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An empirical evaluation

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Abstract

Based on a dataset of 123 economies, both developed and developing countries, this paper investigates the relation between exchange-rate regimes and inflation performance. Our results suggest that those countries with flexible exchange-rate regimes are characterized by higher inflation rates, while the smaller inflation rates are associated with fixed exchange rates and countries with intermediate regimes occupy an intermediate position in their records of inflation rates. These results are maintained when we analyze the countries by income level, except for the case of upper income countries, where we do not find significant differences between fixed and intermediate regimes in inflation performance.

Keywords: Exchange rate regime; inflation rates

JEL codes: E42, F31

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1. Introduction

It is now generally accepted that the primary objective of central banks should be the maintenance of price stability. It implies avoiding both prolonged inflation and deflation, since price stability contributes to achieving high levels of economic activity and employment.

Fixing the value of the domestic currency relative to that of a low-inflation country is one approach central banks have used to pursue price stability. The advantage of an exchange rate target is its clarity, which makes it easily understood by the public. In practice, it obliges the central bank to limit money creation to levels comparable to those of the country to whose currency it is pegged. When credibly is maintained, an exchange rate target can lower inflation expectations to the level prevailing in the anchor country.

Although the theoretical relationships are ambiguous, evidence suggests a strong link between the choice of the exchange rate regime and macroeconomic performance. When analysing the possible relationship between inflation and the exchange rate regime, it is necessary to highlight a prominent feature along many studies: the causality of two variables in both directions. Therefore, from this perspective, we can find two approaches. On the one hand, some authors (Barro and Gordon, 1983; von Hagen and Zhou, 2005, among others) argue that low inflation helps to maintain a fixed exchange rate. On the other hand, some researchers (see, e. g., Dornbusch, 2001, or Giavazzi and Giovannini, 1989) contend that the implementation of a fixed regime can become a

major tool to combat inflation, mainly due to the high credibility that is implicit in the commitment to keep a given parity.

In Ghosh *et al.* (1996) we find quite striking figures in the latter direction. Specifically, these authors obtain that, once a fixed regime has been adopted in one country, it is able to reduce inflation within a year, on average, by 0.6%, reducing it about 0.5 percentage points after three years. This situation is quite different when it comes to a floating regime since, after a year of being implemented, the inflation rate will have been increased by 3%, being reduced with the passage of time.

Other more skeptical authors, such as Tornell and Velasco (2000), show that the gain in terms of reduction in inflation cannot be entirely achieved if not accompanied by policies aimed to a greater fiscal discipline. They argue that no exchange-rate regime can be presented as the alternative to sound policies.

This paper aims to contribute to the literature by providing a fresh and comprehensive assessment of the relation between exchange-rate regimes and inflation performance for a large cross-section of countries over a long sample. The key questions that guide our analysis are: (i) is there an optimal exchange rates to render low inflation rates?, and, (ii) does it depend upon the income level? Answers to these questions seem relevant as they have direct implications for policy makers and academic researchers.

The paper proceeds as follows. The next section briefly reviews the empirical literature on exchange-rate regimes and inflation performance. Section 3 details the data. Section

4 describes the empirical strategy and reports the results. Finally, Section 5 offers some concluding remarks.

2. Literature review

Empirically fixed exchange-rate regimes are associated with lower inflation rates. To justify this result, some authors make use of the explanation of the "inflation bias", based on the idea of a conflict of interest between consumers, producers and policy makers (see, Kydland and Prescott, 1977, and Barro and Gordon, 1983). The reason is as follows: salaries are set according to the inflation target announced by the central bank, therefore, if the level of output is below the efficient level and the central bank announces an inflation target of zero and the agents are surprised by inflation above the target, real wages will be contracted. But, if there is a credibility problem, agents correct their expectations and wage demands are much greater, thus generating a higher rate of inflation in the economy. Therefore, given the existence of a problem of information asymmetry is essential the signalling. In other words, what should be the most appropriate tool to convince the agents that the central bank will not surprise them with a price level above optimal? Two alternatives have been implemented in the literature.

 The first one is to adopt a fixed regime, since, in this way the central bank give the signal of an authority with a preference for low inflation (Canavan and Tommasi (1997), because it requires a moderation in the growth of supply money. The second alternative, that has been gaining weight over the years, is an inflation targeting regime. Several authors (such as Calvo and Mishkin, 2003, or Schmidt-Hebbel, 2006) have shown that this alternative is just as good to deliver low inflation and to achieve greater

independence and credibility in economic policy, both globally and especially in emerging countries.

Since international comparative studies on the impact of exchange-rate regimes on key macroeconomic variables have excluded dollarized countries, Edwards and Magendzo (2003) conducted an analysis of inflation, economic growth and volatility for these countries. After opting a matching methodology to create the most appropriate control group, these authors obtain that dollarized countries have an inflation rate significantly lower than on non-dollarized countries. Specifically, the average difference is between 3.4% and 5.7% per year.

De Grauwe and Schnabl (2004) analyse ten countries in the Central and Eastern Europe (CEECs) during the period 1994-2002 in order to unravel whether greater exchange rate stability has led to lower inflation. In their econometric specification, they assume that inflation is explained by the exchange rate regime, but in turn, pay special attention to the abovementioned problem of reverse causality and, for this reason, apply the generalized method of moments proposed by Arellano and Bond (1991) to avoid endogeneity. Their results corroborate the fact that policy makers adopt fixed regimes with the belief that they can "import" the credibility and good performance of the country which has anchored its currency, thereby achieving lower inflation. However, this conclusion becomes weaker when investigating the possibility of possible structural changes or when extracted outliers from the sample. In a later paper, De Grauwe and Schnabl (2008) expanded the sample used in De Grauwe and Schnabl (2004), concluding that the mechanism of fixing the exchange rate is effective only when

inflation rates are high, but once a certain level is reached, it is no longer useful for this particular purpose.

Within the literature of the impact that the exchange-rate regime can have on the evolution of the price indices, there is a stream of research that states that this effect may be conditioned by the level of development presented by the countries. In general, the emerging and developing countries are characterized by having weaker institutions, lacking the necessary tools to carry out the appropriate operations in international capital markets and relying on the protection of their industries (von Hagen and Zhou, 2005). This situation leads to argue that fixed exchange rate regimes would be powerful tools to curb inflation, since, according to Crockett and Goldstein (1976), there is a commitment of both exchange rate stability and greater responsibility in the rate at the money supply grows. If, however, we analyse the most developed countries, authors such as Calvo and Mishkin (2003) claim that by setting goals on price stability and, without any explicit objective for the exchange rate, these countries can perfectly control inflation.

In an attempt to clarify the implications of fixing the exchange rate on inflation and its volatility, Moreno (2001) studied a group of 98 developing countries for the period 1975-1999. The result of his research, warns that both inflation and its variability is much more in flexible exchange-rate regimes than in fixed exchange-rate regimes.

Another paper which shows that the degree of maturity of the institutions is essential to understand how the performance of macroeconomic variables differs even with the same exchange rate regime is Husain *et al.* (2005). Specifically, they point out that

developing countries achieve lower inflation regimes with fixed exchange rate rather than floating, both because the credibility effect and the effect due to lower discipline growth rate of the money supply. In contrast, emerging economies and advanced do not show a strong relationship between these two variables. The argument that they offer to explain such disparity is again the quality of institutions and the degree of openness to capital markets. Unlike developing countries, where there are many more restrictions on access to international capital markets, emerging economies are characterized by high exposure to such markets.

Finally, Bleaney and Francisco (2007), studying developing countries, show that fixed exchange-rate regimes are useful to promote price stability. Specifically, with the introduction of this category would get a 2.5% reduction in the rate of inflation in the short and up 0.5 percentage points in the long run. On the other hand, the sign of the dummy variable for flexibility is positive and significant for two of the five analysed categorizations. However, its magnitude is relatively weaker, increase the inflation rate by one percentage point in the short and two long-term.

3. Data

We employ data for a total of 123 countries, both developed and developing countries. The 123 countries are: Algeria, Antigua and Barbuda, Argentina, Australia, Austria, Bahamas, Barbados, Belgium, Belize, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Canada, Central African Republic, Chad, Chile, China, Colombia, Congo Dem Rep, Congo Republic, Costa Rica, Côte d'Ivoire, Cyprus, Denmark, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Finland, France, Gabon, Gambia, Germany, Ghana, Greece, Grenada,

Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Iran Islamic Rep, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Kuwait, Lao People Dem Rep, Lebanon, Lesotho, Liberia, Libya, Luxembourg, Madagascar, Malawi, Malaysia, Mali, Malta, Mauritania, Mauritius, Mexico, Morocco, Myanmar, Nepal, Netherlands, New Zealand, Nicaragua, Niger, Nigeria, Norway, Pakistan, Panama, Paraguay, Peru, Philippines, Portugal, Romania, San Marino, Saudi Arabia, Senegal, Singapore, South Africa, Spain, Sri Lanka, St Kitts and Nevis, St Lucia, St Vincent and Grenadines, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Republic, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, United Kingdom, United States, Uruguay, Venezuela, West Bank and Gaza, Zambia and Zimbabwe.

To assess inflation performance, we use the annual data for the consumer price index inflation, taking from the World Bank's Development Indicators (WDI) database.

Regarding the exchange rate regimes, we have used the *de facto* classification of Reinhart and Rogoff (2004), updated to 2010 by Ilzetzki, Reinhart and Rogoff (2011). In line with previous studies, we consider three categories: fixed, intermediate and flexible exchange-rate regimes.

Due to data availability, our sample period ranges from 1970 to 2010. Nevertheless, our sample covers a relevant time period characterized by relatively open and integrated markets over the post-Bretton Woods period.

4. Empirical strategy and results

4.1. Empirical strategy

We form groups of countries at the end of each year based on the *de facto* "natural fine classification" of Reinhart and Rogoff (2004), updated to December 2010 by Ilzetzki, Reinhart and Rogoff (2011), to distinguish between a wide range of *de facto* regimes.

Starting in 1970, we recursively form groups of countries based on the *de facto* classification and we track their inflation performance. The dynamic rebalancing of country groups enables us to look at the average inflation behaviour of groups of countries with similar exchange-rate regimes.

This procedure circumvents the need to assume a specific channel through which regime might influence inflation and naturally handles unbalanced panels of data where countries enter the sample at different times (or drop out of the sample, e.g., due to the adoption of the euro). Additionally, this approach produces results which are readily interpretable in terms of economic significance, since the difference in inflation differentials between groups directly yields an estimate of how much higher the rate of inflation is in countries with a given exchange-rate regime versus countries with an alternative one.

4.2. Empirical Results

Since our data include several time-country combinations of hyperinflations, we considered three statistics to evaluate the inflation performance of each group of

countries: the median, the 20% trimmed mean and the 20% winsorised mean[1]. Table 1 (Panel A) presents the results. As can be seen, those countries that adopt flexible exchange-rate regimes are characterized by higher inflation rates, while the smaller inflation rates are associated with fixed exchange rates. Countries with intermediate regimes occupy an intermediate position in their records of inflation rates. More specifically, the median annual difference in CPI inflation rates is about 211% (270% and 243% for winsorised and trimmed mean CPI inflation, respectively) for country with flexible exchange rates with respect to countries with fixed exchange rates, while the median annual difference in CPI inflation rates is about 115% (156% and 137% for winsorised and trimmed mean CPI inflation, respectively) for country with flexible exchange rates with respect to countries with intermediate exchange rates. A formal test of mean equality indicates that there are indeed highly significant differences between inflation rates of each group of countries, regardless the metrics used in the evaluation. This finding is in line with Ghost *et al.* (1996), Dornbusch (2001), De Grauwe and Schnabl (2004), among others.

To assess the robustness of our results, we divide economies under study in four income groups using the World Bank's classification: low income, lower middle income, upper middle income and high income. Given that income classifications are set each year based on their *per capita* income data, we recursively formed groups of countries based on the *de facto* and income classifications, tracking their inflation performance. Panels B to E in Table 1 report the results. As can be seen, we find once more that inflation

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[1]Note that, in contrast to the arithmetic mean, the trimmed and winsorised means are robust measures of central tendency because they are less sensitive to outliers.

rates are significantly much higher in countries with flexible exchange-rate regimes, that the smaller inflation rates are associated with fixed exchange rates, and that countries with intermediate regimes present an intermediate position in inflation rates. We find that CPI inflation is much higher in lower middle income countries with flexible exchange rates, being the median annual difference with respect to lower middle income countries with fixed exchange rates about 503% (574% and 552% for winsorised and trimmed mean CPI inflation, respectively). The lowest inflation rates obtained for high income countries with fixed exchange rate regimes: 4.2473 for median CPI inflation, 4.4036 for winsorised mean CPI inflation and 4.3518 for trimmed mean CPI inflation. Irrespective of the income level, we again find that countries with intermediate regimes occupy an intermediate position in their records of inflation rates. Nevertheless, for upper income countries, we do not find significant differences between fixed and intermediate regimes in inflation performance, even though the latter are 1.2 times the former regardless the metrics used in the evaluation.

5. Concluding remarks

A perennial question in international economics—whether in academia or in policy circles—concerns the optimal choice of exchange rate regime. A large amount of empirical literature have analysed whether exchange-rate regimes means a major factor in order to explain inflation behaviour. However, the evidence is far from being unambiguous.

Based on a dataset of 123 economies, both developed and developing countries, this paper has empirically investigated the relation between exchange-rate regimes and inflation performance. We have found that those countries with flexible exchange-rate

regimes are characterized by higher inflation rates, while the smaller inflation rates are associated with fixed exchange rates and countries with intermediate regimes occupy an intermediate position in their records of inflation rates. This conclusion is maintained when we analyze the countries by income level, except for the case of upper income countries, where we do not find significant differences between fixed and intermediate regimes in inflation performance. Our results suggest that the highest CPI inflation rates are associated with lower middle income countries with flexible exchange rates, while the lowest CPI inflation rates are present in high income countries with fixed exchange rate regimes. Therefore, it appears that fixed exchange rates have a significant effect on inflation performance.

We consider that our results might have some practical meaning for investors and policymakers, as well as some theoretical insights for academic scholars interested in the behaviour of exchange-rate regimes.

Acknowledgements

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Table 1: Empirical results

	Median	Winsorised mean	Trimmed mean
Panel A: All countries			
Fixed regimes	5.3558	5.7267	5.5375
	(8.4425)	(8.7176)	(8.5800)
Intermediate regimes	7.7388	8.2625	8.0095
	(18.3712)	(18.8701)	(18.7976)
Flexible regimes	16.6336	21.1617	19.0096
	(11.8185)	(11.9807)	(12.3394)
Fixed *vs.* Intermediate	9.7924	10.3172	10.2171
	[0.0026]	[0.0020]	[0.0021]
Fixed *vs.* Flexible	53.3667	67.08286	65.0562
	[0.0000]	[0.0000]	[0.0000]
Intermediate *vs.* Flexible	36.6575	50.2444	47.3614
	[0.0000]	[0.0000]	[0.0000]
Panel B: Low income countries			
Fixed regimes	6.0519	6.3573	6.2641
	(6.5389)	(7.0431)	(6.7548)
Intermediate regimes	9.1185	9.5350	9.4297
	(20.4070)	(19.1123)	(19.6025)
Flexible regimes	26.9351	27.8341	27.4676
	(8.2112)	(8.5302)	(8.4181)
Fixed *vs.* Intermediate	8.9036	9.4934	9.1822
	[0.0042]	[0.0031]	[0.0036]
Fixed *vs.* Flexible	37.5409	40.2420	39.0722
	[0.0000]	[0.0000]	[0.0000]
Intermediate *vs.* Flexible	28.9626	30.7319	29.9103
	[0.0000]	[0.0000]	[0.0000]
Panel C: Lower middle income countries			
Fixed regimes	5.4061	5.7211	5.6268
	(8.8666)	(8.9889)	(8.8973)
Intermediate regimes	9.0728	9.7095	9.4847
	(17.0937)	(17.5045)	(17.6838)
Flexible regimes	32.6045	38.5489	36.7142
	(8.5401)	(7.0507)	(7.3656)
Fixed *vs.* Intermediate	20.5742	22.3185	21.6459
	[0.000]	[0.0000]	[0.0000]
Fixed *vs.* Flexible	49.4898	35.5696	38.2806
	[0.0000]	[0.0000]	[0.0000]
Intermediate *vs.* Flexible	37.2700	27.5401	29.5000
	[0.0000]	[0.0000]	[0.0000]
Panel D: Upper income countries			
Fixed regimes	5.4215	5.8437	5.7289
	(6.9562)	(7.6474)	(7.4901)
Intermediate regimes	8.9579	10.3325	9.9866
	(14.8808)	(11.3334)	(12.5957)
Flexible regimes	29.0878	32.8544	32.1460
	(7.0221)	(7.6119)	(7.5548)
Fixed *vs.* Intermediate	12.6129	14.3900	14.9349
	[0.0007]	[0.0003]	[0.0002]
Fixed *vs.* Flexible	31.5259	37.9721	37.3385
	[0.0000]	[0.0000]	[0.0000]
Intermediate *vs.* Flexible	23.1272	26.0647	26.2113
	[0.0000]	[0.0000]	[0.0000]

Table 1 (continued)

	Median	Winsorised mean	Trimmed mean
Panel E: High income countries			
Fixed regimes	4.2473	4.4036	4.3518
	(8.2674)	(8.5557)	(8.4547)
Intermediate regimes	5.0742	5.1206	5.1013
	(9.2179)	(9.1513)	(9.2041)
Flexible regimes	7.9865	8.5081	8.3811
	(5.6793)	(5.5316)	(5.6408)
Fixed *vs.* Intermediate	1.2060	0.8893	0.98118
	[0.2754]	[0.3485]	[0.3247]
Fixed *vs.* Flexible	6.2377	6.4041	6.5661
	[0.0158]	[0.0147]	[0.0135]
Intermediate *vs.* Flexible	3.7190	4.2838	4.2775
	[0.0593]	[0.0436]	[0.0437]

Notes:

In the ordinary brackets below the parameter estimates are the corresponding *t*-statistics based on Newey and West (1987) standard errors.

XX *vs.* XX are equality tests statistics. In the square brackets bellow these tests, we report the associated *p*-values.