigid exchange rate. Nominal wage flexibility also becomes very important as part of the needed adjustment to restore competitiveness.

Table 6: Effect of a 10 Percent Global Oil Price Shock on Domestic Output Growth

Sample: LICs big oil exporting *(9 countries, 183 observations)*		
MP Framework	*k* (horizon in years)	
	0	1
Exchange Rate	0.46**	0.69***
Inflation or Monetary Targeting	0.62*	-0.03
Difference	-0.16	0.66***
Sensitivity analysis: Difference in monetary policy framework coefficients		
Sample: LICs big oil exporting *(9 countries, 183 observations)*		
Baseline, controling for outliers	0.30	0.71***
Additional Controls:		
Trade Openness	0.32	0.71***
Capital Openness (Inflows + Outflows / GDP)	0.24	0.66***
Capital Openness (Ito's index)	0.27	0.87***
Financial Depth (Bank assests / GDP)	0.28	0.62***
Financial Depth (Credit to private sector / GDP)	0.29	0.68***
Fiscal Policy	0.10	0.43*

Note: The regressions are estimated using Panel Least Squares. The asterisks ***, **, * denote statistical significance at the 1, 5, and 10 percent levels, respectively. In the sensitivity analysis regressions, outliers are excluded using the studentized residual method. The regression variables are specified as follows:

Dependent: domestic real GDP growth rate at time *t+k,* (100*(log GDPt+k - log GDPt+k-1))

Independent: (i) country fixed effects, (ii) forecast error world GDP at time *t*, interacted with monetary policy framework dummy coefficients (exchange rate versus inflation or money targeting), (iii) battle-related deaths (*war*), (iv) country specific external demand (to control for world GDP)

Big oil exporters: Angola, Cameroon, Chad, Rep. of Congo, Ghana, Mauritania, Nigeria, Sudan, Yemen

7. Event Study of the January 1994 CFA Devaluation

The CFA zone consists of fourteen countries, belonging to two currency unions, the West African Economic and Monetary Union (WAEMU), and Central African Economic and Monetary community (CEMAC). The common currency used in each union is the Central African Franc (CFA), fixed to the French franc since 1980, and to the euro since 1999. Many of these countries have relied heavily on exports of primary commodities: cocoa and coffee (Cote d'lvoire), petroleum (Congo, Gabon, Cameroon), cotton (Chad, Burkina Faso, Mali), and phosphate (Togo).

Heavy dependence on commodity exports posed a problem between 1984 and 1989 when the commodity prices (denominated in U.S. dollar) declined—more than 60% for cocoa and petroleum US$ prices, with the cocoa price reaching a fourteen-year low. In addition, the variation of the U.S. dollar-French franc exchange introduced more volatility in the CFA prices, and worsened the countries' economic plight. The loss of income and purchasing power for exporters was accompanied by a loss of domestic demand as the imports became cheaper, such that these economies grew little or not at all for most of the late 1980s and at the start of the 1990s.[26]

In response, most CFA countries implemented one austerity program after another to adjust their real exchange rate. However, by late 1993 the extent of the overvaluation was 30 percent on average. To address this situation, the CFA countries engaged in highly confidential consultations with the IMF and France, leading to the decision to devalue the CFA franc by 50 percent on January 1st, 1994.[27] Thus, while a devaluation in the CFA zone had been expected at some point, its timing and magnitude were not anticipated.

Our event study focusses on assessing the impact of this monetary policy shock on output growth. We examine the evolution of real GDP growth of 10 African LICs within the CFA Zone: Benin, Burkina Faso, Cameron, Central African Republic, Chad, Cote d'Ivoire, Mali, Niger, Senegal, and Togo.[28] To provide a benchmark for comparison, we also examine a control group of 18 other African LICs: Burundi, Cabo Verde, Comoros, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau,

[26] A report issued by the Overseas Development Institute (1990) noted that highly publicized nominal wage cuts in the CFA zone countries had sparked significant political unrest in the late 1980s.

[27] As discussed by Beaudry and Sowa (1994), the experience of Ghana showed that a currency devaluation could help reduce real wages and improve external competitiveness.

[28] We exclude two high-income countries (Gabon and Equatorial Guinea) and three countries that were severely affected by military conflict during the early 1990s (Democratic Republic of Congo, Republic of Congo, and Rwanda).

Kenya, Lesotho, Madagascar, Malawi, Mozambique, Nigeria, Sao Tome & Principe, Tanzania, Uganda, and Zambia.[29] In contrast to the members of the CFA zone, these countries maintained their own independent national currencies and had more flexible monetary policy frameworks.

Table 6: Comparison of Key Indicators for CFA Zone vs. Control Group Countries

	CFA Zone			Control Group		
Indicator	**Mean**	**Min**	**Max**	**Mean**	**Min**	**Max**
Population (millions)	9	3	15	18	0	108
Real GDP Per Capita ($US)	409	197	777	489	148	1,342
Trade/GDP (Export + Imports / GDP, percentage)	24	17	36	28	10	81
Capital Flows/GDP (Inflows + Outflows / GDP, ooercentage)	2	-1	11	5	-1	18
Financial Depth (Bank Assets / GDP, percentage)	14	6	29	13	4	25
Corruption Index	3	2	4	3	2	4
Political Risk Rating	50	41	63	54	41	65
Composite Risk Rating	53	48	59	53	39	64

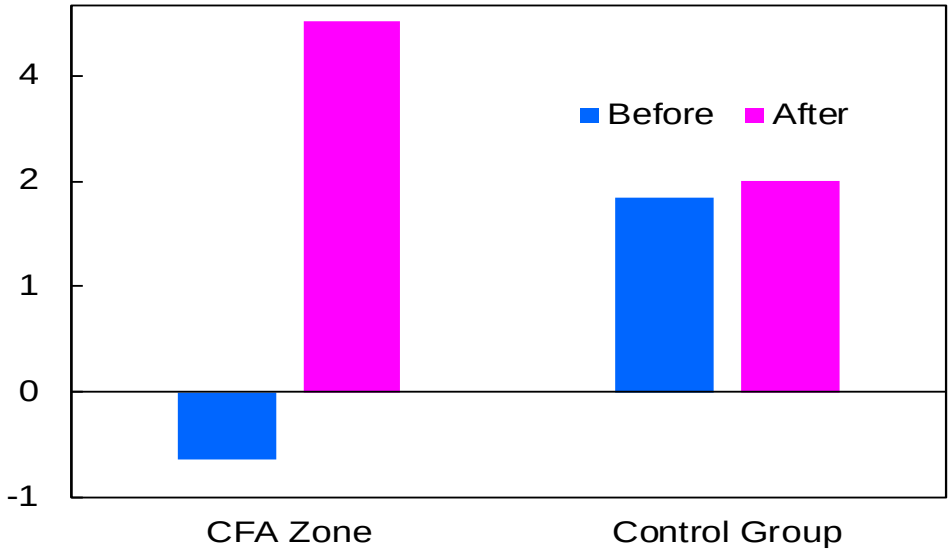
As shown in Table 6, as of 1993 the countries in the control group were broadly similar to the countries in the CFA zone, thereby bolstering the rationale for treating the January 1994 devaluation as a natural experiment. In particular, both groups of countries had relatively similar levels of development (real GDP per capita), trade and capital account openness, financial depth, and measures of governance and political risk. The average level of real GDP per capita is similar across the two groups, and while the range of values is somewhat wider in the control group, we can account for that characteristic in our sensitivity analysis. Finally, Lesotho is the only country in the control group for which the degree of trade openness is much higher than any of the countries in the CFA zone, but the results are not sensitive to its inclusion or exclusion from our analysis.

To assess the impact of the CFA devaluation, we use a difference-in-differences approach to compare the average real output growth outcomes before and after the shock within the CFA zone to the countries in the control group. Concretely, we measure the difference in average real GDP

[29] This control group excludes three sub-Saharan African countries that were not classified as LICs as of 1993 (Botswana, Gabon, and South Africa) and four other countries for which GDP data was not available in 1992-95 (Angola, Eritrea, Liberia, and Sierra Leone). It should also be noted that Guinea-Bissau had its own currency during this period and subsequently joined the CFA zone in 1997.

growth before and after 1994. We allow two-years after devaluation to capture all effects and compare the average growth rate over 1994–1995 with that during 1992–1993 (Figure 2), with the differences reported for the two groups in Table 6.[30] To ensure that the results are not driven by country specific events, we report in Figure 2 and Table 6 the demeaned rates (over the 1990–2015 sample) for each group. In addition, we present in Figure 3 the distribution of the differences in these two-year growth rates (pre- and post-1994).

Figure 2: Contrast in Real GDP Growth in 1992-93 vs. 1994-95



Since we observe a statistically different growth performance post devaluation in the CFA zone, and not one in the control group, then we could infer that the devaluation had real effects: the nominal devaluation led to an instant and full adjustment in prices. In particular, as shown in Figure 2, the results are clearly inconsistent with the hypothesis of monetary neutrality. Real GDP growth on average improved by 5 percent after the devaluation in the CFA zone, while the control group's growth performance was roughly similar before and after 1994.

As shown in Table 7, this result is statistically significant and robust. Indeed, the impact on real growth of the devaluation in the CFA zone is estimated between 2¾ and 5½ percent once we exclude outliers.

[30] The specification of the 2-year time window is intended to capture a high proportion of the impact of a monetary policy shock on real output while minimizing the degree of noise that could result from other types of shocks. Results for a one-year window are similar to those presented here.

Table 7: Contrast in Real GDP Growth in 1992-93 vs. 1994-95

Sample: 28 sub-Saharan African LICs 1/			
Difference in Growth (1994-1995 versus 1992-1993)	**CFA**	**Control group**	**Difference in difference**
Baseline	5.21**	-0.23	5.44*
	(2.06)	(1.23)	p-value 0.07
Sensitivity Analysis: selected sub-Saharan African LICs			
Exclude CFA outlier with very high 1994 growth (Togo)	2.81**	-0.23	3.04*
	(1.13)	(1.23)	p-value 0.06
Exclude Highest Income LICs 2/	5.32**	-0.34	5.66*
	(2.18)	(1.35)	p-value 0.08
Exclude Lowest Income LICs 3/	5.52**	-0.54	6.06*
	(2.30)	(1.48)	p-value 0.08

Note: The regression is estimated using Panel Least Squares. The asterisks ***, **, * denote statistical significance at th 5, and 10 percent levels, respectively. the standard deviation is reported under each coefficient. The p-value refers to th chi-squared test of equality between the coefficients for the CFA zone and the control group. The regression variables a specified as follows:

Dependent: Change in two year real GDP growth rate (1994-1995 versus 1992-1993), demeaned

Independent: Constant, CFA zone dummy, and battle related deaths (to control for wars)

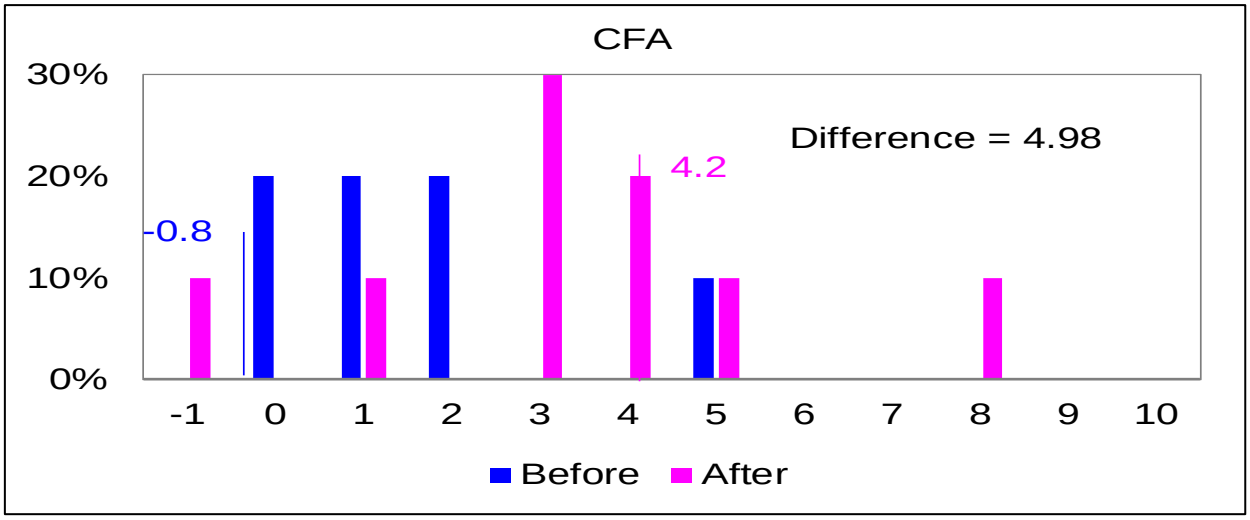
1/ 10 countries CFA (Benin, Burkina Faso, Cameroon, CAR, Chad, Cote d'Ivoire, Mali, Niger, Senegal, and Togo). 18 control group countries (Burundi, Cabo Verde, Comoros, Ethiopia, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Nigeria, Sao Tome & Principe, Tanzania, Uganda, and Zambia).

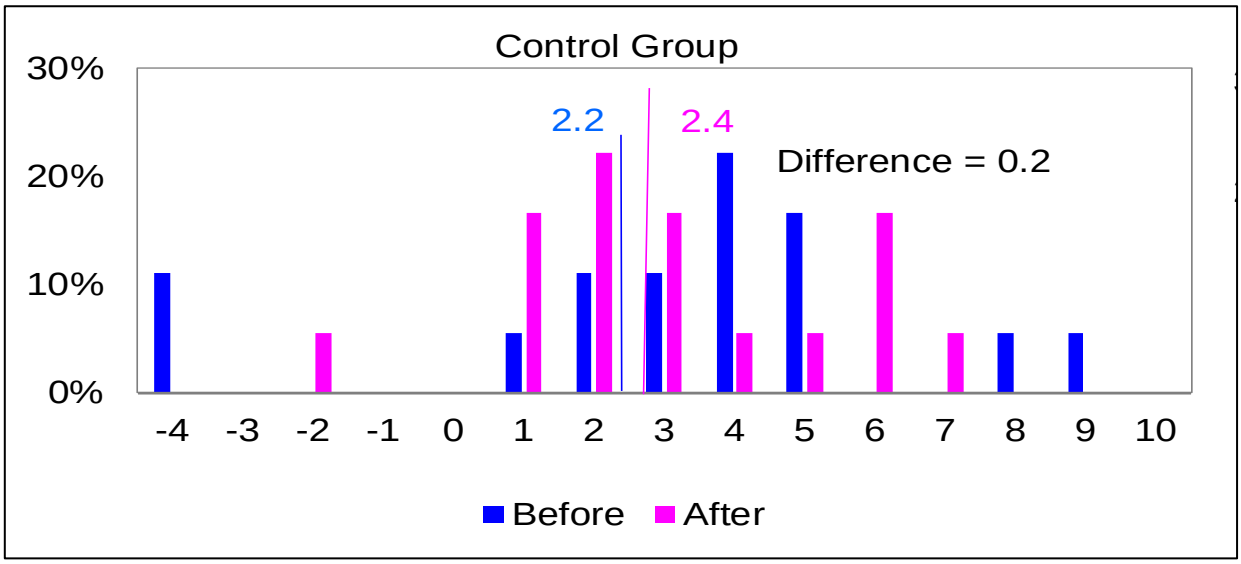
2/ Exclude countries where GDP per capita exceeded US$ 800 in 1995 (Cabo Verde and Nigeria).

3/ Exclude countries where GDP per capita was below US$180 in 1995 (Burundi, Ethiopia, Mozambique, and Tanzania)

Figure 3 shows the cross-country distribution of the growth performance in the CFA zone and the control group in 1992-93 vs. 1994-95, with the same implications as Figure 2. The average growth in the CFA zone was about 4 percent after the devaluation, and the difference between before and after 1994 two-year windows was about 5 percent and statistically significant.

Figure 3: Cross-Country Distribution of Real GDP Growth in 1992-93 vs. 1994-95





8. Conclusions

In recent years many LICs have been modernizing their monetary policy frameworks. The results of our paper provide strong empirical support for the importance of that progress. We overwhelmingly reject the hypothesis that monetary policy frameworks do not matter in LICs. First, we analyze the response of output growth (real GDP) to shocks stemming from abroad (including surprises in the world GDP, shifts in the terms of trade, and fluctuations in the price of oil) using panel data for 79 LICs over the period 1990–2015. Second, we use event study analysis and find that a large surprise devaluation of the CFA franc in early 1994 had highly significant effects on the real GDP growth of 10 African LICs within the CFA zone compared to an otherwise broadly similar group of 18 other African LICs that had different monetary policy frameworks. The results are robust to various specifications—including shocks, control variables, and subsamples—and hold even for the poorest LICs, indicating that nominal rigidities are present in those economies as well.

In particular, we find highly significant differences in the response to shocks on real output growth between LICs with monetary policy frameworks implemented through rigid nominal exchange rates and LICs implementing monetary or inflation targeting. The countries that use exchange rate targeting to ensure price stability see a statistically larger response in real domestic output growth than countries targeting inflation or money.

Our empirical analysis reaches these conclusions without imposing a model or economic structure borrowed from advanced economies. While the paper does not shed light on the underlying causes of money non-neutrality, our findings have broader implications for the formulation of structural models of the monetary transmission mechanism in LICs. In particular, given the relatively high frequency of price adjustment in LICs (as evident from Figure 1), monetary non-neutrality may not reflect the forms of price rigidity that have been embedded in conventional New Keynesian models for more advanced economies.[31] Other potential sources of nominal rigidity might arise from informational frictions, including incomplete knowledge about the underlying structure of the economy as well as misperceptions of the central bank's monetary policy goals, strategies, and

[31] In discussing macroeconomic models of advanced economies, Stiglitz et al. (2006) emphasized that *"it is by no means clear that applying these theories [to LICs] is either justified or appropriate."*

operations.[32] Clarifying the sources of these rigidities in LICs, as well as their magnitude should be a priority for future research, which will in turn provide further insights into analyzing how policymakers in LICs can respond effectively to domestic and external shocks.

More broadly, the building blocks needed for a successful monetary policy framework in LICs are remarkably similar to the best practice for advanced economies and emerging markets (see IMF, 2015). Unsal and others (2020) have recently emphasized the joint relevance of *de jure* and *de facto* characteristics of monetary policy frameworks. Indeed, having a systematic and transparent monetary policy framework may become even more important as LICs face the aftermath of the COVID-19 pandemic and its associated economic disruptions across the globe.

[32] See Mankiw and Reiss (2002), Erceg and Levin (2003), Mackowiak and Wiederholt (2009). Walsh (2017) provides a comprehensive review of structural forms of nominal rigidities that have been implemented in various dynamic stochastic general equilibrium macroeconomic models.

Appendix I: Data Sources for Figure 1

Country	Sample Period	Price Adjustment Frequency *(monthly, percent)*	Source
Barbados	1994-2008	65	Craigwell et al. (2011)
Brazil	2007	32	Gouvea (2007)
Chile	2008	40	Julio et al. (2008)
Colombia	2008	42	Julio et al. (2008)
Eurozone	1996-2001	25	Dhyne et al. (2006)
Ghana	1997-2013	94	Alidou (2014)
Japan	1989-2003	21	Masahiro and Saita (2007)
Lesotho	2002-2009	36	Nchake (2012
Sierra Leone	2006	51	Kovanen (2006)
South Africa	2002-2010	62	Creamer and Rankin (2012)
Turkey	1988-2006	26	Şahinöz and Saraçoğlu (2011)
United States	1988-2004	29	Klenow and Kryvtsov (2008)

Note: For each country listed in this table, the level of PPP-adjusted real GDP per capita in 2017 (measured in constant 2017 international dollars) was obtained from the World Bank's online database at *https://data.worldbank.org*.

Appendix II: Sources for Panel Data Analysis

Variable	Notation	Source	Transformation/Unit
Monetary policy indicator	*MP_ER*	AREAER	Dummy
Real GDP	*GDP*	WEO	In logs; 2005 = 100
World GDP	*WGDP*	WEO	In logs; 2005 = 100
Terms of trade	*ToT*	WEO / IFS	Unit value of exports / unit value of imports, in logs; 2005 = 100
Oil prices	*Oil*	WEO	In logs; 2005 = 100
Oil producing indicator	*OilExp*	IEA	Crude oil production exceeding 5% of NGDP
Wars	*War*	Uppsala Conflict Data / UN	Number of battle-related deaths / number of total population
Nominal GDP	*NGDP*	WEO	
Trade Openness	*TO*	WEO	Nominal exports + Nominal imports (US$) / Nominal GDP (US$)
Capital Account Openness	*FA*	WEO	Financial account inflows + outflows (US$) / Nominal GDP (US$)
Capital Account Openness: Ito index	*CAI*	Chinn-Ito	
Financial Depth: deposit money banks assets (percent of domestic currency GDP)	*BA*	Global Financial Development	
Financial Depth: credit to the private sector (percent of domestic currency GDP)	*CPS*	Global Financial Development	
Fiscal Policy: central government overall balance (domestic currency)	*CGBAL*	WEO	Percent of nominal GDP (domestic currency)
International Country Risk Guide index and main subcomponents	*ICRG*	PRS group	
Central bank independence index and subcomponents	*CBI*	Cukierman	

APPENDIX III: MONETARY POLICY FRAMEWORKS IN LICs, 1990–2015

Exchange rate regimes					
	Hard Pegs	**Soft Pegs**	**Flexible**	**Total**	**Monetary Policy Frameworks**
ER targeting	845	195	24	1,064	
Money targeting	0	82	472	554	
Inflation targeting	0	4	29	33	
Total	**845**	**281**	**525**	**1,651**	

Source: IMF AREAR.

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