

CHAPTER 2

THE EXCHANGE RATE: SHOCK GENERATOR OR SHOCK ABSORBER?

1. INTRODUCTION

The aim of this study is to assess the impact of exchange rate regimes on inflation and per capita growth in a wide group of countries. Given a wide range of factors that influence the choice and effectiveness of the exchange rate regime, we turn to empirical analysis to see which regimes have been associated with lower output volatility, attempting to answer the question whether flexible exchange regimes insulate economies from shocks or generate disturbances of their own.

The study draws on Ghosh, Gulde and Wolf (2002) (GGW), who conduct a similar exercise employing the exchange rate classification based on the IMF Annual Report on Exchange Rate Arrangements and Exchange Restrictions. GGW find that inflation is lower under pegged regimes. This result reflects both a greater discipline imposed on a central bank – reflected in lower monetary growth – and a higher credibility of the system, reflected in a lower velocity of money. Flexible exchange rate arrangements are, on the other hand, associated with a lower variance of output. The lower inflation delivered by the pegged regimes comes therefore at the cost of higher real volatility. There seems to be no strong link between the per capita output growth and the exchange rate regime.

The official classification, however, takes no notice of the *de facto* exchange rate behavior, treating equally exchange rate pegs subject to frequent and infrequent adjustments. GGW approach this problem by constructing a ‘consensus’ classification, dropping cases where the actual exchange rate behavior is markedly different from the official classification. Our paper applies the ‘natural classification’ of Reinhart and Rogoff (2002) (RR), which is based on the behavior of exchange rates – either official or parallel – that are predominant in the economy. We conduct an extensive comparison of results across various classifications and samples.

The actual behavior of the exchange rate may reflect shocks affecting the economy, rather than the authorities’ attempts to affect exchange rate movements. The ‘natural’ classification does not distinguish between these two cases, creating problems for the interpretation of the relationship between macroeconomic variables and exchange rate arrangements. In the absence of shocks, it is more likely that

economic performance will be above average, and that exchange rate behavior will be classified as a variant of a regime with limited flexibility. The relationship between the exchange rate regime and economic performance may therefore be spurious, reflecting the impact of shocks that are common to the economy and to the exchange rate classification. We address this problem, which may be particularly acute when using the 'natural' classification, by checking for the robustness of our analysis under alternative specifications of the inflation equation.

The chapter is organized as follows. Section 2.2 describes the theoretical considerations pertaining to the choice of exchange rate regime. Section 2.3 explains the RR classification adopted in our study. Section 2.4 discusses the data. Section 2.5 describes the methodology, providing a further motivation for the use of the 'natural' classification and for handling regime endogeneity. Section 2.6 reports and discusses empirical results, and Section 2.7 concludes.

2. THE THEORY OF EXCHANGE RATE REGIME CHOICE

The literature on the choice between fixed and flexible exchange rates can be grouped into three broad categories. The first focuses on the insulating properties of regimes. The second examines the impact of different exchange rate regimes on economic integration. Two main issues here are whether the fixed exchange rates reduce uncertainty and transaction costs thereby leading to greater economic integration and what are the conditions under which it is preferable for a group of countries to forgo a domestic monetary policy and form a currency union. The third strand focuses on the credibility aspect of the monetary regime.

2.1 Transmission of shocks to the real economy

The literature on how various regimes would operate under conditions of high capital mobility derives from Fleming (1962) and Mundell (1963). These papers point to different implications of fixed and floating exchange rates for the conduct of stabilization policy. If an economy faces mainly nominal shocks then a fixed exchange rate regime looks more attractive. If the shocks are real e.g. like productivity shocks or changes in the terms of trade, the economy needs to react to changes in relative prices. A flexible exchange rate regime allows for a quick change in relative prices, which reduces the impact of the shock on output and employment.

The combination of shocks under which fixed exchange rates would be preferable to floating depends on capital mobility. If capital is relatively immobile, fixed exchange rates provide better insulation of output against shocks to aggregate demand, while under high capital mobility flexible exchange rate regime is preferable. This is due to asymmetric impact of trade and capital flows on the balance of payments. If capital mobility is low, under fixed exchange rates a positive shock to aggregate demand leads to higher imports and loss of reserves through a trade deficit. If the loss of reserves is not sterilized the money supply contracts partly offsetting the original shock. Under a floating regime the trade deficit leads to

depreciation of the exchange rate, which leads to higher exports magnifying the initial shock.

When capital is highly mobile, the balance of payments effects dominate. Under fixed exchange rates, the positive demand shock raises interest rates, which results in capital inflow that more than compensates for the loss of reserves due to the trade deficit. Therefore money supply is higher magnifying the initial shock. Under a floating exchange rate the capital inflow appreciates the exchange rate, this reduces exports and partly offsets the initial shock.

2.2 Economic integration

Adopting a “hard-pegged” exchange rate implies that the nominal exchange rate can no longer serve as an instrument of adjustment. Therefore the case for adoption of a common currency is stronger if countries are subject to similar shocks. This is the main finding of the optimum currency area literature originating from Mundell (1961). The loss of the adjustment mechanism of the exchange rate is less significant if other adjustment mechanisms are available (such as wage and price flexibility, factor mobility, and fiscal transfer systems). The gains from a hard peg include increased trade and investment flows.

2.3. Credibility

The main advantage of a floating exchange rate is that it provides the ability to employ monetary policy to cope with shocks to the domestic economy. However it can at the same time be criticized for allowing too much discretion in monetary policy, and for not providing a sufficiently strong nominal anchor.

In a closed economy the central bank can pre-commit to low inflation by relying on the repeated game nature of the interaction with wage setters or on the appointment of a hawkish central banker (in an independent central bank). In an open economy, an alternative pre-commitment strategy is the pegging of the nominal exchange rate to a low-inflation country. The peg then imposes an additional constraint on the central bank’s ability to create inflation surprises. This constraint is credible as long as the perceived costs of abandoning the peg are greater than the benefits of generating surprise inflation. Adoption of the hard peg can thus increase credibility and make it easier for the central bank to achieve and maintain low inflation.

2.4. Fiscal constraints, financial fragility and other considerations

Under a fixed exchange rate regime with high capital mobility, fiscal policy is the only tool of macroeconomic stabilization. Therefore the ability to employ fiscal policy as an adjustment mechanism is one of the factors that one needs to consider in choosing the exchange rate regime. High fiscal deficits or debt ratios can undermine the credibility of the government, as investors might expect that the government will seek to monetize the deficit abandoning the peg in the process. The

fiscal theory of price determination applied to the exchange rate regime (Canzoneri, Cumby and Diba, 1998) suggests that the fixed exchange rate will be sustainable only if fiscal policy is sufficiently flexible to respect the government's present value budget constraint at a price level consistent with the exchange rate peg.

On the other hand, some models suggest that fixed exchange rates create an incentive for a government with a short time horizon to run larger deficits and deliver short term growth with inflationary costs imposed on future governments (Tornell and Velasco, 2000).

Another issue to be considered is the ability of the central bank to act as a lender of last resort. Hard exchange rate pegs do not allow the central bank to act as a money-printing lender of last resort. However, in the case of emerging-market economies this does not seem to be a genuine concern. While in developed countries the monetary authority can issue liquidity to bail out the banking system, this extra liquidity is expected to be absorbed in the near future by open market operations without inflationary consequences. In emerging-market economies, central bank lending to the banking system in a wake of a financial crisis and a sudden stop in capital inflows is likely to unleash fears of an inflationary explosion and to lead to a sharp depreciation of the exchange rate. If a large proportion of private debt is denominated in foreign currency, this will lead to even more financial instability.

Further, even if a country is better off with a floating exchange rate, the shift from a fixed regime might have serious economic consequences. The move from peg to floating regime in the midst of a crisis is likely to exacerbate the crisis. The initial devaluation, which raises the value of foreign-denominated debt, can cause widespread destruction of private balance sheets, which can lead to a downward spiral. In addition, restoring the national currency might also lead to a major overhaul of the domestic financial sector (Caballero and Krishnamurthy, 2002; Jeanne, 2002).

3. CLASSIFICATION OF EXCHANGE RATE REGIMES

It is widely recognized that exchange rate regime classifications based on declarations of central banks do not correctly depict reality. Officially pegged exchange rates are often subject to frequent adjustments. On the other hand, Calvo and Reinhart (2000) and Hausmann, Panizza and Stein (2001) claim that countries with *de jure* flexible exchange rates regimes often do not allow their exchange rates to move freely ('fear of floating'). Factors such as a lack of credibility, combined with a high exchange rate effect on inflation (pass-through) and the potentially devastating impact of large exchange rate changes on the banking sector, may prevent countries from pursuing an independent monetary policy. There is evidence that in the developing countries in which authorities defend the exchange rate without a formal commitment, interest rates are more sensitive to changes in the US interest rate than in countries with officially fixed exchange rates. Such "floaters" risk premiums may thus be more sensitive to the US interest rates, requiring stronger interest rate adjustments to reduce exchange rate volatility, and further limiting the scope for independent monetary policy.

In addition to the vast difference between *de jure* and *de facto* exchange rate behavior, relying on the behavior of officially reported exchange rates may be also misleading. Most countries after World War II relied on capital controls and/or multiple exchange rate systems at some stage, and it is not possible to assess the underlying monetary policy of a country or the ability of an economy to adjust imbalances, without looking at the market-determined exchange rate. RR identify the periods when dual or multiple exchange rates were in place or when parallel markets were active. They use monthly data on parallel/dual exchange rates to check for consistency between the *de facto* and *de jure* exchange rate regimes and construct a 'natural' classification, based on the actual behavior of the predominant – either official or parallel – exchange rate. They find that under the Bretton-Woods system many countries had a *de facto* floating exchange rate. In about 45% of arrangements officially classified as pegs, the actual regime was in fact a managed or freely floating arrangement with limited flexibility. On the other hand, RR classify 53% of the regimes officially classified as managed floating as in reality being pegs, crawls or narrow bands to an anchor currency. Under the 'natural' classification, the most popular exchange rate regime during 1970-2001 was the peg (33% of observations based on 153 countries), followed by the crawling peg or narrow crawling band (26% of observations).

Finally, RR stress the importance of distinguishing the countries with inflation over 40%, and classify these countries as having a freely falling regime. Relationships between macroeconomic variables in these high-inflation countries are very different from those in more stable economies. It is therefore important to check for the robustness of any estimated economic relationships when the high-inflation cases are excluded. RR do not provide an econometric analysis of the impact of the re-classified exchange rate regimes on inflation and growth. However, the reported average per capita growth rate for the freely floating regimes under the standard classification is 0.5%. Once the freely falling regimes are separated from the free-floating regimes, the growth rate of countries with freely floating exchange rates increases to 2.3%.

4. DATA

The RR classification covers 144 countries over the 1940-2001 period. Data on inflation, GDP growth and a range of additional controls, such as broad money growth, terms of trade, dollar value of exports and imports, investment share in GDP, are reported in GGW and originate from the World Economic Outlook database. The official classification of exchange rate regimes is also taken from the data reported in GGW.

Data availability differs across countries: neither the RR nor GGW classifications cover all of the countries across the whole period. For the sake of comparison, in the case of both inflation and growth we use the same sub-sample of observations as in GGW, excluding observations not available in the RR classification. As pointed out in RR, comparisons of pegged and floating regimes that do not separate the freely falling cases are meaningless. Since we focus on

countries with low and moderate inflation levels, hyper-inflationary cases – i.e. observations that belong to the ‘freely falling’ RR group – are excluded in most of the samples. In addition, we exclude from the same samples the RR category called ‘dual market in which parallel market data is missing’.

5. INFLATION AND GDP GROWTH ACCORDING TO THE RR CLASSIFICATION

Table 2.1 reports the average inflation rate in countries grouped according to the RR classification. The best inflation performance, with average annual inflation of 4.9%, is recorded in countries with no separate legal tender. This is followed by the ‘de facto peg’ regime, with an average of 5.3%, and the ‘moving narrow band’ of 6.5%. In the ‘freely falling’ regime, which by definition records the highest inflation, the average annual CPI growth is 302.5%. The second worst group is the pre-announced crawling peg with average inflation of 55%.

The best growth performance (see Table 2.2) is recorded in the residual category (‘dual market in which parallel market data is missing’). High GDP growth is also recorded in the narrow moving band, the *de facto* crawling band and the pre-announced peg (all around 5%). A similar growth performance is recorded on average in countries with no separate legal tender. Overall, it seems that this category of countries seems to enjoy the lowest level of inflation and a growth rate comparable to the best performance in other regimes, although the inflation performance of the pegged regimes seems to deteriorate towards the end of the sample.

The pegged exchange rate regimes are more heavily concentrated in the low-inflation 1960s, while the flexible regime observations are predominant in the higher-inflation 1970s and 1980s. The shift from low inflation under pegged regimes to high inflation under floating might be explained by the choice of exchange rate regime, but it might equally well be attributed to negative macroeconomic shocks in the later period.

Table 2.3 summarizes information provided above. Categories are combined into six groups, of which the first three are aggregates of the fine classification (each consisting of 4 consecutive subgroups), and the last three are the same as in the fine classification. On balance, the pegged regimes do best in terms of combined performance of inflation and GDP growth.

6. METHODOLOGY

Our aim is to test for a relationship between exchange rate arrangements (defined by the ‘official’ and ‘natural’ classifications) on the one hand, and inflation, per capita growth, and the volatility of output on the other.

6.1 Inflation

The commonly held view is that pegged exchange rates can be an important anti-inflationary tool. This is because a pegged exchange rate provides a visible commitment and raises the costs of excessive monetary growth. Also, if the peg is credible, the increase in money demand following given monetary expansion is likely to be bigger. Our basic specification – identical to GGW – models inflation by the inverted money demand equation, adding other determinants:

$$\pi = \beta_0 + \beta_{ExrR} ExrR + \beta_m \Delta m + \beta_y \Delta y + \beta_{Open} Open + \beta_{CBTurn} CBTurn + \beta_{ToT} \Delta ToT + \beta_{GovGDP} GovGDP + \varepsilon \quad (2.1)$$

where *ExrR* stands for exchange rate regimes dummies, Δm is broad money, Δy is real output, *Open* is trade openness, *CBTurn* is turnover rate of the central bank governors, ΔToT stands for changes in the terms of trade, and *GovGDP* is the fiscal balance as a % of GDP.

The trade openness enters the inflation equation since it raises the costs of monetary expansion, as argued by Romer (1993). The turnover rate of central bank governors is a measure of central bank independence proposed by Cukierman (1992). Higher central bank independence helps solve the time inconsistency problem, leading to lower money growth and lower inflation. International terms of trade are an exogenous source of inflation (Fischer, 1993). The government deficit can affect inflation both through direct monetary financing of the deficit and through the pressure from increased aggregate demand.

The basic specification is augmented with aggregated and disaggregated regime dummies, time dummies to capture unobservable shocks common to all countries and country dummies. We use this formulation to compare results with the RR and GGW classifications in the two samples: one including all categories and the second excluding the ‘freely falling’ and the residual category as defined in the RR classification. All subsequent regressions use the second sample excluding the ‘freely falling’ and the residual category.

The above formulation of the inflation equation implies that explanatory variables other than money and GDP growth rates explain changes in the velocity of money. The indirect influence of the additional variables on inflation is purged from regression coefficients by including money as a separate explanatory variable. In our second specification the money growth rate is excluded.

The models, both including and excluding money growth, include potentially endogenous variables, leading to considerable methodological difficulties. Estimation of the model depends on assumptions about the structure of the error term, correlation between errors and explanatory variables, as well as about the equation’s dynamics. Consider the following general form of the panel data model:

$$y_{it} = \beta x_{it} + \eta_i + v_{it}; \quad i = 1, 2, \dots, N; \quad t = 2, 3, \dots, T; \quad (2.2)$$

There are several factors potentially affecting inflation performance, which are country-specific and either unobservable (e.g. society's aversion to inflation) or difficult to measure for a diverse group of countries (e.g. degree of wage indexation). It is therefore reasonable to assume a non-zero variance for unobservable components η_i . Parameters of the model can be consistently estimated by OLS if $E(x'_{it} v_{it}) = 0$ and $E(x'_{it} \eta_i) = 0$ for $t = 1, 2, \dots, T$. But both of these conditions are likely to be violated: money growth, output growth and government balance can be determined simultaneously with inflation; and unobservable country characteristics can be correlated with the choice of exchange rate regime and the behavior of other variables.

The fixed-effects transformation of the model averages equation 2.2 over time:

$$\bar{y}_i = \beta \bar{x}_i + \eta_i + \bar{v}_i \quad (2.3)$$

and subtracts the cross-section equation 2.3 from the original equation:

$$y_{it} - \bar{y}_i = \beta(x_{it} - \bar{x}_i) + v_{it} - \bar{v}_i; \quad i = 1, 2, \dots, N; \quad t = 2, 3, \dots, T; \quad (2.4)$$

This transformation removes individual specific effects η_i from the model, and estimation of equation 2.4 by OLS eliminates a potential bias from the correlation of unobservable characteristics with explanatory variables. The fixed-effects estimation, however, does not eliminate correlations between explanatory variables and idiosyncratic shocks v_{it} . The instrumental variables (IV) method allows for a consistent estimation of the model, but a special structure of the transformed error term in equation 2.4 requires instruments z_{it} to be strictly exogenous conditional on fixed-effects, i.e.:

$$E(v_{it} | z_{i1} \dots z_{iT}, \eta_i) = 0 \quad (2.5)$$

This assumption implies that shocks v_{it} are uncorrelated with past, current, and future instruments. The assumption is stronger than the earlier assumption of no contemporaneous correlation between errors and explanatory variables sufficient for consistency of the pooled OLS estimation. Any correlation of v_{it} with past or future instruments renders them invalid, since the transformed equation 2.4 contains time-averaged errors \bar{v}_i . This, in particular, excludes lagged values of endogenous explanatory variables from the list of valid instruments. Similarly, when an endogenous explanatory variable is replaced in the model by its lagged values, the correlation between variable's future values and shocks renders the estimates inconsistent. Estimation of a model with lagged dependent variables encounters the same problem since a lagged dependent variable is correlated with time-averaged shocks in equation 2.4.

An alternative approach to eliminating unobserved effects is first differencing of equation 2.2:

$$\Delta y_{it} = \beta \Delta x_{it} + \Delta v_{it}; \quad i = 1, 2, \dots, N; \quad t = 2, 3, \dots, T; \quad (2.6)$$

The new transformed equation is more amenable to IV using appropriate lags of endogenous variables as instruments. Under the assumption that past values of endogenous variable are uncorrelated with shocks v_{it} , any lag of an untransformed endogenous variable longer than 2 can be used as an instrument¹. The same estimation technique is suitable for models with lagged dependent variables, with lags higher than the longest lag in the equation serving as instruments. Some refinements of the basic IV techniques are available for discrete endogenous explanatory variables. Efficiency is increased when fitted values from a first-stage logit or probit model for the discrete variable (with exogenous explanatory variables) are used as instruments for the second-stage model 2.6. Using the same explanatory variables directly as instruments for the discrete variable in equation 2.6, however, also produces consistent estimates.

Previous empirical studies of the effects of exchange rate regimes use a number of empirical techniques in estimating the effects of regimes on macroeconomic performance. GGW(2002) use IV estimation in their basic specification, treating the regime choice as exogenously determined. Other potentially endogenous variables are instrumented by their lags. In checking the robustness of this specification, the GGW estimate a probit model for the choice of exchange rate regime in the first step and use fitted values from this model in the inflation equation to correct for the potential endogeneity of the regime choice. In both specifications no attempt is made to eliminate unobservable country specific effects. The regression with country specific effects in GGW (2002), in turn, does not correct for the potential endogeneity of the regime choice and other variables.

6.2 GDP growth

The impact of exchange rate regimes on growth is ambiguous. In a simple growth accounting approach the exchange rate regime may influence economic growth either through the rate of factor accumulation (investment or employment growth) or through the growth rate of total factor productivity. The link between a pegged exchange rate and investment is not clear. A pegged exchange rate reduces policy uncertainty, interest rate volatility and real exchange rate volatility, leading to higher investment. On the other hand, a pegged exchange rate can exacerbate protectionist pressures and, if foreign trade is associated with higher productivity, it will then also reduce the efficiency of the existing capital stock. In addition, pegged exchange rates may lead to misalignments of real exchange rates and prevent efficient allocation of resources across sectors. Following GGW, the impact of exchange rate regimes on output will be analyzed based on the regression of real per capita GDP growth at constant international prices on a range of explanatory variables common in the literature. The final equation used in the estimation is as follows:

$$\begin{aligned}
\Delta y^{PC} = & \beta_0 + \beta_{ExrR} ExrR + \beta_{inv} \Delta InvGDP + \beta_{Open} Open + \\
& \beta_{School} School + \beta_{ToT} ToT + \beta_{GovGDP} GovGDP + \\
& \beta_{TaxGDP} TaxGDP + \beta_{yrel} (y_0 / y_0^{US}) + \beta_{dpop} \Delta Pop + \beta_{pop} \log(Pop) + \varepsilon
\end{aligned}
\tag{2.7}$$

We include changes in the ratio of investment to GDP ($\Delta InvGDP$) and the average number of years of schooling of the population ($School$). We also include a gap between the country's per capita GDP to that of the US (y_0 / y_0^{US}), to capture the relative convergence hypothesis. In addition, we include openness to trade, the tax to GDP ($TaxGDP$) and government balance to GDP ratios, the terms of trade, population size (Pop), and population growth (ΔPop). We also include regime dummies, time dummies and income level dummies.

7. RESULTS

7.1 Inflation performance

Table 2.4 reports results from the basic specification of the inflation equation described in the previous section for the 'official' classification in the full sample of countries, and in the sample excluding the 'freely falling' cases and the residual category.

The full sample results confirm those obtained in previous studies. The pegged exchange rate regimes, even broadly defined, tend to have lower inflation compared to free floats. Since this result is conditional on money growth, pegging leads to a lower velocity, which may be the effect of higher credibility and lower inflationary expectations. These results are challenged when the 'freely falling' and the residual categories are excluded from the sample. Then the level of inflation in broadly defined pegged regimes is not significantly lower than in the floating regimes. Hard pegging, however, is still associated with lower inflation. The intermediate regimes, which perform similarly to floating regimes in the full sample results, have a significantly worse inflation record in the limited sample. Exclusion of outliers is therefore important for correct inference, especially if the focus is on low- and medium-inflation countries, as in this study. Other explanatory variables in the regression have the correct signs and most of them are statistically significant.

In the same specification with the 'natural' classification (Table 2.5), the regime dummies are not significantly different of zero, with the exception of the 'freely falling' category. The dummies for aggregate regimes continue to be insignificant after this category, and the unclassified regimes, are excluded. In the results with the 'fine' regime classification dummies, countries with no separate legal tender have lower inflation, while some of the intermediate regimes perform worse in terms of inflation than floating regimes. The results from the two classifications are consistent with each other, although the results obtained with the RR classification are less precise than in the case of the GW classification.

The results with money growth excluded from the set of explanatory variables (Tables 2.6 and 2.7) lead to similar conclusions. The hard pegs are associated with lower inflation than the floating regimes, with intermediate regimes performing worse. The coefficients of the regime dummies are now higher in absolute terms than in the regression with money growth, since in this case the dummies reflect not only credibility effects, but also a direct effect of lower money creation on inflation.

In order to deal with the endogeneity problem, the revised, dynamic specification discussed above is estimated. Since there are not enough regime changes in the sample to estimate the models using the 'fine' classification, only estimates using broadly defined pegs are presented in Table 2.8. The results suggest that introduction of a *de jure* pegged regime is associated with inflation reduction, while exiting from the peg increases inflation. The dummy associated with a *de jure* pegged regime in the broad classification was not statistically significant in the base estimation in Table 2.4. This points to the importance of accounting for the endogeneity of regime choice before drawing any conclusions regarding the impact of the exchange rate regime on economic variables. The signs of coefficients of other determinants of inflation remain correct, and the variables are mostly significant. It is important to reiterate that, while these results control for the potential correlation between individual effects and the choice of regime, they do not eliminate the effect of other shocks on the joint behavior of inflation and regime choice. Exiting from the peg may be associated with a crisis related to an exogenous shock, and in this case the relationship estimated between the exchange rate regime and inflation will be spurious.

7.2 Growth performance

Tables 2.9 and 2.10 report the results of the estimation of equation 2.7. With the exception of average years of schooling and terms of trade developments, all variables are statistically significant and have the expected signs. A higher investment to GDP ratio is associated with faster per capita GDP growth. This is also the case with greater openness to trade. Countries that run a budget surplus tend to grow faster, as do the countries with larger populations. Our results also support the conditional convergence hypothesis, as a higher initial income level is associated with lower GDP growth. A higher share of taxes in GDP results in slower GDP growth.

Our results indicate that there are no statistically significant differences in GDP performance between pegged and intermediate exchange rate regimes. Disaggregation into six categories of *de jure* exchange rate regimes still shows no differences in GDP growth across groups. When the finer *de jure* classification is employed, the only statistically significant dummy applies to countries with unclassified rule based intervention, where GDP performance is slightly worse than in case of pure floating regimes. All explanatory variables are robust to the introduction of a different set of regime dummies.

Our results differ from those obtained by GGW (2002) in a similar specification, who found that GDP growth is faster under intermediate regimes by 0.7 percentage

points. The impact of pegged regimes, although positive, is not statistically significant, which is in agreement with our estimates. When the broad *de jure* classification is employed, GGW find that countries with hard pegs and traditional single currency pegs do not experience slower GDP growth, but GDP growth is faster under various intermediate regimes by about 1 percentage point per year as compared to free floating.

Estimation of a similar specification with exchange rate regimes identified by the 'natural' classification indicates that there are no statistically significant differences in GDP growth under different exchange rate arrangements. All the remaining explanatory variables are robust to the introduction of a different set of regime dummies.

Overall, our results indicate that controlling for other determinants, there are no significant differences in the growth performances of countries under various exchange rate arrangements. This is a similar result to that obtained by GGW, who conclude that differences in growth performance are rather small.

7.3 Output volatility

The theoretical literature suggests that output volatility tends to be higher under pegged regimes if the economy is subject to real shocks and if nominal rigidities are present in the economy. When studying the conditional effect of the exchange rate regime on output volatility, we follow GGW by employing volatility of terms of trade and of the investment ratio in a specification similar to equation 2.7. Additional explanatory variables are the same as in the growth regressions.

Results presented in Tables 2.11 and 2.12 suggest that both terms of trade variability and investment to GDP variability contribute to the volatility of output. The results also indicate that pegged regimes are associated with greater output volatility of about 1.5 percentage points per year. The volatility of output decreases with average income, as high-income countries experience the lowest output volatility. The 'fine' *de jure* classification indicates that the highest output volatility is recorded in countries with basket pegs and hard pegs, exceeding output volatility under floating regimes by 2.4 and 1.5 percentage points respectively. Application of the 'fine' classification shows that countries with secret basket pegs, currency boards, managed floats with heavy intervention, dollarization, crawling pegs, published basket pegs and monetary union membership are also associated with greater volatility of output than the floating exchange rate regime.

In the 'natural' classification the signs are reversed. Pegged regimes (especially *de facto* pegs and *de facto* crawling bands narrower than or equal to $\pm 2\%$) are associated with significantly lower output volatility. This is a similar result to that obtained by GGW in the results based on their 'consensus' classification (dropping cases where the actual exchange rate behavior is markedly different from the official classification). The authors suggest that this may be due to the circumstances of particular countries in the sample, and not a reflection of the impact of the exchange rate regime on output volatility. The 'consensus' classification includes under the float category all countries that experience significant exchange rate movements,

among which some countries experiencing severe economic turmoil, while it excludes pegs with similarly pronounced movements in economic activity. The ‘natural’ classification of RR is likely to classify countries experiencing large shocks as floaters, and countries not subject to shocks as pegged regimes. The resulting endogeneity of the regime classification leads to potentially spurious results. First differencing – which may be successful in dealing with endogeneity when the source of the problem lies in the correlation between the regime choice and the individual effects – is likely to exacerbate the problem in the case of output volatility, since the endogeneity is more likely to stem from the correlation between regime choice and other shocks.

Overall, our results are similar to those reported by GGW, although the magnitudes of the estimated impact of exchange rate regime on output volatility are significantly higher. GGW find that pegged exchange rates are associated with greater output volatility of about one-third to one-half percentage points, while we find that hard pegs have volatility that is 1.5 percentage points higher and ‘basket pegs’ volatility that is 2.4 percentage points higher than free floaters.

8. CONCLUSIONS

Inflation and GDP growth performances differ significantly across countries with various exchange rate arrangements. The econometric results point to a significant role for hard pegs in improving inflation performance, and a detrimental effect of intermediate regimes on inflation. In modeling the relationship between the exchange rate choice and inflation, it is critically important to eliminate high-inflation countries from the sample. The presence of outliers produces spurious estimates, pointing to a significant impact of any form of pegging on inflation performance. The choice of exchange rate regime classification seems to be less critical for the results, although using the ‘natural’ classification based on actual exchange rate behavior leads to less precise estimates. In general, it is difficult to establish a casual link between regime choice and inflation performance due to a potential endogeneity problem inherent in the regression, which is likely to be more pronounced when the ‘natural’ classification is used. This is confirmed by our estimates correcting for endogeneity of regime choice, which show that only *de jure* pegged regimes are associated with lower inflation.

Similarly to other studies, we did not find any significant relationship between exchange rate regimes and per capita growth. The choice of exchange rate regimes is, however, significantly correlated with output volatility, leading to a potential trade-off between inflation and output performance. Flexible exchange rate arrangements are, on average, able to insulate economies from certain shocks. This insulating property comes, however, at the cost of lower credibility and therefore higher inflation. This result is not robust to the regime classification: the pegged regimes defined by the ‘natural’ classification are associated with lower output volatility. The endogeneity of the ‘natural’ classification is the most likely factor leading to this result.

NOTES

¹ First lags are not valid instruments since they are correlated with first differences of shocks v_{it} .

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APPENDIX 2.1. TABLES

Table 2.1. Average inflation rates in countries grouped according to the RR classification

RR classification	Average	Variance	No. of observations
No separate legal tender	4.9	97.0	130
Pre announced peg or currency board arrangement	9.7	6651.6	1608
Pre announced horizontal band that is narrower than or equal to $\pm 2\%$	10.0	85.8	6
De facto peg	5.3	34.1	361
Pre announced crawling peg	55.5	1341.3	16
Pre announced crawling band that is narrower than or equal to $\pm 2\%$	19.7	594.2	24
De facto crawling peg	8.7	71.7	235
De facto crawling band that is narrower than or equal to $\pm 2\%$	8.4	47.7	759
Pre announced crawling band that is wider than or equal to $\pm 2\%$	13.2	56.7	10
De facto crawling band that is narrower than or equal to $\pm 5\%$	11.7	133.5	462
Moving band that is narrower than or equal to $\pm 2\%$	6.5	42.9	48
Managed floating	16.9	3391.3	428
Freely floating	8.4	100.4	153
Freely falling	302.5	1193477.3	389
Dual market in which parallel market data is missing.	8.9	138.7	96
TOTAL			4725

Source: Reinhart and Rogoff (2002); authors' own estimations.

Table 2.2. Average annual GDP growth in countries grouped according to the RR classification

RR classification	Average	Variance	No. of observations
No separate legal tender	4.9	44.8	122
Pre announced peg or currency board arrangement	5.1	144.8	1088
Pre announced horizontal band that is narrower than or equal to $\pm 2\%$	-0.6	1.3	2
De facto peg	3.9	12.9	283
Pre announced crawling peg	3.4	20.5	14
Pre announced crawling band that is narrower than or equal to $\pm 2\%$	4.1	10.2	24
De facto crawling peg	3.7	45.3	192
De facto crawling band that is narrower than or equal to $\pm 2\%$	4.6	18.9	593
Pre announced crawling band that is wider than or equal to $\pm 2\%$	4.5	21.9	5
De facto crawling band that is narrower than or equal to $\pm 5\%$	5.1	20.5	286
Moving band that is narrower than or equal to $\pm 2\%$	5.4	24.7	48
Managed floating	3.4	31.5	341
Freely floating	3.0	10.5	120
Freely falling	0.9	41.3	340
Dual market in which parallel market data is missing.	7.0	300.8	49
TOTAL			3507

Source: Reinhart and Rogoff (2002); authors' own estimations.

Table 2.3. Inflation and growth performance according to the 'coarse' RR classification

Regime	Inflation	GDP growth
Pegged	8.6	4.8
Intermediate	9.5	4.4
Floating	13.8	4.3
Freely floating	8.4	3.0
Freely falling	302.5	0.9
Dual market in which parallel market data is missing.	8.9	7.0

Source: Reinhart and Rogoff (2002); authors' own estimations.

Table 2.4. Level of inflation: 'official' (GGW) classification with various samples

	Coeff. (t-value)	Coeff. (t-value)
Constant	0.010 (1.140)	0.009 (1.050)
3-year SD Investment to GDP ratio	0.311 (4.410)	0.323 (4.560)
Openess	0.023 (8.970)	0.023 (8.770)
Avg yrs of schooling	-0.002 (-2.480)	-0.002 (-2.650)
3-year SD ToT	0.098 (8.910)	0.094 (8.440)
Tax to GDP ratio	-0.021 (-1.920)	-0.022 (-1.930)
Initial income/US income	0.089 (15.500)	0.085 (14.300)
Population size	-0.001 (-1.900)	-0.002 (-1.960)
Population growth	-0.525 (-9.300)	-0.525 (-9.280)
Gov. balance	-0.251 (-16.800)	-0.255 (-17.000)
Upper Income	-0.050 (-8.840)	-0.043 (-7.100)
Upper Middle Income	-0.024 (-5.690)	-0.021 (-4.620)
Lower Middle Income	-0.010 (-3.130)	-0.009 (-2.580)
Pegged	-0.008 (-1.780)	
Intermediate	-0.004 (-0.987)	
Floating	-0.003 (-0.668)	
No separate legal tender		-0.012 (-1.490)
Pre announced peg or currency board arrangement		-0.006 (-1.090)
Pre announced horizontal band that is narrower than or equal to +/-2%		-0.007 (-0.398)
De facto peg		-0.012 (-2.200)
Pre announced crawling peg		0.001 (0.039)
Pre announced crawling band that is narrower than or equal to +/-2%		-0.003 (-0.313)
De factor crawling peg		0.005 (0.933)
De facto crawling band that is narrower than or equal to +/-2%		-0.009 (-1.850)
Pre announced crawling band that is wider than or equal to +/-2%		0.006 (0.372)
De facto crawling band that is narrower than or equal to +/-5%		0.000 (-0.020)
Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)		-0.009 (-1.090)
Managed floating		-0.004 (-0.787)
R squared	0.366	0.372
No. of obs.	1782	1782

Table 2.5. Level of inflation: the 'natural' (RR) classification with various samples

	Free Falling and Unclassified Incl.		Free Falling and Unclassified Excl.	
	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Constant	0.003 (0.102)	0.001 (0.016)	0.016 (1.410)	0.019 (1.510)
Broad money growth	0.472 (37.100)	0.471 (36.800)	0.504 (29.100)	0.508 (29.400)
Real GDP growth	-0.687 (-8.800)	-0.684 (-8.760)	-0.253 (-7.250)	-0.247 (-7.070)
ToT Growth	-0.104 (-3.070)	-0.105 (-3.080)	-0.093 (-6.230)	-0.092 (-6.190)
CB Turnover	0.083 (4.350)	0.081 (4.170)	0.029 (3.450)	0.033 (3.870)
Gov. balance	0.046 (0.759)	0.044 (0.729)	-0.031 (-1.270)	-0.027 (-1.130)
Openness	-0.007 (-1.290)	-0.007 (-1.250)	-0.003 (-1.270)	-0.003 (-1.280)
Upper Income	-0.024 (-1.750)	-0.020 (-1.370)	-0.031 (-5.450)	-0.029 (-4.900)
Upper Middle Income	0.013 (0.925)	0.020 (1.330)	-0.022 (-3.480)	-0.018 (-2.820)
Lower Middle Income	-0.011 (-0.809)	-0.008 (-0.608)	-0.024 (-4.240)	-0.022 (-3.910)
Pegged	0.000 (-0.011)		-0.004 (-0.437)	
Intermediate	-0.007 (-0.316)		-0.008 (-0.938)	
Floating	0.004 (0.154)		0.004 (0.427)	
Freely falling	0.346 (13.600)			
Dual market in which parallel market data is missing	-0.009 (-0.249)			
No separate legal tender		-0.058 (-1.290)		-0.043 (-2.570)
Pre announced peg or currency board arrangement		0.008 (0.306)		0.001 (0.082)
Pre announced horizontal band that is narrower than or equal to +/-2%		-0.028 (-0.177)		-0.001 (-0.011)
De facto peg		-0.004 (-0.167)		-0.004 (-0.441)
Pre announced crawling peg		0.032 (0.455)		0.063 (2.300)
Pre announced crawling band that is narrower than or equal to +/-2%		0.044 (0.796)		0.058 (2.810)
De factor crawling peg		-0.013 (-0.494)		-0.014 (-1.420)
De facto crawling band that is narrower than or equal to +/-2%		-0.007 (-0.323)		-0.009 (-1.030)
Pre announced crawling band that is wider than or equal to +/-2%		-0.037 (-0.458)		-0.012 (-0.387)
De facto crawling band that is narrower than or equal to +/-5%		-0.004 (-0.151)		0.000 (0.049)
Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)		-0.039 (-0.874)		-0.023 (-1.350)
Managed floating		0.016 (0.653)		0.011 (1.260)
Freely falling		0.347 (13.500)		
Dual market in which parallel market data is missing.		-0.008 (-0.226)		
R squared	0.634	0.636	0.441	0.451
No. of obs.	2347	2347	1979	1979

Table 2.6. Level of inflation: the 'official' (GGW) classification with money growth excluded

	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Constant	0.091 (6.890)	0.091 (6.850)	0.083 (6.230)
Broad money growth			
Real GDP growth	-0.147 (-3.450)	-0.144 (-3.380)	-0.151 (-3.620)
ToT Growth	-0.050 (-2.740)	-0.047 (-2.620)	-0.048 (-2.710)
CB Turnover	0.060 (5.900)	0.062 (6.010)	0.047 (4.640)
Gov. balance	0.001 (0.042)	-0.001 (-0.028)	-0.027 (-0.899)
Openness	-0.005 (-1.830)	-0.004 (-1.400)	-0.006 (-1.970)
Upper Income	-0.076 (-11.000)	-0.077 (-10.600)	-0.070 (-9.730)
Upper Middle Income	-0.016 (-2.180)	-0.012 (-1.560)	-0.016 (-2.080)
Lower Middle Income	-0.029 (-4.140)	-0.026 (-3.800)	-0.031 (-4.560)
Pegged regimes	-0.018 (-2.620)		
Intermediate regimes	0.017 (2.490)		
Hard pegs		-0.046 (-4.120)	
Single currency pegs		-0.022 (-2.570)	
Basket pegs		-0.010 (-1.320)	
Floats with rule-based intervention		0.018 (2.240)	
Floats with discretionary intervention		0.015 (1.870)	
Dollarized			-0.089 (-4.310)
Currency board			-0.021 (-1.740)
Monetary union to outside (CFA) or inside (EMU) set of countries			0.018 (0.303)
Single currency peg			-0.014 (-1.560)
Published basket peg (SDR or non-SDR)			0.008 (0.922)
Secret basket peg			-0.018 (-1.950)
Cooperative system (EMS or predecessor)			-0.012 (-1.240)
Crawling peg			0.098 (5.720)
Target zone			0.093 (4.380)
Unclassified rule-based intervention			0.081 (3.620)
Managed float with heavy intervention			0.102 (5.460)
Unclassified managed float			0.013 (1.420)
Other floats			0.009 (0.609)
Float with light intervention			0.024 (1.330)
R squared	0.165	0.171	0.212
No. of obs.	1979	1979	1979

Table 2.7. Level of inflation: the 'natural' (RR) classification with money growth excluded

	Coeff. (t-value)	Coeff. (t-value)
Constant	0.0831 (5.440)	0.079 (5.280)
Broad money growth		
Real GDP growth	-0.1294 (-3.020)	-0.127 (-3.030)
ToT Growth	-0.0419 (-2.290)	-0.041 (-2.300)
CB Turnover	0.0631 (6.120)	0.056 (5.520)
Gov. balance	-0.0144 (-0.480)	-0.023 (-0.786)
Openness	-0.0073 (-2.530)	-0.006 (-2.060)
Upper Income	-0.0657 (-9.540)	-0.059 (-8.370)
Upper Middle Income	-0.0198 (-2.610)	-0.021 (-2.640)
Lower Middle Income	-0.0284 (-4.080)	-0.028 (-4.000)
Pegged	-0.0022 (-0.206)	
Intermediate	0.0072 (0.711)	
Floating	0.0209 (1.980)	
No separate legal tender		-0.060 (-2.950)
Pre announced peg or currency board arrangement		0.010 (0.860)
Pre announced horizontal band that is narrower than or equal to +/-2%		-0.031 (-0.443)
De facto peg		-0.007 (-0.545)
Pre announced crawling peg		0.268 (8.400)
Pre announced crawling band that is narrower than or equal to +/-2%		0.081 (3.260)
De factor crawling peg		-0.001 (-0.126)
De facto crawling band that is narrower than or equal to +/-2%		0.004 (0.395)
Pre announced crawling band that is wider than or equal to +/-2%		0.039 (1.070)
De facto crawling band that is narrower than or equal to +/-5%		0.026 (2.240)
Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)		-0.040 (-2.010)
Managed floating		0.030 (2.700)
R squared	0.156	0.204
No. of obs.	1979	1979

Table 2.8. First-differences of inflation: the ‘natural’ (RR) and ‘official’ (GGW) classifications

	Coeff. (t-value)		Coeff. (t-value)		Coeff. (t-value)		Coeff. (t-value)	
Constant	-0.014	-3.9	-0.015	-4.71	-0.001	-1.28	-0.001	-1.49
ΔBroad money growth	0.086	1.32			1.037	23.1		
ΔReal GDP growth	-0.048	-0.55	-0.043	-0.48	-0.680	-6.75	-0.694	-5.29
ΔToT Growth	-0.032	-1.52	-0.021	-1.18	-0.360	-13.4	-0.367	-8.40
ΔCB Turnover	0.003	0.22	0.004	0.33	-0.010	-0.603	0.063	3.80
ΔGov. balance	0.070	1.68	0.070	1.81	0.237	6.17	0.215	3.19
ΔOpenness	0.005	0.29	0.007	0.50	-0.012	-13.7	-0.012	-8.09
ΔPegged (RR)	-0.047	-1.39	-0.051	-1.04				
ΔPegged (GGW)					-0.053	-1.89	-0.162	-5.72
no. of observ	1898		1898		1898		1898	

Table 2.9. GDP growth per capita: the 'official' (GGW) classification

	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Constant	0.0911 (4.910)	0.097 (5.190)	0.102 (5.280)
Investment to GDP ratio	0.0917 (4.670)	0.085 (4.290)	0.093 (4.580)
Openess	0.0058 (1.930)	0.006 (2.140)	0.007 (2.120)
Avg yrs of schooling	0.0008 (1.110)	0.001 (1.090)	0.001 (0.818)
ToT	-0.0165 (-4.400)	-0.017 (-4.510)	-0.017 (-4.620)
Tax to GDP ratio	-0.0328 (-2.720)	-0.039 (-3.100)	-0.045 (-3.460)
Initial income/US income	-0.0226 (-3.610)	-0.022 (-3.550)	-0.020 (-3.130)
Population size	0.0017 (1.950)	0.002 (1.940)	0.002 (1.810)
Population growth	-1.1789 (-19.200)	-1.176 (-19.200)	-1.180 (-19.200)
Gov. balance	0.1227 (7.610)	0.120 (7.420)	0.125 (7.580)
Upper Income	-0.0002 (-0.027)	-0.001 (-0.167)	-0.003 (-0.410)
Upper Middle Income	0.0049 (1.040)	0.004 (0.798)	0.002 (0.488)
Lower Middle Income	0.0043 (1.250)	0.003 (0.757)	0.003 (0.880)
Pegged regimes	0.0018 (0.486)		
Intermediate regimes	0.0016 (0.474)		
Hard pegs		-0.006 (-1.180)	
Single currency pegs		0.001 (0.294)	
Basket pegs		0.006 (1.410)	
Floats with rule-based intervention		0.002 (0.416)	
Floats with discretionary intervention		0.002 (0.550)	
Dollarized			0.002 (0.149)
Currency board			-0.008 (-1.020)
Monetary union to outside (CFA) or inside (EMU) set of countries			-0.007 (-1.190)
Single currency peg			0.000 (-0.027)
Published basket peg (SDR or non-SDR)			0.008 (1.640)
Secret basket peg			0.003 (0.696)
Cooperative system (EMS or predecessor)			0.007 (1.280)
Crawling peg			0.007 (0.822)
Target zone			-0.011 (-0.971)
Unclassified rule-based intervention			-0.022 (-1.930)
Managed float with heavy intervention			-0.002 (-0.231)
Unclassified managed float			0.001 (0.178)
Other floats			0.008 (0.858)
Float with light intervention			0.000 (0.028)
R squared	0.279	0.282	0.286
No. of obs.	1786	1786	1786

Table 2.10. GDP growth per capita: the 'natural' (RR) classification

	Coeff. (t-value)	Coeff. (t-value)
Constant	0.090 (4.710)	0.095 (4.630)
Investment to GDP ratio	0.092 (4.660)	0.097 (4.850)
Openess	0.006 (1.900)	0.006 (1.880)
Avg yrs of schooling	0.001 (1.060)	0.001 (1.030)
ToT	-0.016 (-4.340)	-0.017 (-4.140)
Tax to GDP ratio	-0.032 (-2.660)	-0.037 (-2.970)
Initial income/US income	-0.023 (-3.720)	-0.022 (-3.380)
Population size	0.002 (2.020)	0.002 (1.740)
Population growth	-1.178 (-19.200)	-1.179 (-19.100)
Gov. balance	0.123 (7.560)	0.122 (7.520)
Upper Income	0.000 (-0.008)	-0.002 (-0.341)
Upper Middle Income	0.005 (1.110)	0.004 (0.764)
Lower Middle Income	0.004 (1.220)	0.002 (0.669)
Pegged	0.001 (0.288)	
Intermediate	0.002 (0.347)	
Floating	0.001 (0.198)	
No separate legal tender		0.003 (0.320)
Pre announced peg or currency board arrangement		-0.003 (-0.487)
Pre announced horizontal band that is narrower than or equal to +/-2%		0.022 (1.080)
De facto peg		0.007 (1.220)
Pre announced crawling peg		0.005 (0.209)
Pre announced crawling band that is narrower than or equal to +/-2%		-0.003 (-0.227)
De factor crawling peg		0.003 (0.450)
De facto crawling band that is narrower than or equal to +/-2%		0.001 (0.255)
Pre announced crawling band that is wider than or equal to +/-2%		0.001 (0.069)
De facto crawling band that is narrower than or equal to +/-5%		0.003 (0.495)
Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)		0.001 (0.113)
Managed floating		-0.001 (-0.252)
R squared	0.279	0.282
No. of obs.	1786	1786

Table 2.11. Volatility of GDP growth per capita (3-year SD): the 'official' (GGW) classification

	Coeff. (t-value)	Coeff. (t-value)	Coeff. (t-value)
Constant	-0.009 (-1.150)	-0.005 (-0.662)	-0.006 (-0.821)
3-year SD Investment to GDP ratio	0.293 (4.180)	0.324 (4.650)	0.341 (4.890)
Openess	0.023 (8.930)	0.023 (8.920)	0.019 (6.970)
Avg yrs of schooling	-0.001 (-1.430)	-0.001 (-1.590)	-0.001 (-1.620)
3-year SD ToT	0.099 (9.010)	0.089 (8.080)	0.089 (8.050)
Tax to GDP ratio	-0.026 (-2.410)	-0.037 (-3.260)	-0.026 (-2.260)
Initial income/US income	0.091 (15.700)	0.095 (16.400)	0.090 (15.300)
Population size	0.000 (0.141)	0.000 (0.192)	0.000 (0.316)
Population growth	-0.541 (-9.660)	-0.537 (-9.660)	-0.519 (-9.360)
Gov. balance	-0.249 (-16.900)	-0.254 (-17.300)	-0.266 (-18.000)
Upper Income	-0.048 (-8.310)	-0.050 (-8.680)	-0.048 (-8.040)
Upper Middle Income	-0.024 (-5.710)	-0.027 (-6.360)	-0.030 (-6.670)
Lower Middle Income	-0.007 (-2.330)	-0.007 (-2.130)	-0.009 (-2.690)
Pegged regimes	0.015 (4.630)		
Intermediate regimes	0.004 (1.120)		
Hard pegs		0.015 (3.440)	
Single currency pegs		0.004 (0.891)	
Basket pegs		0.024 (6.490)	
Floats with rule-based intervention		0.002 (0.528)	
Floats with discretionary intervention		0.006 (1.760)	
Dollarized			0.020 (2.160)
Currency board			0.028 (3.850)
Monetary union to outside (CFA) or inside (EMU) set of countries			0.011 (2.080)
Single currency peg			0.005 (1.110)
Published basket peg (SDR or non-SDR)			0.016 (3.570)
Secret basket peg			0.034 (7.710)
Cooperative system (EMS or predecessor)			-0.005 (-1.030)
Crawling peg			0.019 (2.580)
Target zone			0.016 (1.640)
Unclassified rule-based intervention			0.009 (0.900)
Managed float with heavy intervention			0.023 (2.440)
Unclassified managed float			0.006 (1.510)
Other floats			0.006 (0.775)
Float with light intervention			0.002 (0.245)
R squared	0.374	0.387	0.399
No. of obs.	1782	1782	1782

Table 2.12. Volatility of GDP growth per capita (3-year SD): the 'natural' (RR) classification

	Coeff. (t-value)	Coeff. (t-value)
Constant	0.010 (1.140)	0.009 (1.050)
3-year SD Investment to GDP ratio	0.311 (4.410)	0.323 (4.560)
Openness	0.023 (8.970)	0.023 (8.770)
Avg yrs of schooling	-0.002 (-2.480)	-0.002 (-2.650)
3-year SD ToT	0.098 (8.910)	0.094 (8.440)
Tax to GDP ratio	-0.021 (-1.920)	-0.022 (-1.930)
Initial income/US income	0.089 (15.500)	0.085 (14.300)
Population size	-0.001 (-1.900)	-0.002 (-1.960)
Population growth	-0.525 (-9.300)	-0.525 (-9.280)
Gov. balance	-0.251 (-16.800)	-0.255 (-17.000)
Upper Income	-0.050 (-8.840)	-0.043 (-7.100)
Upper Middle Income	-0.024 (-5.690)	-0.021 (-4.620)
Lower Middle Income	-0.010 (-3.130)	-0.009 (-2.580)
Pegged	-0.008 (-1.780)	
Intermediate	-0.004 (-0.987)	
Floating	-0.003 (-0.668)	
No separate legal tender		-0.012 (-1.490)
Pre announced peg or currency board arrangement		-0.006 (-1.090)
Pre announced horizontal band that is narrower than or equal to +/-2%		-0.007 (-0.398)
De facto peg		-0.012 (-2.200)
Pre announced crawling peg		0.001 (0.039)
Pre announced crawling band that is narrower than or equal to +/-2%		-0.003 (-0.313)
De facto crawling peg		0.005 (0.933)
De facto crawling band that is narrower than or equal to +/-2%		-0.009 (-1.850)
Pre announced crawling band that is wider than or equal to +/-2%		0.006 (0.372)
De facto crawling band that is narrower than or equal to +/-5%		0.000 (-0.020)
Moving band that is narrower than or equal to +/-2% (i.e., allows for both appreciation and depreciation over time)		-0.009 (-1.090)
Managed floating		-0.004 (-0.787)
R squared	0.366	0.372
No. of obs.	1782	1782



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