INFLATION-OPENNESS RELATIONSHIP: A PANEL APPROACH FOR DEVELOPING COUNTRIES

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Abstract

This paper aims at verifying the existence of significant relationship between inflation and openness in the context of the developing countries. The dataset comprises 53 developing countries located at five different regions for the years from 1975 to 2002. With money and quasi money growth, GDP in terms of SDR, different measures of degree of openness, namely, export ratio, import ratio and trade ratio, and dummies for country, year, region and exchange rate regimes as the explanatory variables, a wide range of variants of the basic dynamic specification containing the levels and first lags of all variables have been estimated. The dynamic models were estimated by the system GMM method.

The static specifications give results in favour of the existing theoretical and empirical literature, that the openness has a significant negative effect on inflation, but this is clearly seen only in the period after 1989. The analysis of pre-1989 data shows that only the fixed exchange rate regime has had a significant negative effect on inflation.

The results of the dynamic specification show that openness does not have any significant effect on inflation if country effects are controlled for, but the lag of the money growth has a significant negative effect hinting that the effect of openness might have been captured in the latter. A notable result in this analysis is that openness affects inflation positively, while its lag affects it negatively.

In addition to the panel data analysis, a simple time series analysis of inflation in selected countries has been carried out using ARMA (1,1) model for two different time spans during one of which the country under examination was more open than the other span, to check for any change in the significance of inflation inertia, assumed to be

captured by the coefficient of the lag of inflation. The results support the hypothesis that openness might enhance inflation inertia for India and not the other countries.

1.Introduction

Economic liberalisation and globalisation have resulted in a strikingly great integration of the world economy since the 1990s. To look at numbers, for the entire world, the volume of trade as a percentage of GDP in PPP has gone up from 21.2 in 1988 to 28.3 in 1998 and as a percentage of production of goods, has increased from 71.9 in 1988 to 92.1 in1998. Apart from being a period of increased openness, the 1990s saw a trend of average inflation coming under control throughout the world. IMF claims the average inflation in the industrialized countries in terms of the GDP deflator to have fallen from 8% in 1982-1991 to 4.9% in 1999 and that in the developing countries from 45.1% to 6.9% in the respective periods. This leads us to the obvious question of whether these two events are related, which has motivated a great deal of research, most of which claims the existence of a significant negative relationship between inflation and openness.

At this stage, no developing country can keep itself away from the trend of increasing openness that has been occurring. The implications of an increased openness in terms of inflation in a developing country are manifold, of which, loss of independence of fiscal and monetary authorities, fluctuations in the exchange rate, balance of payments and dynamic as well as complex effects of the foreign investment inflows on the price and quantity levels in the economy are important.

Though the claim that inflation is undesirable for any social and economic system is not fully justifiable, inflation has a few obvious costs such as shoe-leather costs, menu costs and tax distortion (Thirlwall 1995). Therefore, given the aforesaid trend, it is worthwhile to empirically verify the proposition that openness can play a significant role in controlling inflation. The low GDP of the developing countries facilitates the validity of the assumption of a small open economy, thereby avoiding the complexities that would have arisen in the analysis otherwise.

In this paper, an analysis of inflation-openness relationship has been carried out for 53 developing countries from 1975 to 2002, in static as well as dynamic panel data set-ups. Section 2 summarises some well-known theoretical arguments, while section 3 discusses a few empirical studies pertaining to this issue. In the section 4, the data sources, methodology and model specifications have been elucidated. Section 5 consists of the results of the regressions, while the conclusions, policy recommendations and extensions have been dealt with in brief in the section 6.

2.Theoretical Arguments

The roles of inflation in capital accumulation, industrial takeoffs, and in the release of reserves for development by income redistribution are a few benefits of inflation, while profit reduction by cost inflation and inflationary finance by demand inflation are the examples of its costs (Thirlwall 1995). Assuming that the costs of inflation outweigh its benefits, while looking for the ways to control inflation in a closed economy, structuralists claim the basic causes of inflation to be inherent in the structure of the economy, while the monetarists assume fiscal deficit to be the root cause of inflation insofar as it affects the money supply.

However, in the context of an open economy, the relationships are likely to undergo significant changes. New growth theory proposes output as a channel through which openness might control inflation via its presumed, yet realistic enough, positive effect on the former. Romer (1993) uses a Barro and Gordon type model to argue that since the unanticipated monetary expansion leads to real exchange rate depreciation, the latter being more harmful in more open economies, the incentives of the central bank to go for the former are lower, thereby curbing inflation caused by the absence of precommitment in monetary policy. Firstly, unanticipated inflation could arise from imperfect information about the aggregate price level or incomplete price adjustment, both of which are higher in a more open economy, thereby lowering the weight β in equation 1.

$$y = y^* + \beta(\pi - \pi^e), \beta > 0 \qquad\qquad ---(1)$$

Secondly, a more open economy gains less from a higher output owing to the greater cost of real depreciation resulting from the domestic expansion. In other words, the parameter γ in the equation 2 is decreasing in openness.

$$W = -1/2\ \pi^2 + \gamma y,\ \gamma > 0 \qquad\qquad\qquad ---(2)$$

If the policy-maker is assumed to choose an optimal π that maximizes W, subject to the equation 1, the equilibrium is $y = y^*$ and $\pi = \pi^e = \gamma\beta$, which attains a less sub-optimal level in the presence of a greater degree of openness. Though there are several other theoretical arguments, we confine ourselves to Romer (1993) for simplicity.

According to Lane (1997), an unanticipated permanent increase in the money stock generates a short-run expansion in non-traded output given the nominal price rigidity in the non-traded sector, which vanishes in the long run, thereby reducing the potential benefits of the former and curbing a subsequent rise in inflation.

3. Review of Empirical Literature

To be brief and precise, we summarise very few empirical studies in the recent years and not those done decades ago since this is a widely studied area in the theoretical as well as empirical literature of macroeconomics. Romer (1993) found a negative inflation-openness relationship for a cross-section of countries, even after controlling for real income per capita and dummy for OECD membership. Relaxing the assumption of exogeneity of openness measure, he used the land area of the countries as a negative measure of openness in the sense that the large economies are, in general, less open and found the results to be still holding. Following this, the current study proposes the inverse of population as an alternative measure of openness capturing time- as well as country-variant factors.

Lane (1997) found the effect to be stronger with the inclusion of country-specific effects, suggesting new channels by which openness could affect inflation, namely, central bank independence and political instability. Though the time-series data was not used in this analysis, as the author did not claim any cyclical effects, a panel data analysis would always help understand the effects in both the dimensions comprehensively.

Montano and Philippopoulos (1997) presents a model in which inflation depends on the exchange-rate regime and the time remaining till the next election to estimate a simultaneous equation model for wage inflation, price inflation and unemployment. They find a significant Barro-Gordon type bias after the fall of the fixed exchange rate regime and no difference in inflation performance across different political administrations. This has motivated us to include the dummy for exchange rate regime in the analysis.

Terra (1998) found a significant influence of the extent of indebtedness on the significance of the negative inflation-openness relationship. With the same level of indebtedness as a more closed economy, an economy needing the same trade surplus to carry out the external transfer would need a lower exchange rate devaluation reducing the extent to which the internal constraints are tightened due to it, thereby avoiding the otherwise mandatory inflationary tax.

There are many papers that consider the structuralist factors that affect inflation such as agricultural growth. For example, Ashra (2002) has taken the rate of growth of real agricultural value added, annual growth rate of M2 and openness as the explanatory variables for 15 developing countries, controlling for the level of inflation, area, geographical location, income and emerging economies classification. The results support the theoretical arguments for the negative relationship between inflation and openness and also point out many differences in the magnitude and significance of the variables for the different classifications.

Alfaro (2002) has shown empirically that the role of openness on inflation is not robust to the inclusion of the dummies for the exchange rate regime using a panel data of developing and developed countries from 1973 to 1998. She claims that a short-run control over inflation is possible insofar as openness affects inflation through the unexpected monetary expansion, by pegging the exchange rate, owing to its nature of being a highly visible commitment. Moreover, fixed exchange rate has implications for openness itself, since the latter can be increased due to enhanced trade and investment arising out of a decreased exchange-rate volatility and risk facilitated by the former.

Since this paper also deals with a few dynamic panel data regressions, a summary of papers that illustrate the methods used in them would be of much use. One of them, namely, Arellano and Bond (1991), has presented specification tests for the GMM estimation of dynamic panel data. In this paper, a GMM estimation of a standard employment model gives reasonable and significant results. The GMM estimator is significantly more efficient than the IV and produces well-determined estimates in the dynamic panel data models. The two-step GMM estimators, despite being more efficient than their one-step counterparts, result in downward biased estimates of standard errors.

This suggests that the two-step estimates could be reported along with one-step estimates of the standard errors, which has been done in this paper.

System GMM (GMMSYS) estimator is determined as a weighted average of the standard GMM estimators of the level equations and the difference equations. Blundell and Bond (2000) has presented theoretical arguments as well as an empirical exercise to prove that the system GMM estimator, which relies on relatively mild restrictions on the initial condition process, is asymptotically more efficient than the standard GMM estimator, more so for highly autoregressive panel series. This finding has motivated us to use the system GMM estimation for this study.

4. Data, Methodology and Model Specifications

The dataset for this paper has been collected from the International Financial Statistics database prepared by the IMF. It consists of 53 developing countries from five different regions, as shown in the appendix, for the years from 1975 to 2002. Taking into consideration the theoretical arguments as well as the empirical studies that have been done in this area, the following is the most general specification of all the panel data models that have been estimated in this study.

$$\log \pi_{it} = \alpha + \gamma_1 \log \pi_{it-1} + \Sigma^1_{k=0} \beta_k \log OP_{it-k} + \Sigma^1_{k=0} \log X_{it-k} \delta_k + D_{it} \phi + e_{it} \qquad \text{-- (3)}$$

where,

π_{it} is the inflation of ith country for the tth year (in terms of both GDP deflator and Consumer Price Index)

OP_{it} is the degree of openness of ith country for t^{th} year.

X_{it} is the vector of the explanatory variables other than the degree of openness, namely, annual growth of the sum of money and quasi money, GDP at SDR.

D_{it} is the vector of the dummy variables for countries, years, regions, and exchange rate regimes.

The inflation in each country was calculated for each year as the ratio of change in price index from the previous year to the level of price index in the previous year, where the price index is in terms of GDP deflator or CPI. GDP deflator is the price index that measures the change in the price level of GDP relative to the real output in terms of 1987 local currency.

As for the degree of openness, four different measures have been attempted in this study. Firstly, exports of goods and services, as a proportion of GDP in terms of SDR, includes the value of merchandise, freight, insurance, travel, and other non-factor services, excluding the factor and property income or factor services such as investment income, interest and labour income. Secondly, imports of aforesaid goods and services as a proportion of GDP and thirdly, trade ratio as a sum of export and import ratios defined above have been included. Finally, to make sure of exogeneity of the variable that proxies or to be technically precise, acts as an 'instrumental variable' for the degree of openness, the inverse of population is included, with a reasonable assumption that the higher the population, the less open is the economy, as proposed by Romer (1993) for using land area as an instrument for openness. In all these cases, a negative sign would be expected for the coefficient so as to support the proposition that openness curbs inflation.

The first variable among the other explanatory variables is the money growth measured in terms of the annual growth rate of money and quasi money growth. Money and quasi money comprise the sum of the money outside banks, demand deposits other than those of the central government, and the time, savings and foreign currency deposits of resident sectors other than the central government. The theory predicts a positive sign for the coefficient of this variable.

The GDP in this study is the gross domestic product calculated in terms of the Special Drawing Rights. A negative sign is expected on its coefficient if the theories arguing that a richer economy in aggregate terms would have a lower inflation are true. Though being 'rich' is not exactly captured by this variable, it consists of various structural factors in the economy, which affect inflation.

For the exchange rate regimes, there are three groups, namely, fixed, dirty and floating exchange rate regimes, of which float is taken as the control group and dropped to avoid the exact multicollinearity. For the arguments of Alfaro (2002) to hold true in the context of the developing countries, the coefficient of the fixed exchange rate dummy should have significant negative value, while the dirty exchange rate regime dummy might have a significant or insignificant negative value.

The various models are formulated from the equation 3 by including and excluding GDP and the dummies. Moreover, the static specification is estimated by

dropping all the lags and repeating the above exercise. In addition, by classifying the observations into two categories, namely, those with high inflation (>50%) and those with low inflation (<50%), the static panel data analysis is carried out and the differences are noted to see if the level of inflation would matter for the magnitude, sign or significance of the effect of openness on inflation. Finally, the time span is divided into two – 1975-1989 and 1990-2002, and the analysis is carried out separately for these two spans so as to verify whether inflation-openness relationship is a recent phenomenon.

A small piece of time series analysis has been done for five chosen countries each selected from one of the five regions of the world, with the following specification of an ARMA(1,1) model.

$$\log \pi_t = \alpha + \gamma_1 \log \pi_{it-1} + \phi_1 e_{t-1} + e_t \qquad \text{-- (4)}$$

For each country, two different ARMA regressions are carried out using the MLE method - one for the years before the year in which there is any sustained striking change in the degree of openness in most of its measures (at least two) and the another for the years after that point. The value of γ_1 is interpreted as a measure of inflation inertia so that its significant positive value would indicate an existence of stability in inflation and if e_t captures the effects of all omitted variables such as the ones in the equation 3, then a significant ϕ_1 would confirm the existence of lagged effects of the other variables. The idea is to see whether the significance of these parameters is different for the two spans taken, so that the effect of openness on inflation inertia could be roughly verified for its existence.

5. Results:

The table 1 shows the summary statistics of the variables involved in the regressions. A wide range of values is seen for each variable, thereby encouraging the use of a model taking logarithm for all the variables.

As for the results of the regressions, in all the tables, '*' is used to denote that the coefficient is significant at 2% Level of Significance, '**' is used to denote that it is so at 5% LOS and '***' is used to denote its significance at 10% LOS. It should also be noted that for all the models involving dummies, the Hausmann's specification test was carried out and it was found that the fixed effect specification is better than random effect specification.

Table 1: The Summary Statistics

Variable	No. of Obs	Mean	Std. Dev.	Min	Max
export ratio	1366	0.403	1.222	0.0004	27.03
import ratio	1367	0.482	1.904	0.0004	47.33
trade ratio	1366	0.885	3.114	0.0008	72.975
GDP inflation	1333	35.602	417.048	-100	13377.78
CPI inflation	1348	30.359	1598.918	-31850	40632.61
Money growth	1421	24.502	387.276	-100	13267.92

Table 2 shows the results of the static specification, without including dummies for time, country and exchange rate regime. A clearly significant effect of the degree of openness can be noted irrespective of including or excluding GDP and regional dummies and of using import or export ratio as a measure of openness. Due to the insignificant effect of trade ratio even without controlling for other variables, the results of other regressions using it have not been shown. Use of the logarithm of inverse of population as an instrument of degree of openness gives insignificant results and hence, is dropped and not shown in the tables. Moreover, the results with CPI growth rate as a measure of inflation were insignificant and hence have not been tabulated. A significant positive effect of the money growth, which is robust to all possible variations in the model, supports the theoretical arguments of the monetarists. The proposition that GDP curbs inflation too holds good as evident from its negative significant effects.

Table 2: Results for the static model without time and country dummies

	1	2	3	4	5	6	7	8
export ratio	-0.171*				-0.167*		-0.192*	
import ratio		-0.24*	-0.274*			-0.24*		-0.27*
trade ratio				-0.001				
money growth	0.23*	0.224*	0.224*	0.236*	0.229*	0.223*	0.229*	0.222*
GDP AT SDR			-0.055*				-0.048*	-0.055*
Regional dummies					yes	yes	Yes	yes

Table 3 shows that all the above results hold even when the country-specific and time-specific dummies are included after excluding the regional dummies. However, GDP loses its significance if the exchange rate dummies are included with import ratio as a measure of openness. A further interesting result is the significance of the positive effect of the dummy for the dirty exchange rate regime, showing that the stability in

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exchange rate offered by this regime is not sufficient to increase trade and investment to the extent that inflation is controlled and the unexpected monetary expansion is not reduced sufficiently. A fall in the magnitude of the effect of money growth in this case suggests that a part of it has been transformed to this dummy, confirming the statement that dirty exchange rate has encouraged money growth, capturing a part of its effect.

Table 3: Results for static model with time and country dummies and ERR dummies

	1	2	3	4	5	6	7	8
export ratio	-0.184*		-0.156*		-0.187*		-0.128**	
import ratio		-0.25*		-0.234*		-0.266*		-0.223*
money growth	0.209*	0.203*	0.211*	0.205*	0.203*	0.205*	0.205*	0.198*
GDP AT SDR			0.0327*	0.0185*			0.072**	0.053
Time dummies	yes	yes	yes	Yes	yes	yes	Yes	yes
Country dummies	yes	yes	yes	Yes	yes	yes	Yes	yes
fix					-0.009	-0.009	0.057	0.04
dirty					0.35*	0.377*	0.417*	0.423*

From table 4, it can be inferred that before 1989, the relationship between openness and inflation was not significant. This might be due to the fact that openness was not high enough that it could influence inflation in this period. The factors that had been positively affecting inflation significantly in this time span were money growth and GDP, which is partly surprising as GDP is expected to control inflation. However, it can be substantiated by recognizing the fact that the developing countries were in their initial stages in this span, when the increase in GDP would inherently involve the costs of inflation. More importantly, GDP captures various other structural factors, whose combination may cause positive or negative effect on inflation. A further interesting result is that the dummy for fixed exchange rate regime has a significant negative effect on inflation, while that for dirty one has the same if import ratio is included without GDP, even after controlling for country- and time-specific effects. Though this is fully in agreement with Alfaro(2002), the analysis of post-1989 data shows that import ratio is significant even after controlling for these effects, despite fixed exchange regime still having a significant negative effect. Moreover, GDP is found to have a significant negative effect in accordance with the earlier studies, maybe due to the possible fact that the developing countries might have reached a sufficient level of GDP after which the costs of inflation associated with its increase are almost negative. Hence, the period

chosen for study is quite important to arrive at any conclusion. This might be taken as an evidence for the proposition that inflation-openness relationship is a relatively recent phenomenon.

Table 4: Results for model with dummies for time, country and Exchange Rate Regime

	USING PRE-1989 DATA				USING POST-1989 DATA			
	1	2	3	4	5	6	7	8
export ratio	0.078		0.22		-0.156		-0.16	
import ratio		-0.071		0.0497		-0.93*		-0.993*
Money growth	0.174*	0.17*	0.18*	0.177*	0.207*	0.208*	0.206*	0.2*
GDP AT SDR			0.017**	0.116**			-0.003**	-0.065**
Time dummies	Yes	yes	yes	yes	yes	yes	yes	Yes
Country dummies	Yes	yes	yes	yes	yes	yes	yes	Yes
Fix	-1.766*	-1.732*	-1.23*	-1.31*	-1.858*	-1.674*	-1.883*	-1.715*
Dirty	-0.615	-1.414*	-0.205	-0.487	0.534	0.659	0.535	0.692

Table 5 shows the puzzling results of the dynamic panel data analysis. It should be noted here that there was a significant first order autocorrelation in these models, while the second order autocorrelation was found to be insignificant, which is what is required for carrying out a System GMM analysis. Moreover, Sargan's test confirmed the absence of any significant over identification by the instruments chosen for the analysis. The lags of money growth and openness have significant negative effects, while the current level of openness has a positive effect. If country dummies are included, openness becomes insignificant. The reasoning that might be given for this is that the lag of money growth might be affecting the degree of openness via interest rate and exchange rate, and hence playing a significant role in curbing inflation, which could also be the reason for the insignificance of the degree of openness. The results do not change even after including the dummies for exchange rate, which also turn out to be insignificant. Lag of Inflation is significant in most cases, suggesting the presence of clear-cut 'inflation inertia', in an informal terminology.

Table 5: Results for the Dynamic Model Without the Country Dummies

	1	2	3	4	5	6	7	8	9	10
Inf_t-1	0.475**	0.498*	0.507*	0.505*	0.507*	0.505*	0.3*	0.307*	0.413*	0.301*
import ratio	0.337*		0.27*		0.27			0.049	0.078	
Im_t-1	-0.451*		-0.363*		-0.363			-0.071	-0.097	
Money growth	0.014	-0.217	0.0411	0.024	0.0411	0.024	0.045	0.034	0.039	0.057
money growth_t-1	-0.289*	-0.274*	-0.306*	-0.278*	-0.306*	-0.278*	-0.285*	-0.279*	-0.319*	-0.308*
export ratio		0.224*		-0.037*		-0.037	0.026			0.02
Ex_t-1		-0.3*		0.041*		0.041	-0.037			-0.049
GDP AT SDR		-0.357*	-0.387	-0.444	-0.387	-0.444	-0.299	-0.356	-0.386	-0.331
GDP_t-1		0.396	0.393	0.465	0.393	0.465	0.231	0.196	0.186	0.311
Tim dum			yes	yes			yes	yes	yes	yes
Country dummies					Yes	yes	yes	yes	yes	yes
Fix									-1.713	-1.498
Dirty									0.691	0.599

As seen in the tables 6 and 7, for the countries with relatively high inflation (>50%), all coefficients carry the expected signs after controlling for all the possible variables, except for the GDP, which loses its significance while controlling for the exchange rate regime, if the entire period of study is considered. However, for the years preceding 1989, both openness and GDP lose their significance at the cost of the exchange rate regime dummies that carry negative significant effects in contrast with being insignificant for the entire span. Even after 1989, only import ratio and GDP carry the significant negative effects and dirty exchange rate regime is insignificant. This suggests that the countries with high inflation have a significant inflation-openness relationship in the recent years, though the fixed exchange rate regime still has significant negative effect.

Table 6:Results for the countries with inflation > 50% without country & ERR dummies

	1	2	3	4	5	6	7	8	9	10
Export ratio	-0.171*		-0.189*		-0.167*		-0.192*		-0.179*	
import ratio		-0.24*		-0.274*		-0.24*		-0.273*		-0.261*
money growth	0.230*	0.224*	0.231*	0.224*	0.229*	0.223*	0.229*	0.22*	0.222*	0.216*
GDP AT SDR			-0.046*	-0.055*			-0.048*	-0.054*	-0.041*	-0.051*
Regional dummies					Yes	yes	yes	yes		
Time dummies									yes	yes

Table 7:Results for the countries with inflation > 50% with country & ERR dummies

	1	2	3	4	5	6	7	8
export ratio	-0.128***		-0.3*		0.22		-0.16	
import ratio		-0.223*		-0.26*		0.05		-0.993*
money growth	0.205*	0.198*	0.21*	0.211*	0.18*	0.177*	0.206*	0.2*
GDP AT SDR	0.072	0.053	-0.21*	0	0.145	0.12	-0.003*	-0.065***
Time dummies	yes	Yes			yes	yes	yes	yes
Country dummies	yes	Yes	yes	yes	yes	yes	yes	yes
fix	0.06	0.04			-1.23*	-1.3*	-1.53*	-1.715*
dirty	0.42	0.42			-1.73*	-0.4	0.534	0.69
Period of Study	1975-2002	1975-2002	1975-2002	1975-2002	1975-1989	1975-1989	1990-2002	1990-2002

Tables 8 and 9 indicate that for the countries with inflation lower than 50%, the same results discussed in the previous paragraph hold, except for the fact that dirty exchange rate regime has a significant positive effect for the entire period. Thus low-inflation countries have a higher inflation if they have dirty exchange rate regime maybe due to higher exchange rate volatility and a resulting smaller degree of openness than those resulting from a fixed exchange rate regime.

Table 8: Results for the countries with inflation<50% without including ERR dummies

	1	2	3	4	5	6	7	8
Export ratio	-0.189*		-0.192*		-0.179*		-0.3*	
Import ratio		-0.274*		-0.274*		-0.261*		-0.26*
Money growth	0.231*	0.224*	0.229*	0.222*	0.223*	0.216*	0.21*	0.211*
GDP AT SDR	-0.046*	-0.055*	-0.048*	-0.055*	-0.042*	-0.051*	-0.21*	0
Reg dum			Yes	Yes				
Time dummies					Yes	yes		
Country dummies							yes	yes

Table 9: Results for countries with inflation<50% with ERR dummies included

	1	2	3	4	5	6
export ratio	-0.128*		0.22		-0.16	
import ratio		-0.223*		0.05		-0.993*
money growth	0.205*	0.198*	0.18*	0.177*	0.206*	0.2*
GDP AT SDR	0.072	0.053	0.145	0.12	-0.003*	-0.065*
Time dummies	yes	yes	Yes	Yes	Yes	yes
Country dummies	yes	yes	Yes	Yes	Yes	yes
Fix	0.06	0.04	-1.23*	-1.3*	-1.53*	-1.715*
Dirty	0.42*	0.42*	-1.73	-0.4	0.534	0.69
Period of Study	1975-2002	1975-2002	1975-1989	1975-1989	1989-2002	1989-2002

As for the modest time series analysis carried out in this study, the results are interesting only for India, as shown in the Table 10. It should be noted here that the technical tests such as unit root test, involved in time series are not carried out for simplicity and partly due to data insufficiency. The time span during which India was less open, namely, 1975-1990, shows an insignificant AR parameter and significant MA parameter, suggesting an absence of inflation inertia and presence of significant dependence of inflation on the lag of variables other than its own lag. During the period in which India was more open, i.e., 1991-2002, AR parameter is significant, suggesting that a stability or inertia has been generated in inflation probably due to enhanced openness. This shows that apart from reducing inflation, openness can play a significant

role in enhancing inflation stability. However, this result is not obtained for all the other countries, where the AR and MA parameters are insignificant in both of the time spans.

Table 10: Results for two-span ARMA(1,1) study for a few countries

Country	Span	Inflation_t-1	e_t-1
India (Asia)	1975-1990	0.687	-1.01*
	1991-2002	0.916**	-0.26
Barbados (Latin America)	1975-1990	0.14	0.99**
	1991-2002	-1.17	0.99
Benin (Africa)	1975-1990	0.43	0.14
	1991-2002	0.12	0.54
Cyprus (Europe)	1975-1990	-0.12	9.1
	1991-2002	0.57	0.3
Saudi Arabia (Middle East)	1975-1990	0.0421	0.618
	1991-2002	0.29	0.999

6. Conclusions

The static specifications support the proposition that the openness controls inflation if import ratio or export ratio is taken as a measure of degree of openness and GDP deflator growth rate is taken as that of inflation, even after controlling for all other explanatory variables and the dummies for countries, regions, years and exchange rate regimes. However, this breaks down for the time span from 1975 to 1989, indicating that this relationship is a recent phenomenon. The same results hold for the countries with high inflation and low inflation except for the fact that the latter has a significant positive effect of the dummy for dirty exchange rate regime.

In all the relevant specifications, the money growth term has a significant positive effect. GDP has a significant negative effect in all models, except in those that have included the dummies for country, time and exchange rate regime. The fixed exchange rate regime has significant negative effect on inflation if the dataset is analysed in two different spans of time, indicating that it is a short-run phenomenon.

In the dynamic panel data setup, however, the results are strikingly different. Though the degree of openness, *per se*, has a significant positive effect on the inflation, the robust significance of the first lag of the money growth and conditional significance of the first lag of openness (on not controlling for the country-specific effects) seems to indicate that the effects of openness could have been captured by the lag terms.

The simple time series analysis carried out proves that inflation inertia, if captured by the significance of the coefficient of the lag of inflation in an ARMA(1,1) model, has been created in India probably owing to the increased degree of openness, while no conclusions could be made for the other countries.

Hence, the proposition that openness has a negative effect on inflation holds good at least in short run according to this study, though this is sensitive to the measure of openness taken. Its validity in a relatively long run is reasonable to the extent that the lag of money growth affects the degree of openness. However, there is insufficient evidence in favour of the hypothesis that inflation can be stabilized by openness.

In addition to the models estimated in this paper, some more extensions could be done by including dummies for the independence of central banks, level of indebtedness, land area and political stability, if a time-series data for these variables is made available. Moreover, inclusion of per capita GDP, debt-GDP ratio, some explicit structural indicators such as growth of agricultural share in GDP, capital inflows, import costs, tariff structures, and a more comprehensive analysis in the dynamic panel setup could make this study more reliable and concise. A more serious treatment is required for the time-series model estimated in this paper. Carrying out some of these extensions could eliminate the ambiguities resulting from a few models in this paper.

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Appendix: List of the Countries Included in the Study

AFRICA

Benin

Africa

Burkina Faso

Ghana

Madagascar

Morocco

Rwanda

Senegal

Seychelles

Sierra Leone

South Africa

Swaziland

Uganda

Zimbabwe

ASIA

Bangladesh

Fiji

India

Indonesia

Korea

Malaysia

Myanmar

EUROPE

Cyprus

Hungary

Malta

Poland

MIDDLE EAST

Bahrain

Egypt

Kuwait

Oman

Saudi Arabia

Syrian Arab Republic

LATIN AMERICA

Argentina

Barbados

Bolivia

Brazil

Chile

Columbia

Costa-Rica

Dominican Republic

Ecuador

ElSalvador

Guatemala