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Trinity Strikes Back: Monetary Independence and Inflation in the Caribbean

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Trinity Strikes Back: Monetary Independence and Inflation in the Caribbean

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Abstract

Monetary independence is at the core of the macroeconomic policy trilemma stating that an independent monetary policy, a fixed exchange rate and free movement of capital cannot exist at the same time. This study examines the relationship between monetary autonomy and inflation dynamics in a panel of Caribbean countries over the period 1980–2017. The empirical results show that monetary independence is a significant factor in determining inflation, even after controlling for macroeconomic developments. In other words, greater monetary policy independence, measured as a country's ability to conduct its own monetary policy for domestic purposes independent of external monetary influences, leads to lower consumer price inflation. This relationship—robust to alternative specifications and estimation methodologies—has clear policy implications, especially for countries that maintain pegged exchange rates relative to the U.S. dollar with a critical bearing on monetary autonomy.

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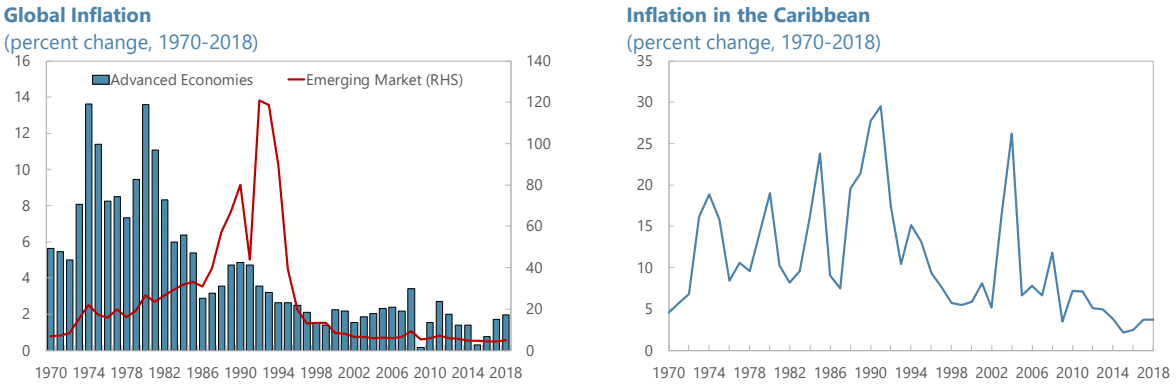
I. INTRODUCTION

Global inflation has been trending down from the peak of over 40 percent in the 1990s to an average of 3.5 percent over the past decade. A similar pattern, albeit more volatile, is evident among the Caribbean countries, where average inflation moved from 17.4 percent to 4.5 percent over the same period (Figure 1). Nevertheless, there are considerable differences in the level of inflation and how the disinflation process has evolved across countries over time. Empirical evidence points to macroeconomic developments and institutional factors such as greater central bank autonomy in conducting monetary policy as significant contributors to price stability (Cecchetti and Krause, 2002; Rogoff, 2003; Borio and Filardo, 2007; Auer, Levchenko, and Sauré, 2018; Ha, Kose, and Ohnsorge, 2019). The bulk of the literature, however, has focused on legal central bank independence from political influences in the conduct of monetary policy, with little attention to effective monetary autonomy. The latter is at the core of the macroeconomic policy trilemma stating that an independent monetary policy, a fixed exchange rate and free movement of capital cannot exist at the same time (Obstfeld and Taylor, 2004; Obstfeld, Shambaugh, and Taylor, 2005). The "impossible trinity" or the "trilemma" states that a country may simultaneously choose any two, but not all, of the following three objectives: monetary independence, exchange rate stability and financial openness. In other words, while countries without fixed exchange rate regimes and capital controls retain a sufficient degree of monetary independence, those with pegged exchange rates would lose significant monetary autonomy.

Figure 1. Inflation Across the World and the Caribbean



Source: IMF; authors' calculations.

It has long been argued that outsourcing the effective conduct of monetary policy by adopting a fixed exchange rate regime would bring low and stable inflation. In this paper, we test this hypothesis in a group of relatively homogenous Caribbean counties where pegged exchange rate regimes are prevalent.[2] To this end, we use an index of monetary autonomy—developed by Aizenman, Chinn, and Ito (2010) as the reciprocal of the annual correlation between the monthly interest rates of the home country and the base country—and explore empirically how monetary

[2] Nine out of 15 Caribbean countries in our sample, shown in Appendix Table 1, maintain pegged exchange rates relative to the U.S. dollar.

autonomy affects inflation dynamics. We estimate alternative models using the panel fixed effects approach and the system Generalized Method of Moments (GMM) technique. Econometric evidence indicate that monetary independence has a statistically significant effect on inflation as measured by the consumer price index (CPI), even after controlling for macroeconomic and financial factors. That is to say, greater monetary independence, measured as a country's ability to conduct its own monetary policy for domestic purposes independent of external monetary influences, is associated with lower inflation in our sample of Caribbean countries over the period 1980–2017. This relationship—robust to alternative specifications and estimation methodologies—has clear policy implications, especially for countries that maintain pegged exchange rates relative to the U.S. dollar with a critical bearing on monetary autonomy. While the impact of monetary autonomy on inflation does not necessarily call for abolishing fixed exchange rate regimes, it highlights the need for better aligning the monetary policy stance with domestic conditions and improving the channels of monetary transmission.

The remainder of this study is organized as follows. Section II provides an overview of the related literature. Section III describes the data used in the analysis. Section IV introduces the salient features of our econometric strategy. Section V presents the empirical results, including a series of robustness checks. Finally, Section VI offers concluding remarks with policy implications.

II. Literature Review

This paper draws from two major threads of the literature—determinants of inflation and monetary independence. The first comprises a voluminous literature on inflation across countries and over time. The equilibrium rate of inflation is a function of factors determining the degree of inflation aversion including policy preferences (Rogoff, 1985) macroeconomic developments including income level, trade openness and fiscal deficits (Végh, 1989; Romer, 1993; Campillo and Miron, 1997; Lane 1997; Galí and Gertler, 1999; Catao and Terrones, 2005; Clark and McCracken, 2006; Badinger, 2009), flexibility of labor-market institutions (Cukierman and Lippi, 1999), type of exchange rate regimes (Levy-Yeyati and Sturzenegger, 2001; Husain, Mody, and Rogoff, 2005), and political and institutional factors (Cukierman, 1992; Aisen and Veiga, 2007). Focusing on Latin America and the Caribbean, Moore, Lewis-Bynoe, and Morgan (2012) identify domestic demand pressures, commodity (oil and food) price shocks, and political factors (elections and political repression) as the key determinants of inflationary episodes.

The second covers extensively the relationship between central bank independence and inflation, building on Kydland and Prescott (1977) and Barro and Gordon (1993). Most of these studies, however, focus on legal independence from political influences in the conduct of monetary policy. A plethora of empirical studies show that greater central bank legal independence brings about lower inflation, but not always in a consistent and statistically significant way across all countries (Cukierman, Webb, and Neyapti, 1992; Alesina and Summers, 1993; Campillo and Miron, 1997; Lougani and Sheets, 1997; Cottarelli, Griffiths, and Moghadam, 1998; Posen, 1998; Arnone, Laurens, and Segalotto, 2006; Brumm, 2006; Walsh, 2008). Focusing on Latin America and the Caribbean during the 1990s, Jácome and Vázquez (2008) find a negative relationship

between central bank legal independence and inflation. Although this result holds for alternative measures of legal central bank independence and after controlling for international inflation, banking crises, and exchange regimes, it fails to find a causal relationship running from legal central bank independence to inflation.

Our paper, however, is most closely related to the strand of literature connecting the macroeconomic policy trilemma to the behavior of inflation. Most models in international finance predict that when a country maintains a pegged exchange rate regime, it losses its monetary independence. However, while Hausmann and others (1999) and Frankel, Schmukler, and Serven (2004) argue that exchange rate flexibility does not necessarily provide monetary autonomy, Shambaugh (2004) find evidence suggesting that "countries with fixed exchange rates follow the interest rate of the base country more closely than countries with flexible exchange rates." In other studies, Gruben and McLeod (2002), Gupta (2008) and Badinger (2009) examine the relationship between capital account openness and inflation and find that unrestricted capital mobility lowers inflation by disciplining central banks. On the other hand, focusing on Latin America, de Mendonça and Veiga (2017) conclude that monetary independence has no statistically significant effect on inflation and argue that this may due to high macroeconomic instability and low policy credibility throughout the region. Hence, the contribution of this paper to the literature is to investigate the nature and scale of the relationship between monetary independence and inflation using a panel of relatively homogenous Caribbean countries over a long span of time.

III. DATA OVERVIEW

This study utilizes a panel dataset of annual observations covering 15 Caribbean countries during the period 1980–2017. Economic and financial statistics are assembled from the IMF's International Financial Statistics (IFS) and World Economic Outlook (WEO) databases, and the World Bank's World Development Indicators (WDI) database. The dependent variable is inflation as measured by the annual rate of change in the CPI and transformed as the logarithm of (1+inflation) to minimize the heteroscedasticity of the error term. Following related studies examining determinants of inflation, we introduce a number of control variables, including the logarithm of real GDP per capita as proxy for a country's level of economic development, the output gap to capture the cyclical conditions of the economy[3], the logarithm of trade openness

[3] The output gap for each country is obtained by applying the Hodrick-Prescott (HP) filter, which removes low-frequency variations and smoothes the GDP series to its stochastic trend, depending on the weight assigned to the linear time trend (Hodrick and Prescott, 1997). If there is no noise, the series is fully informative and the weight—λ—should be equal to zero. While a λ of 100 is typically the choice for annual data in the literature, Baxter and King (1999) argue that a value of 10 is more reasonable, and Ravn and Uhlig (2002) recommend 6.25 for estimations using annual data. After experimenting with a range of smoothing parameters, we find marginal computational differences in the analysis and adopt a λ of 6.25. It should be noted that the HP filter is also susceptible to the end-point problem—the trend follows actual GDP more closely at the beginning and end of the estimation period than in the middle. We deal with the end-point problem by extending the series through 2024, using projections, before applying the HP filter to the GDP series.

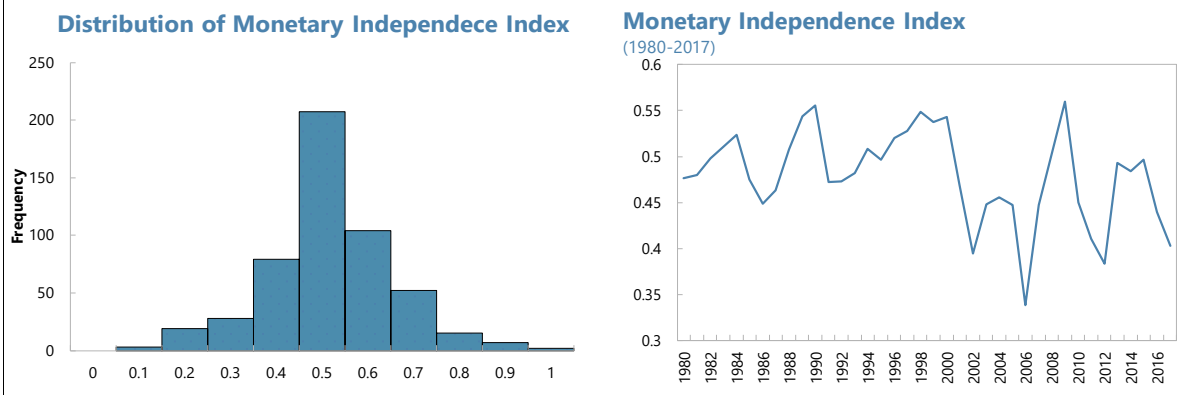
as measured by the share of international trade in GDP, a measure of financial openness/integration developed by Chinn and Ito (2006)[4], the change in the logarithm of the terms-of-trade index, money supply growth, the real effective exchange rate (REER), and the fiscal balance.

Monetary policy autonomy—the main variable of interest—is not easy to define and measure. One of the widely used measures of monetary independence is the extent of deviation of the domestic interest rate from the base (or foreign) rate. The reciprocal of the annual correlation between the monthly short-term interest rates of the home country and the base country allows the assessment of whether a country sets its own monetary policy for domestic purposes independent of external monetary influences. In this paper, we use the monetary independence index defined by Aizenman, Chinn, and Ito (2010) as:

$$MI = 1 - \frac{corr(i_c, i_j) - (-1)}{1 - (-1)}$$

in which i denotes interest rates in home countries (c) and the base country (j) in a given year. The base country is defined as the country with which a home country's monetary policy is most closely linked, as suggested by Shambaugh (2004).[5] By construction, the minimum and maximum values are 0 and 1, respectively. A higher value of the index means lower correlation of interest rates and thus greater monetary policy independence (Figure 2). [6]

Figure 2. Monetary Independence in the Caribbean



Source: Aizenman, Chinn, and Ito (2010); authors' calculations.

[4] The Chinn-Ito index is normalized between zero and one, with higher values indicating that a country is more open to cross-border capital transactions.

[5] The base countries include Australia, Belgium, France, Germany, India, Malaysia, South Africa, the United Kingdom (U.K.) and the United States (U.S.). In the case of Caribbean countries, the U.S. is the base country.

[6] The evolution of monetary independence in each country during the period 1980-2017 is presented in Appendix Figure 1.

The correlation between the monthly short-term interest rates of the home country and the base country may reflect business cycle synchronization rather than the lack of monetary independence. Therefore, it is necessary to control for the correlation of business cycles. We apply the same approach used in constructing the monetary independence index and estimate business cycle synchronization through the correlation between output gaps in the home country and the U.S. economy by applying the three-year moving averages encompassing the preceding, concurrent, and following years (t–1, t, t+1) of observations.

Descriptive statistics for the main variables used in the analysis are presented in Appendix Table 2. There is a significant degree of dispersion across Caribbean countries in terms of inflation and overall macroeconomic performance as well as the extent of monetary policy independence. It is essential to analyze the time-series properties of the data to avoid spurious results by conducting panel unit root tests. We check the stationarity of all variables by applying the Im-Pesaran-Shin (2003) procedure, which is widely used in the empirical literature to conduct a panel unit root test. The results, available upon request, indicate that the variables used in the analysis are stationary after logarithmic transformation or upon first differencing.

IV. EMPIRICAL METHODOLOGY

We investigate the impact of monetary policy independence on inflation by applying alternative models and specifications. The empirical approach used in this paper follows the literature and adopts a dynamic model of inflation as our baseline specification in the following form:

$$\pi_{c,t} = \beta_1 + \beta_2 \pi_{c,t-1} + \beta_3 MI_{c,t} + \beta_4 X_{c,t} + \eta_c + \mu_t + \varepsilon_{c,t}$$

where $\pi_{c,t}$ is inflation in country *c* and time *t*; *MI* denotes the monetary independence index; $X_{c,t}$ is a vector of control variables including real GDP per capita, trade openness, the terms-of-trade index, and money supply growth. The η_c and μ_t coefficients denote the time-invariant country-specific effects and the time effects controlling for common shocks that may affect inflation across all countries in a given year, respectively. $\varepsilon_{c,t}$ is an idiosyncratic error term that satisfies the standard assumptions of zero mean and constant variance. To account for possible heteroskedasticity, robust standard errors are clustered at the country level.

We estimate and present the standard fixed effects model, but the presence of the country-specific effect in conjunction with the lagged dependent variable creates a bias in the usual least squares dummy variable estimator when the time dimension is fixed, since demeaning creates a correlation between the error term and the lagged dependent variable in the transformed model. We therefore use the system GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998). The system GMM approach involves constructing two sets of equations, one with first differences of the endogenous and pre-determined variables instrumented by suitable lags of their own levels, and one with the levels of the endogenous and pre-determined variables instrumented with suitable lags of their own first differences. We apply the one-step version of the system GMM estimator to ensure the robustness of the results, as the

standard errors from the two-step variant of the system GMM method are known to be downward biased in small samples.

The use of all available lagged levels of the variables in the GMM estimation leads to a proliferation in the number of instruments, which reduces the efficiency of the estimator in finite samples, and potentially leads to over-fitting. A further issue is that the use of a large number of instruments significantly weakens the Hansen *J*-test of over-identifying restrictions, and so the detection of over-identification is hardest when it is most needed. Conversely, however, restricting the instrument set too much results in a loss of information that leads to imprecisely estimated coefficients. Estimation of such models therefore involves a delicate balance between maximizing the information extracted from the data on the one hand, and guarding against over-identification on the other. To this end, we follow the strategy suggested by Roodman (2009) to deal with the problem of weak and excessively numerous instruments. We also validate the system GMM identification assumptions by applying a second-order serial correlation test for the residuals and the Hansen *J*-test for the overidentifying restrictions. The values reported for AR(1) and AR(2) in Table 1 for baseline results and Appendix Table 3 for robustness checks are the *p*-values for first- and second-order autocorrelated disturbances in the first-differenced equation. As expected, we find that there is high first-order autocorrelation, but no evidence for significant second-order autocorrelation. Similarly, the Hansen *J*-test result indicate the validity of internal instruments used in the dynamic model estimated via the system GMM approach.

V. ESTIMATION RESULTS

The empirical results, presented in Table 1, show a consistent picture across different model specifications and estimation methods. Since potential endogeneity of some variables and the presence of correlation between the unobserved country-specific effects and the lagged dependent variable may render the fixed-effects estimation approach inappropriate and biased, our primary focus is on the estimation results obtained via the system GMM approach.

Our results indicate that monetary independence has a statistically significant negative effect on consumer price inflation, regardless of the model and estimation technique. The coefficient of the monetary independence variable ranges between -0.68 and -0.90 dependent on the specification. This means that greater monetary independence—measured as a country's ability to conduct its own monetary policy for domestic purposes independent of external monetary influences—is associated with to lower consumer price inflation in our sample covering 15 Caribbean countries during the period 1980–2017.

Table 1. Baseline Estimations—Monetary Independence and Inflation

	Fixed Effects		System GMM	
$Inflation_{t-1}$			0.458***	0.250***
			[0.044]	[0.048]
Monetary independence	-0.623***	-0.758*	-0.680***	-0.904***
	[0.350]	[0.380]	[0.273]	[0.266]
Financial openness		-0.616**		-0.615***
		[0.280]		[0.182]
Real GDP per capita		-0.748**		-0.400**
		[0.300]		[0.178]
Business cycle synchornization		0.044		0.074
		[0.048]		[0.047]
Trade openness		0.496		0.427**
		[0.343]		[0.210]
Terms-of-trade		-1.852***		-1.967***
		[0.498]		[0.269]
Money growth		1.161***		0.860***
		[0.311]		[0.231]
Number of observations	499	454	467	429
Number of countries	15	15	15	15
Country FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adj R^2	0.01	0.25		
AR1 *p* -value			0.000	0.000
AR2 *p* -value			0.562	0.984
Hansen *J* -test *p* -value			0.043	0.022

Note: The dependent variable is inflation as defined in Section III. Robust standard errors, clustered at the country level, are reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

In terms of control variables, we obtain coefficients that are as expected and broadly comparable to the findings in previous studies. The lagged dependent variable is found to be statistically significant, with a positive coefficient. This suggests a high degree of persistence in inflation dynamics over time, even after including additional control variables. First, financial openness is found to a have a significant dampening effect on inflation, which reinforces the impact of monetary autonomy. Second, consumer price inflation tends to be lower in countries with a higher level of real GDP per capita and thus economic development. Third, business cycle synchronization with the U.S. economy does not appear to be a significant factor in inflation dynamics. Fourth, trade openness is a statistically significant determinant of inflation, with a positive coefficient. Fifth, the inflationary impact of openness becomes even more evident with the terms-and of-index, which is found to have a highly significant negative coefficient. An increase in the terms-of-trade index (that is, lower import prices relative export prices) reduces inflation, which is consistent with the fact that Caribbean countries are highly dependent on international trade and consequently vulnerable to external shocks affecting food and energy

prices.[7] Finally, the empirical results show that money supply growth has the expected positive impact on inflation, with a statistically significant coefficient. In other words, an increase in money supply leads to higher inflation as expected.

We conduct a number of robustness checks to validate our findings based on the dynamic model estimated via the system GMM approach. First, we truncate the sample at the 5st and 95th percentiles to exclude outliers. Second, we estimate the model using 3-year nonoverlapping intervals instead of annual observations.[8] Third, we introduce additional control variables including the real effective exchange rate and the fiscal balance. Fourth, we use the interaction of monetary independence and financial openness, instead of separate series. Finally, we replace the country-specific terms-of-trade index with international oil prices, which is a significant factor in island economies that are dependent on imported petroleum products. These results, presented in Appendix Table 3, show a broadly similar picture. There are some minor changes in the magnitude of estimated coefficients, but monetary independence maintains its significant negative effect on inflation in the context of Caribbean countries over the period 1980–2017.

VI. CONCLUSION

In this paper, we consider the effect of monetary independence on inflation dynamics in a group of relatively homogenous Caribbean counties where pegged exchange rate regimes are prevalent. The results show that monetary independence has a statistically significant negative effect on inflation, regardless of the model specification and estimation technique, in our panel of 15 Caribbean countries during the period 1980–2017. In other words, greater monetary independence—measured as a country's ability to conduct its own monetary policy for domestic purposes independent of external monetary influences— is associated with lower inflation. This finding also remains robust to the inclusion of control variables (such as real GDP per capita, business cycle synchronization with the U.S., trade openness, financial openness, terms of trade, money growth, the REER, and fiscal balance), which have the expected effect on inflation dynamics.

Econometric evidence presented in this paper has clear policy implications, especially for countries that maintain pegged exchange rates relative to the U.S. dollar with a critical bearing on monetary autonomy. The adoption of a fixed exchange rate regime outsources a country's conduct of monetary policy to the country whose currency provides the external anchor. This arrangement may arguably acquire the credibility accumulated by the issuer of the anchor currency and thereby achieve low and stable inflation. A floating regime, on the other hand, maximizes the flexibility with which a country can use monetary policy for macroeconomic stabilization. This trade-off between credibility and flexibility has been a long debate in economic

[7] This finding remains robust when we use international oil prices instead of the terms-of-trade index and find a statistically significant positive effect on inflation (Appendix Table 3).

[8] This is as close as we can get to a cross-sectional regression, as the number of observations decline to 144 from 429 in the baseline estimation. This reduces the degrees of freedom of the estimation and the robustness of the results.

policymaking, with no clear consensus. The empirical results, however, show that pegged exchange rate regimes across the Caribbean does not necessarily provide the appropriate monetary policy stance for domestic purposes and deliver lower inflation. On the contrary, we find that greater monetary independence leads to better management of inflation dynamics. This does not necessarily call for abolishing exchange rate pegs, but highlights the need for better aligning the monetary policy stance with domestic conditions and improving the channels of monetary transmission.

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Appendix Table 1. List of Countries		
Antigua and Barbuda*	Dominica*	St. Kitts and St. Nevis*
Aruba	Grenada*	St. Lucia*
Bahamas*	Guyana	St. Vincent and Grenadines*
Barbados*	Haiti	Suriname
Belize*	Jamaica	Trinidad and Tobago
* denotes countries with exchange rates pegged to the U.S. dollar.		

Appendix Table 2. Summary Statistics

Variables	Obs.	Mean	Std. Dev.	Min.	Max.
Consumer price inflation	554	7.2	12.2	-11.4	142.8
Monetary independence index	516	0.5	0.1	0.1	0.9
Real GDP per capita	544	61371.6	100439.6	1327.0	522874.9
Output gap	570	0.0	2.5	-14.3	11.0
Business cycle synchronization	540	-0.2	0.7	-1.0	1.0
Trade openness	542	104.1	32.2	31.1	275.0
Financial openness	526	0.4	0.3	0.0	1.0
Real effective exchange rate index	561	114.8	118.2	28.9	1293.6
Terms-of-trade	549	145.4	43.2	55.5	314.6
Money growth	540	12.9	16.6	-10.3	205.6
Fiscal balance	357	1.8	4.4	-9.9	17.4

Source: Aizenman, Chinn, and Ito (2010); IMF; authors' calculations.

Appendix Table 3. Robustness Checks—Monetary Independence and Inflation

	System GMM				
	Truncated sample	3-year averages	Additional controls	Interaction of monetary independence and financial openness	Oil price instead of terms-of-trade
$Inflation_{t-1}$	0.257***	0.041	0.187***	0.185***	0.257***
	[0.052]	[0.092]	[0.059]	[0.057]	[0.047]
Monetary independence	-0.383*	-0.890**	-1.091***		-0.975***
	[0.207]	[0.394]	[0.330]		[0.259]
Financial openness	-0.121	-0.516*	-0.070*		-0.639***
	[0.185]	[0.293]	[0.372]		[0.181]
Real GDP per capita	-0.055	-0.631**	-0.396	-0.178	-0.511***
	[0.154]	[0.269]	[0.279]	[0.245]	[0.178]
Business cycle synchornization	0.017	0.161	0.058	0.077	0.069
	[0.036]	[0.102]	[0.059]	[0.059]	[0.047]
Trade openness	0.410**	0.182	0.272	0.274	0.394*
	[0.200]	[0.348]	[0.292]	[0.267]	[0.209]
Terms-of-trade	-1.002***	-2.556***	-2.449***	-2.493***	
	[0.209]	[0.600]	[0.362]	[0.364]	
Money growth	0.046*	1.909***	0.674***	0.827***	0.756***
	[0.306]	[0.655]	[0.284]	[0.279]	[0.232]
REER			-0.007**		
			[0.004]		
Fiscal balance			0.002		
			[0.012]		
MI*FO				-0.547**	
				[0.469]	
Oil Price					0.941***
					[0.126]
Number of observations	342	144	289	283	433
Number of countries	15	15	14	14	15
Country FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
AR1 *p* -value	0.000	0.000	0.000	0.000	0.000
AR2 *p* -value	0.973	0.431	0.466	0.462	0.675
Hansen *J* -test *p* -value	0.208	0.000	0.072	0.071	0.036

Note: The dependent variable is inflation as defined in Section III. Robust standard errors, clustered at the country level, are reported in brackets. A constant is included in each regression, but not shown in the table. *, **, and *** denote significance at the 10%, 5%, and 1% levels, respectively.

Appendix Figure 1. Monetary Independence Index, 1980–2017