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Ouput Response to Currency Crises

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Abstract

Currency crises are not growth-neutral in the short-run. Nor are they necessarily contractionary. Even when they are associated with a contraction, the magnitude of contraction tends to vary significantly across episodes. Using a sample of 195 crisis episodes across 91 developing countries, this paper presents the main stylized facts on the behavior of output. Notably, this paper finds that more than 40 percent of the crises have been expansionary and rejects the notion that output severity of crises has risen overtime. It, however, does find that large and more developed economies are more often subject to contraction during crises than small economies. In addition, the paper identifies factors that contribute to such diverse growth effects. It finds that crises that are preceded by large capital inflows, occur at the height of an economic boom, under a relatively free capital mobility regime, and in countries that trade less with the rest of the world, are more likely to be contractionary in the short-run. The growth effect gets further exacerbated in the short-run, if trade competitors also devalue, crude oil prices rise, and post-crisis period is marked by tight monetary policy. However, large private capital flows, which could be detrimental to growth in a crisis environment, are found to be beneficial to growth in the long run, posing an important "short-versus-long-run" policy trade-off for developing countries.

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I. INTRODUCTION

Currency crises are not growth neutral, at least not in the short-run. Experience of several emerging market countries recently affected by currency crises shows that, not only do growth effects tend to be large, but are also predisposed to be adverse. While adverse, the impact on growth seems to vary significantly across episodes. For example, following the 1997 crisis, while the Indonesian and Thai economies contracted by 13 and 10 percent respectively, the Philippines economy shrunk by only 0.5 percent. Similarly, during the 1994 peso crisis, the magnitude of contraction for the Mexican economy was only 4 percent while Argentina, which successfully defended its currency, experienced a contraction of 7.5 percent, almost double the contraction in Mexico[2].

When we had first begun to write this paper our main objective was to identify factors whose presence or absence made one crisis more contractionary than others. Given the well-publicized experience of the recent crisis countries, we took for granted that currency crises were almost always contractionary. But a thorough inspection of the data over a large group of countries and over three decades, convinced us fairly quickly that our basic premise needed a revision.

Figure 1, which plots the magnitude of contraction/expansion during selected currency crises, shows why. First, currency crises in even some of the relatively large emerging markets have been expansionary (e.g. Brazil-1979, Colombia-1985, China-1994, Venezuela-1984 and 1987, and Hungary-1993). Second, there is huge disparity in the growth experience of other developing countries following currency crises. While some of the crises have been highly contractionary (e.g. Nicaragua-1979, Lesotho-1998, Papua New Guinea-1995, Togo-1981, Jordan-1989, Costa Rica-1981 and Madagascar-1981), in others, they have

[2] A currency crisis is called contractionary (expansionary), if the average growth rate in the crisis and first post-crisis years is lower (higher) than the average growth rate in three pre-crisis tranquil years. For details, see Section III.

been highly expansionary (Lesotho-1984, Nigera-1989, Uganda-1981, and Togo-1994). Third, in certain cases, the effect on growth has varied significantly across episodes even for the same country (e.g. Togo-1981 versus 1994, Lesotho-1998 versus 1984, Chile-1982 versus 1972, Madagascar-1981 versus 1994, and Venezuela-1984 versus 1987)[3].

Observations such as these led us to expand our initial objective from identifying factors whose presence (or absence) made some crises more contractionary than others to identifying factors whose presence (or absence) made both contraction and expansion of economic activity possible. In doing so, we explore various competing explanations, like sudden stops or reversals of capital inflows, the presence of liability dollarization and increased debt burden from devaluation, maturity mismatch between short-run foreign assets and liabilities, degree of external liberalization, banking crises, competitive devaluation by other countries, fiscal and monetary policies pursued during crises, and so on, that are now thought to influence output in the short run .

To our knowledge, previous empirical studies have not explored why some crises are contractionary and others not, even though some crises occurring as late as in the mid-1990s have been expansionary. While the growth experience of the Mexican and East Asian countries has clearly dominated this literature, there are very few studies looking beyond these countries[4]. To a large extent this is understandable because, while crises associated with deep contractions pose serious policy dilemma, there is little reason to be concerned about positive growth outcomes.

[3] Note that, many of the expansionary crises occurred in the industrial countries. While an interesting observation, because of lack of comparable data between developing and industrial countries, we did not include the latter group in this study.

[4] See, for example, Lederman, Menéndez, Perry, and Stiglitz (2000), and Krueger and Tornell (1999) for the Mexican crisis, and Corsetti, Pesenti and Roubini (1999) and Lane and Phillips (1999) for the Asian crisis.

In the more distanced past, the effect of currency devaluation on trade balance had been of overriding academic interest. Therefore, most studies at the time focused on the relationship between real exchange rate and growth via its effect on exports and imports[5]. In recent years, however, many developing countries have aggressively liberalized their external and financial sectors, raising new concerns associated with volatility of capital flows, increased dollar liabilities of the private sector, maturity mismatch between external assets and liabilities, emergence of twin (banking and currency) crises, and so on. Thus, many new channels through which currency devaluation could potentially affect growth are now taking center stage. In sum, the underlying relationship between large currency devaluation or currency crises and growth is now believed to be far more complex than a decade ago.

Using a broad sample of 195 currency crises in 91 countries from 1970 to 1998, the paper establishes some stylized facts on output growth behavior. It finds that, while a majority of crises has been contractionary, crises associated with an expansion have also occurred with remarkable regularity. More than 4 out of 10 currency crises are found to be expansionary in the sample. Moreover, crises in large emerging market crises are not necessarily contractionary[6]. For the large emerging markets, the corresponding ratio is 3 out of 10, and for the small emerging markets it is 5 out of 10[7]. Finally, the ratio of expansionary to contractionary crises has barely changed in the last two decades - both for the large as well as for the small emerging markets -, and this ratio is found to be independent of the methodology used to identify a currency crisis.

[5] For example, see Cooper (1971), Connolly (1983), Taylor and Rosensweig (1984), Edwards (1986), Edwards (1989), Morley (1992) and Kamin and Klau (1998).

[6] A Large emerging market (LEM) is defined in terms of the size of private capital flows received by the country between 1970-97. The results are similar if, instead, we use the size of the economy, i.e. GDP in current US dollar, as the criteria to identify LEM. Details are discussed in Section III.

[7] This paper does not undertake an independent study to identify crisis episodes but uses the definition used in previous studies, as explained in Section III.

A regression analysis shows that following a currency crisis, the contraction in growth rate is larger, the bigger is the surge of private capital flow prior to the crises, the more liberalized are the capital and current accounts, the more pronounced is the pre-crisis business cycle boom, and the higher is the per capita income of the country. Factors that contribute positively to growth are mostly related to international trade. The expansion is found to be stronger, the bigger is the share of trade in economic activity and the larger is the growth of exports in response to devaluation. While external factors together account for a much smaller explanation of the diversity in growth outcomes, competitive devaluation (measured in terms of third country real devaluation) and a rise in crude oil prices are found to have a negative and significant impact on growth during crises periods. Regarding monetary policy, we find that raising interest rates or tightening money supply is generally *associated* with adverse growth outcomes. Unlike the effects of monetary policy, a tight fiscal policy is found to have a positive *association* with short-run growth during crises.

Our cross-section regression analysis (where each crisis is treated as one observation) is, potentially susceptible to two mis-specification problems. First, certain crisis-specific factors may have been unaccounted for in the cross-section regressions. Second, the policy variables are likely to be endogenous to growth outcomes. There is probably no completely satisfying way to resolve these problems, especially the second one, in the context of this paper. This is because this paper intends to be as extensive as possible in terms of its coverage of country and time period. But this imposes a cost. Output data for many developing countries are only available at annual frequency, which, in turn, is unlikely to be appropriate for analyzing macroeconomic policy response under currency crisis which occurs with higher frequency. We, however, take a number of steps to mitigate these problems. First, based on hypotheses put forward in the recent currency crisis literature, we make the set of regressors sufficiently broad to reduce the possibility of omission of any important variables.

Second, we try to control for the size of the external shock itself, by using the change in international reserves between one year before crisis and the crisis year as a proxy for the size of the crisis. Finally, we undertake a number of sensitivity analyses to ensure the robustness of our results.

The rest of the paper is organized as follows. Section II identifies a number of factors that are likely to have a bearing on output growth during currency crises. Section III outlines different methods used to identify currency crisis dates and discusses alternative ways of measuring output contraction or expansion. Section IV presents the stylized facts and Section V, the regression results. In Section VI, the trade-off between short- and long-run growth rates that countries could potentially face is discussed. The last section concludes.

II. THEORETICAL EXPLANATIONS

From a theoretical perspective, the output effects of a currency crisis may depend on a large number of factors, including the conditions prevailing in the real, external and financial sectors at the time of the crisis; fiscal and monetary policies implemented during the crisis; and finally, the structural characteristics of the economy. The existing theoretical literature discusses several channels whereby these factors can affect the output growth during crises, as discussed below.[8]

Liability Dollarization and External Debt Burden: When a large part of the liabilities of the domestic firms are denominated in foreign currency, a sudden devaluation leads to an overnight increase in their debt burden. This in turn, almost immediately impacts their balance sheets, and makes it virtually impossible for them to raise new loans to make debt

[8] The list of factors discussed here is by no means exhaustive. The literature offers several other demand and supply effects such as real balance effect, redistribution effect, costly input effect etc., through which a currency devaluation can affect growth. See Agenor (1991) and Lizondo and Montiel (1989) for details. We do not include such variables as it was not possible to either quantify them or data for many countries was not available.

repayment. The debt overhang can be expected to reduce aggregate investment and economic activity[9]. Since most or all of the developing countries' external debt is denominated in foreign currencies, they are particularly vulnerable to this effect.

Sudden Stop or Reversal of External Capital Inflows: A second possible explanation for an economic contraction proposed by Calvo (1998) and shown empirically by Calvo and Reinhart (1999), is that, if a currency crisis is accompanied by a sudden stop or reversal of external capital inflows, and the credit underlying the projects is of shorter maturity than the projects themselves, it increases the incidence of non-performing loans and reduces productive activity. Thus, countries that have been recipients of large capital inflows are most vulnerable to a contraction via this channel, especially if they have fully liberalized their capital account.

External Liberalization in the Presence of Domestic Distortions: It has been argued that liberalizing external capital account without adequately strengthening prudential regulations and supervision, may facilitate excessive risk taking by financial institutions on both the liability as well as the asset sides of their balance sheets. Such liberalization policies, accompanied by tax breaks and other regulatory advantages, often give rise to offshore financial markets, also a source of external vulnerability, as was the case in the East Asian crisis[10]. Further, with a liberalized external capital account, it is difficult to prevent a sharp and significant capital outflows by external and domestic investors at the time of the crisis, amplifying the severity of the crisis. Open capital accounts are also likely to undermine the authorities' ability to undertake "counter-cyclical" policies during periods of currency crises.

Banking Crisis: If the banking sector is not sound or is already experiencing a crisis around the time of the currency crisis, the supply of credit to domestic firms is likely to get

[9] See Bruno (1979), van Wijnbergen (1986), Calvo (1998) and Mishkin (1999).

disrupted. With devaluation adversely affecting the balance sheets of their clients and with a rise in non-performing loans, banks may roll back their lending activities or go bankrupt. Thus, devaluation not only disrupts the productive firms' balance sheets but also further magnifies the preexisting problems in the banking sector giving rise to a "credit crunch". Mishkin (1999) has argued that such a contraction in credit brought about by banking sector problems has been instrumental in aggravating the crises in emerging markets and reducing economic activity.

Short-term Debt and Liquidity Crisis: Rodrik and Velasco (2000) has argued that difficulties in rolling over short-term debt during currency crises could squeeze the liquidity available within the economy and shrink the level of economic activity. In their analysis, they find the ratio of short-term debt to reserves to be a robust predictor of the financial crises as well as their severity[11].

Devaluation and External Trade: Perhaps, the oldest known channel by which devaluation can be expected to affect growth is via its effects on external trade (see footnote 5 for references). If the country undergoes a real devaluation, net exports can be expected to increase. As demonstrated in the trade-growth literature, growth in exports could serve as an engine of output growth. There are, however, many caveats to this channel in the context of our study. First, the time period we consider in this paper may not be sufficiently long to allow for exports and growth to rise as a result of devaluation. The currency crisis could have caused a severe disruption in economic activity for which a reasonable recovery period should be allowed for. Or, it may simply be the case that the J-curve effect is in play. Second, nominal devaluation may not lead to a real devaluation in all cases. In other words, the pass-

[10] See Furman and Stiglitz (1999) and the World Bank's Global Economic Prospects (1997/98).
[11] Note that, Rodrik and Velasco (2000) define a currency crisis as a significant reversal of external capital flows.

through between depreciation and inflation may be very high or the currency was overvalued to begin with. Third, the trade regime may not be sufficiently open to allow for the beneficial effects of devaluation to occur. Fourth, the economy may suffer a terms of trade shock at the same time as the currency crisis, offsetting the beneficial effect of real devaluation on exports. Finally, competitor countries may also devalue their currencies at the same time, a point that is discussed in greater detail below.

Competitive Devaluations: Traditionally, it is argued that a nominal devaluation restores competitiveness of the real exchange rate and provides a boost to the production of tradables (provided the Marshall Lerner condition is satisfied)[12]. But such an expansion may not materialize if trade competitors' of the country also undertake a similar devaluation. Competitive devaluations, or the so called "beggar thy neighbor" effect, has long been recognized as a major hindrance for even very open economies to expand their exports.

Monetary and Fiscal Policies: The stance of monetary and fiscal policy adopted during the crisis is likely to affect the behavior of output in the short run. Monetary policy is often tightened to stem the extent of speculative attack on the currency and to prevent foreign exchange reserves from falling rapidly. Similarly, fiscal policy may be tightened in the immediate aftermath of the crisis to signal a strong policy resolve on the part of the authorities, particularly if past policies were lax, and to compensate for the fiscal burden that inevitably arises following a crisis. While it can be reasonably argued that such policies help stem the slide of the domestic currency or prevent capital outflows, the direction in which such policies would affect growth in the short run is not obvious.

Business Cycles and Currency Crises: Evidence show that countries have experienced currency crises both at the peak as well as the trough of their business cycles. While there is no theoretical justification for crises to be contractionary during booms and vice versa, this

[12] See Guitian (1976) and Dornbusch (1988).

seems to have been the case in most instances (see Milesi-Ferretti and Razin (1998)). Therefore, to avoid any misspecification error, average growth rate during three pre-crisis (tranquil) years, which would proxy for the business cycle condition at the onset of the crisis, is used as a control variable in the regression analysis.

III. DATA AND MEASUREMENT ISSUES

We start with the union of the sample countries in four previous studies: Berg and Pattillo (1999), Frankel and Rose (1996), Goldstein, Kaminsky and Reinhart (1999), and Milesi-Ferretti and Razin (1998), referred to as BP, FR, GKR and MR, respectively. The union set had 114 countries, of which 6 industrial countries were eliminated due to lack of availability of comparable data[13]. We then selected countries on the basis of a simple majority rule. If the majority of the studies identified certain countries as crisis countries, those countries are included in our sample. Specifically, among the 108 developing countries, 11 countries were dropped from our sample because majority of the studies did not identify those as crisis countries[14]. We then searched for comparable data on key variables that are critical for our analysis in the remaining 97 countries. We had to further drop 6 countries since information on some key variables were missing[15]. We thus arrived at a sample of 91 developing countries over the 1970-1998 period[16]. The geographical distribution is as

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[13] These 6 industrial countries are: Denmark, Finland, Greece, Norway, Portugal, Spain, and Sweden.

[14] The 11 countries that were dropped from our sample were: Barbados, Belize, Djibouti, Grenada, Haiti, Oman, Panama, Seychelles, St. Vincent and Grenadines, Tunisia, and Yugoslavia.

[15] The 6 countries for which comparable data was not available are: Guinea, Israel, Liberia, Samoa, Taiwan POC, and Vanuatu.

[16] Some of these studies do not cover the entire period till 1998. Therefore, we update the crises dates, wherever possible, till 1998. We used the respective methodologies of the authors or in some cases, relied on the documentation of the crisis dates from other recent papers.

follows: 42 African countries, 17 Asian countries, 20 Latin American countries, and 12 countries from the East European and Middle Eastern regions (see Appendix A for details).

To determine the crisis dates in each of those countries we proceeded as follows. While BP and GKR look at a composite index of nominal depreciation and reserve loss, FR and MR look only at the depreciation rate to identify crises. Given the scope for a large overlap in the crisis dates across these studies, we again used a simple majority rule to select the crisis dates. That is, for a given country, we select a particular year as the crisis year only if the majority of the papers that include that country in their sample do the same. By using this criterion, we identified a total of 229 crises in the sample. We then had to drop 34 more observations because data on key variables around the time of the crisis were not available. Thus, we finally arrived at 195 episodes, of which, 24 occurred in the 1970s, 83 in the 1980s, and 88 in the 1990s. The details on how these studies identify crises are given in Appendix B. We also report, where appropriate, separate results for each of these 4 studies using their respective crisis dates.

The data set used in the regressions have been obtained from multiple sources, including the IMF's International Financial Statistics, the World Bank's World Development Indicators, Global Development Finance, Economist Intelligence Unit and JP Morgan's website. The currency crisis dates and data on capital and exchange rate restrictions are obtained from previous studies listed in Appendix B. The details concerning the definition and construction of the variables are provided in Appendix C.

III.I *Measuring the Short-run Growth Impact of Crises*

There are several alternative ways of measuring the extent of contraction or expansion of growth rate during currency crises. Two obvious ways are to take the difference between some average of the pre- and post-crisis growth rate, or to compute the deviation of growth rate from a linear or HP trend. One could also introduce variations by using different

windows of pre- and post-crisis periods, or choose to take the nearest tranquil period as the controlling period[17].

Letting g denote the growth rate of real GDP, we define two alternative measures to estimate the change in growth rate on account of the crisis:

- (g_{post_n} - g_{pre_m}): This measure is the difference in the average growth rate between 'm' pre-crisis years and 'n' post-crisis years.
- (g_{post_n} - $g_{pre\_m,\ tranq}$): This is measured in a similar way as the previous one, except when there are consecutive crises within 'm' years. If there is another crisis in the country under question within m years, the nearest 'm' tranquil (non-crisis) years are used.

Since we are primarily interested in the short-run effects, we constrain m and n to be 2 or 3 years. To illustrate the variations across these measures, let us consider a simple example. Brazil experienced a currency crisis in 1989 as well as in 1990 and its economy grew at the rate of 7.9, 3.5, -0.1, 3.2 percent in 1986, 1987, 1988 and 1989, respectively. If we set m=3, then g_{pre_3} and $g_{pre\_3,tranq}$ are found to be 2.2 and 3.8 percent respectively. If we set n=2, then with its post-crisis growth rate of -4.3 in 1990 and 1.2 in 1991, g_{post_2} is found to be -1.5 percent. Thus, according to, (g_{post_2} - g_{pre_3}), the Brazilian economy experienced a contraction of –3.7 percent, and according to (g_{post_2} - $g_{pre\_3,\ tranq}$) by –5.3 percent.

Table 1 below shows the correlation across these alternative measures, with different windows of pre- and post-crisis years. The correlation between alternative measures is found to be extremely high. We selected the measure (g_{post_2} - $g_{pre\_3,tranq}$) to carry out the rest of the

[17] We do not use the deviation of growth rate from a linear trend since it is, by construction, based on long-term time series data which seems inappropriate for analyzing the short-term nature of the questions we pose in this paper regarding developing countries. While the HP filter does take care of non-linearities in the data, we were uncomfortable with using it for developing countries because, while appropriate for smoothing periodic cyclical fluctuations, it did not seem so for smoothing the erratic and significant structural changes that these developing countries went through in the last three decades. We, therefore, use a measure that compares the growth performance during the crisis with performance during those years that are reasonably close to the crisis years.

analysis in the paper. We find this measure intuitively appealing because an average of the previous three years smoothes out large fluctuations that may occur in a particular year (due to say, a bumper harvest or a natural calamity) and an average of two years post-crisis is likely to compensate for the fact that we are dealing with annual data when a crisis could occur at any time during a given year. A number of sensitivity analyses using the other measures (not reported in the paper), however, show that results reported here are robust to these alternative definitions of growth slowdown.

Most other studies in the literature, interested in the short run growth effect of crises, have used measures similar to ours (see, for example, Bordo and Eichengreen (2000)). Studies examining the medium to long-run effects of crises, have also used the same length of pre-crisis window as ours, but their post-crisis window has often been much longer than ours (see Aziz, Caramazza and Salgado (1999), Mulder and Rocha (2000)).

Table 1: Correlation Coefficient of Alternative Growth Change Measures

		A	B	C	D	F	G	H	I
$g_{post\_2} - g_{pre\_2}$	A	1.00							
$g_{post\_2} - g_{pre\_3}$	B	0.88	1.00						
$g_{post\_3} - g_{pre\_2}$	C	0.95	0.81	1.00					
$g_{post\_3} - g_{pre\_3}$	D	0.82	0.93	0.87	1.00				
$g_{post\_2} - g_{pre\_2,tranq}$	E	0.95	0.86	0.88	0.78	1.00			
$g_{post\_2} - g_{pre\_3,tranq}$	G	0.82	0.95	0.74	0.87	0.87	1.00		
$g_{post\_3} - g_{pre\_2,tranq}$	H	0.91	0.89	0.86	0.79	0.84	0.91	1.00	
$g_{post\_3} - g_{pre\_3,tranq}$	I	0.86	0.91	0.81	0.90	0.88	0.83	0.85	1.00

IV. SOME STYLIZED FACTS ON CURRENCY CRISES AND GROWTH

We begin by looking at the frequency distribution of the post-crisis growth rate of output, i.e. g_{post_2}, in Figure 2. It shows that there is a wide variation in post-crisis growth rates across our sample of crisis episodes and the distribution approximates a normal

distribution.[18] The mean, median and standard deviation of g_{post_2} are 1.7, 1.8, and 4 percent, respectively. Only 28 percent of the crises are associated with a decline in output (henceforth, referred to as a recession) and only 2 out of 195 crises (Nicaragua:1979 and Uruguay:1982) have been associated with recessions exceeding 10 percent[19]. For the 1997 East Asian crisis countries, g_{post_2} are - 4.1 percent for Indonesia, -0.1 percent for Korea, 0.1 for Malaysia, and –5.2 percent for Thailand[20].

Figure 2: Frequency Distribution of g_{post_2}

Measuring absolute growth rates to discern the real impact of crises in developing countries may, however, be deceptive, since many of the developing countries tend to have average growth rates exceeding 4 percent. So instead of the absolute growth rates, what we look at is the relative growth slowdown or surge, compared to the pre-crisis years. Specifically, we use (g_{post_2} - $g_{pre\_3,tranq}$), the frequency distribution of which is shown in Figure 3. Though the distribution of (g_{post_2} - $g_{pre\_3,tranq}$) is more skewed towards a contraction than the distribution in Figure 2, it continues to show a large variation in the post-crisis growth rates.

Figure 3 shows that 43 percent of the crises were expansionary and 57 percent contractionary. This was a surprise to us, given our priors that most crises would be contractionary. The average expansion for the expansionary episodes was 3.5 percent, while the average contraction for the contractionary episodes was 4.8 percent. Only 6 percent of these crises, that is, 11 out of 195 experienced a contraction exceeding 10 percent. Of these, 4

[18] The Jarque-Bera test statistic indicates that the null hypothesis of a normal distribution is accepted.

[19] A currency crisis is called recessionary in the paper, if the average growth rate in the crisis year and one post-crisis year is negative.

[20] If we calculate the average growth over 1998 and 1999, the numbers are –6.9 percent for Indonesia, 1.7 percent for Korea, -1.2 percent for Malaysia, and -3.3 percent for Thailand.

occurred in the 1990s (Indonesia:1997, Lesotho:1998, Papua New Guinea:1995, and Thailand:1997), 6 in the 1980s (Chile:1982, Mexico:1982, Philippines:1984, Togo:1981, Uruguay:1982, and Zimbabwe:1983), and 1 in the 1970s (Nicaragua:1979). Some of the crises associated with an expansion include, Brazil: 1979 (2.1 percent), China:1994 (2.6 percent), Colombia:1985 (2.5 percent), Hungary:1993 (7.3 percent), Nigeria:1989 (7.8 percent), and Venezula:1987 (6.7 percent). It is, however, important to note that most of the big expansions occurred in low income, small open economies, several of them in Africa, like Central African Republic:1994, Chad:1981, Ethiopia:1993, Gabon:1981, Ghana:1978, Republic of Congo:1994, and Senegal:1981.

Figure 3: Frequency Distribution of (g_{post_2} - $g_{pre\_3,tranq}$)

IV.I Alternative Crisis Definitions and Changes in the Severity of Crises Overtime

In the rest of this paper our main task is to address, understand, and explain this diverse response of the growth rate during currency crises. But before we plunge more deeply into this issue, we would like to make sure that the heterogeneity in growth rate is not arising because of a sample selection bias.. Specifically, does our using a mix of different (BP, KGR, FR, and MR) crisis-identifying criteria create a systematic bias? If a particular criterion identifies events with a particular growth pattern, then using a mix of crisis dates based on different criteria may pre-determine the varied growth experience in our sample. Second, if the severity of crises is increasing overtime, as some have argued, it may explain why in our sample, which stretches over 3 decades, growth response has differed so much[21]. The evidence presented below, however, rules out these two as possible explanations for the heterogeneity observed in the growth patterns during crises.

[21] See Stiglitz (1999).

Different Crisis-Identifying Criteria: As mentioned earlier, BP and GKR use a composite index of nominal depreciation and reserve loss, and FR and MR use only the nominal depreciation to identify crises. These studies differ in another dimension as well. While BP and GKR look only at a small set of developing countries from Asia and Latin America, FR and MR look at a much larger set of low and middle-income developing countries[22]. To see if we have introduced a systematic bias towards heterogeneity in our large sample, we check whether the growth pattern in the subset of countries that are common across all four studies differ in any significant way. There are only 14 such countries that have been covered by all four studies: Argentina, Bolivia, Brazil, Chile, Colombia, Indonesia, Korea, Mexico, Peru, Philippines, Thailand, Turkey, Uruguay, and Venezuela. In Table 2, we report some of the descriptive statistics measuring the extent of growth slowdown under these alternative criteria.

Note that the mean, median and the standard deviation of (g_{post_2} - $g_{pre\_3,\ tranq}$) is not very different across these four studies. There is some difference in the number and dates of crises each study identifies in these 14 countries. The statistics based on our crisis dates, which is based on a majority rule, are reported in the last row of Table 2. Interestingly, our dates not only yield a larger average contraction than most other studies, but also have a comparable standard deviation. We take this as an evidence indicating that using a majority rule to pick dates that are a combination of different criteria does not bias the results in any particular way; for sure our methodology does not disproportionately pick those episodes in which an expansion has occurred.

Table 2: Descriptive Statistics of (g_{post_2} - $g_{pre\_3,\ tranq}$) Under Alternative Crisis Identifying Criteria*

Studies Using Alternative Crisis Identifying Criteria	Mean	Median	Max.	Min.	Std. Dev.	# of Crises

[22] GKR also have 5 industrial countries in their sample.

Goldstein, Kaminsky, and Reinhart (1999)	-2.6	-2.7	10.6	-14.5	5.6	58
Berg and Patillo (2000)	-3.0	-3.4	8.1	-14.5	5.0	46
Frankel and Rose (1996)	-2.5	-1.8	12.2	-16.6	5.7	53
Milesi-Ferretti and Razin (1998)	-4.4	-4.6	8.4	-16.6	5.9	30
Based on Dates Used in this paper (See Appendix B)	-3.8	-4.1	6.4	-14.5	4.9	46

*For 14 countries which have been covered by all the four studies.

We compare the frequency distribution of (g_{post_2} - $g_{pre\_3,tranq}$) across different studies for the same 14 countries in Figure 4. It can be seen that the distributions are strikingly similar across different criteria. For example, 32 percent of the crises in GKR, 33 percent of the crises in BP, 36 percent of the crises in FR, 26 percent of the crises in MR, and 30 percent of the crises in our sample, are found to be expansionary. Note that the proportion of expansionary crises in these 14 countries, which happen to be some of the large emerging markets, is lower than for the entire sample, which is 43 percent. This indicates that large emerging markets, like these 14, tend to experience more contractionary crises than the smaller ones -- more on this observation later.

Figure 4: Frequency Distribution of (g_{post_n} - $g_{pre\_m,\ tranq}$)
Under Alternative Crisis Identifying Criteria

Based on the experience of these 14 countries, one can soundly reject the concern that using a mix of different crisis-identifying criteria gives rise to varied growth response during crises. Unfortunately, a similar exercise cannot be conducted for the rest of the countries in the sample[23]. But there are at least two reasons why we think that using a criterion based solely on devaluation (FR and MR) or one based on both devaluation and reserve loss (BP and GKR) are unlikely to yield very different crisis dates for the rest of the sample. First, the

[23] Four countries, India, Jordan, Pakistan, and Sri Lanka are included in the BP, but not in GKR. Similarly, Israel and South Africa are included in the GKR but not in BP. All these six

rest of the sample comprises mostly of lower income, smaller emerging market countries that do not receive a lot of private foreign capital, and are, therefore, unlikely to experience speculative attacks of the nature that Mexico or the East Asian countries recently experienced. Thus, the movements in the stock of international reserves, more often than not, reflects movements in official capital flows. Hence, sudden and large reserve changes would be atypical in the remaining sample. Instead, currency or balance of payment crises in these countries are most likely to take the form of a large nominal devaluation, which would be captured by each of the definitions used in all four studies in a similar manner.

Changing Severity of Crisis Overtime: Is the output behavior during crises changing overtime? We address this issue in Figure 5. The first panel in the figure shows that around the crisis, the behavior of growth rates on average has been quite similar during the decades (1970s, 1980s and 1990s). The growth rate significantly slows between years T-1 and T, by 3 percent in the1970s, 2.5 percent in the 1980s, and nearly 2 percent in the 1990s. The crisis year T, is generally the trough of the growth curve; the growth rate begins to pick up in the year T+1, and reverts back to the pre-crisis level by the year T+2.

Figure 5: Severity of Crisis : A Comparison across Three Decades

The second panel of Figure-5 compares the frequency distribution of (g_{post_2} - $g_{pre\_3,tranq}$) across the three decades. The distribution does not appear to have changed much across these decades. The percentage of episodes in which an expansion occurred increased from 28 in 1970s to 50 in 1980s, and then fell back to 42 in 1990s. But on a broad scale, there does not appear to be any evidence to support the view that the severity of crises has dramatically or systematically changed for the worse in the last 30 years.

countries are included in FR and MR. If we add these six countries to our fourteen country list, the results shown in Table 2 and Figure 4 do not change much.

In order to statistically check whether the severity of crisis has increased in the 1990s, we regress the change in growth rate around crises, i.e. (g_{post_2} - $g_{pre\_3,tranq}$), on three time dummies representing the three decades, in a simple OLS regression. The coefficients of the dummies measure the average contraction/expansion during the crises in the respective decades. The results reported in Table 3, show that the average crisis has been contractionary in all the three decades. While the magnitude of contraction has steadily fallen, from -2.9 in the 1970s to -1.1 in the 1980s and to -0.8 in the 1990s, the null hypothesis that the coefficients are equal to one another (as shown in the last three columns under the heading "Wald Coefficient Restriction Tests") is rejected at the 10 percent significance level for only the coefficients associated with the 1970s and 1990s.

The above results, however, appear at odds with the oft-expressed concern that the severity of crises measured in terms of growth rate of output has risen in recent years. Further regressions using several sub-samples, based on different groups of countries or different crisis episodes, do not provide any additional evidence in favor of the increasing severity hypothesis, as demonstrated below.

First, if we compare crises which occurred simultaneously affecting a larger number of countries- namely, the East Asian crisis in 1997, the debt crisis in Latin America in the 1980s, and the Tequila crisis in 1994, we do find that the East Asian crisis has been the most severe (shown in Panel B of Table 3)[24]. But, as the Wald test statistic shows, the average contraction during East Asian crisis is not significantly different from either the Debt crisis or the Tequila crisis.

[24] The Debt crisis event includes crisis that occurred in 1982 and 1983 in the following countries: Argentina, Bolivia, Brazil, Chile, Ecuador, Mexico, and Uruguay. The Tequila crisis event includes Argentina and Mexico as the former was clearly and severely affected by the crisis in Mexico. But note that the former otherwise is not included in our sample of crisis episodes. The East Asian crisis includes crisis in Indonesia, Korea, Malaysia, Philippines and Thailand in 1997.

Second, if we limit the sample to only those crises which were associated with a contraction (that is, in which (g_{post_2} - $g_{pre\_3,tranq}$)<0), the Wald test statistic reported in panel [C] indicates that the average contractionary crisis during the 1990s has not become more severe than an average contractionary crisis during the 1970s or the 1980s.

Third, if we limit the sample to only large emerging markets - LEM (where LEM is defined as a country which has received on average 100 million US dollars of private external capital flows per year, between 1970-98)[25], we find that the average contraction across the three decades within the LEMs has not changed significantly.

Instead of making comparison across time, if one compares across countries, one does find a possible source of diversity in growth patterns. As panel [F] shows, the dummy variable representing LEM has an estimated coefficient of –3.07, while for the SEM the coefficient is 0.24. These coefficients are significantly different from each other in statistical terms. So while an average crisis in LEM has been contractionary, with a three percent contraction of output, an average crisis in SEM has a positive but insignificant growth effect.

Thus far, the following stylized facts on the behavior of output growth in the crises episodes have been established. First, while the majority of currency crises have been contractionary, a highly significant proportion, more than 40 percent, has been expansionary. Second, the ratio of expansionary to contractionary crises has not changed much in the last three decades; in fact, there is no evidence at all that the last decade witnessed more contractionary episodes. Third, the likelihood of a currency crisis associated with an expansion is less likely in large emerging markets than in small emerging markets. Fourth, neither the average level of contraction in contractionary crises, nor the magnitude of

[25] The results do not change qualitatively if we use GDP in US Dollar as the criterion to identify LEMs rather than private foreign capital flows.

expansion in expansionary crises has varied much in the last three decades. And finally, these results appear to be robust to different criteria used in defining crises.

V. Econometric Analysis and Results

Treating each crisis episode as one observation, we estimate the following cross-sectional regressions:

$$(g_{post\_2} - g_{pre\_3,tranq})_i = \alpha + \sum_k \beta_k X_{ki} + \varepsilon_i, \quad \varepsilon_i \approx N(0, \sigma_i^2), \quad i = 1,2,.....,I$$

The dependent variable,(g_{post_2} - $g_{pre\_3,tranq}$), is the difference between the pre- and the post-crisis output growth rate (discussed extensively in Section III), X_k is kth explanatory variable, i denotes the ith crisis episode, and I is the total number of crisis episodes (ranging from 141 to 195). To deal with potential endogeneity problems, lagged values have been used as instruments wherever appropriate.

The regressors are a set of variables motivated by the theoretical explanations discussed in Section II are selected. To this set, a number of control variables for the domestic and global economic conditions at the time of the crisis are added to facilitate unbiased estimation across crisis episodes. The fiscal and monetary policy variables, though important and included as explanatory variables in some regressions, could not be dealt with precision because this analysis has been conducted with annual data, which are not as meaningful to answer shorter run policy response questions to crisis management. .

The choice of variables (TM) motivated by the crisis literature are : (i) the three-year cumulative flow of external private capital as a percentage of GDP (CAPFLOWS_GDP) to test the Calvo (1998) hypothesis that countries that are large recipients of private capital inflows are most vulnerable to output contraction; (ii) the pre-crisis restrictions on foreign exchange

and capital account transactions (CONTROL_DUM) [26] to see whether countries with greater degree of capital mobility suffered larger output losses. This variable is used as an interaction term with the private capital flows variable; (iii) the change in external long-term debt burden (ΔDEBT_BURDEN) to test the Calvo-Mishkin hypothesis that a sudden jump in the domestic value of the external liability could adversely affects economic activity. The sudden jump occurs when the currency crashes in the presence of large dollar denominated liabilities of domestic firms and banks; (iv) the pre-crisis ratio of short-term debt to international reserves (STD_RESERVES) to test the Rodrik-Velasco (2000) hypothesis that, the difficulty of rolling over short term debt during crises could lead to a decline in economic activity; and (v) a banking crisis dummy (BANK_DUM) to check whether its occurrence worsens economic conditions additionally.

To test whether devaluation affects output positively via the growth of exports, we collected information on (vi) a measure of overvaluation of the exchange rate (OVERVALU); (vii) the average export growth rate (X_GROWTH) during the crisis and one post crisis year; (viii) the share of trade in economic activity, that is exports plus imports as a share of GDP (XIM/GDP) in period t-1; and (ix) a competitive devaluation by other countries (ΔREER_3RDCOUNTRY).

The domestic control (DC) variables are: (i) the pre-crisis business cycle conditions (BC_DUM) to control for the possibility that countries could be at different stages in the business cycle when the crisis occurred[27]; (ii) the loss in foreign exchange reserves (ΔRES) to control for the size of the country-specific external shock; and (iii) the per capita income

[26] Capital account restriction refers to the lack of convertibility of the domestic currency for capital account transactions. Exchange rate restriction refers to the regulation of nominal exchange rate or when the country maintains dual or triple exchange rates.

[27] We use a dummy that takes a value of -1 if the three year pre-crisis average growth rate is less than 0 percent, 0 if the growth rate is between 0 and 3 percent, and +1 if the growth rate exceeded 3 percent.

(PCY) in period t-1 to proxy for the level of development of the economy; and (iv) the size of the economy in terms of US dollars (GDPUS$) in period t-1 to see whether larger countries, which are likely to have more diversified economic base, experience lower disruptions than the smaller economies.

The global control (GC) variables are: (i) the US real interest rate (US_int_rate); (ii) Growth rate in industrial countries (GR_INDUSTRIAL); (iii) the change in crude oil price (ΔOil_PRICE); and (iv) the change in terms of trade (ΔToT). Unlike the domestic variables, where mostly pre-crisis or one year lagged variables are used, for global factors we use contemporaneous values in the regressions.

To proxy for monetary and fiscal policy (MFP) we use: (i) the percentage change in real broad money supply during the crisis year, using exchange rate change as the deflator (ΔM2$); or (ii) the change in the real interest rate between the crisis year and the pre-crisis year (D_REAL_IINTEREST_RATE); (iii) the post-crisis level of budget deficit as a percentage of GDP (BUDGET DEFICIT) and (iv) the change in the fiscal stance (ΔBUDGET DEFICIT).

A useful first step to see the association between the growth variable and the large number of independent variables identified so far would be to present results from the bi-variate regressions (Table 4). In general, there are more TM (theoretically motivated) and DC (domestic control) variables which appear to be associated with the growth variable, than the GC (global controls) and MFP (monetary and fiscal policy) variables.

While we begin our regression analysis with 157 crisis episodes (Table-5, Case –1), but based on priors from previous studies, we had to drop few crisis episodes as from our sample as outliers. The main motivation for doing so was to exclude extreme changes in data measured in local currency terms that occurred because of episodes of hyper devaluation. We found two variables with extreme values that strongly influenced the results: the change in

nominal debt burden and short term debt to reserves ratio. In the former case, we excluded observations that exceeded 5000 percent (4 episodes), while in the latter case, we dropped values that exceeded 30 (11 episodes).We conducted robustness checks by excluding the extreme observations from our sample.

The results from the multivariate analysis are presented in Tables 5-7. We proceed along the following lines. In Table 5, we include only the (TM) and (DC)variables; we then extend this set by including the (GC) variables (Table 6); and finally, we add the (MFP) variables in Table 7. In the first two specifications, that is, Tables 5 and 6, we report the results for the following three samples. In 'Column A', the entire sample of 157 crises for which the data are available is used in the estimation, in 'Column B' the outliers for the change in long term debt burden are excluded, and in 'Column C' the outliers for short term debt to reserve ratio are excluded as well. For brevity, regression results in Table 7 have been reported only for the sample excluding the outliers.

The regression results are strikingly similar across different specifications for most of the variables. In all specifications, the level of the three-year pre-crisis cumulative capital flows to GDP ratio, the restrictions on exchange and capital flows, the pre- crisis business cycle condition dummy, and the per capita income appear to be the most significant and robust factors predicting the growth response during crises. Other variables, which are significant in many but not all specifications, are the ratio of short-term debt to reserves, the third country devaluation measure, the export growth rate, degree of openness of the economy measured by the size of the tradable sector, and the oil price change.

Variables motivated by theoretical explanations--(TM) Variables: We find that crisis episodes that are preceded by higher receipts of private capital flows imply a higher contraction of the economy. This positive and significant association between pre-crisis surge in capital flows and post-crisis contraction is one of the most robust findings of our analysis,

which supports the hypothesis that the sudden stop or reversal of capital flows is likely to be an important explanation for a growth slowdown following currency crises. Note that the estimate for CAPFLOWS_GDP varies from –0.35 to –0.26 across the 9 regressions reported in Tables 5-7. This implies that if the cumulative external private capital inflows as a percentage of GDP in the last 3 years prior to crisis is, say 15 percent, then this variable alone, assuming all other things constant, may lead to an output contraction of 5.2 percent to 3.7 percent.

On the other hand, if the inflows of external capital is also associated with less liberalized exchange rate capital account regime, then the contraction actually reverses; in other words, the typical economy experiences an expansion in the post crisis period. Note that the sign associated with the estimate of the CAPFLOWS_GDP*CONTROL_DUM term is always positive, significant, and in absolute terms, the estimate exceeds the estimate of the CAPFLOWS_GDP term. This is remarkable, as it suggests that if a country has received external private capital which cumulates to 15 percent of its GDP during the last 3 years prior to crisis, and did so under a relatively closed capital account, then the country is likely to witness an expansion of 4.5 to 5.5 percent, assuming all other things constant. While exploring the channels through which this expansion may come about is outside the scope of this paper, it is likely that the composition of capital flows in a country with a relatively closed capital account is dominated by FDI, rather than short term inflows, which can be expected to play a positive role in helping the economy recover faster from the crisis. It is worth pointing out that our study does not suggest that capital accounts should be closed following a crisis , but only that if the capital account was already relatively closed when a crisis occurs, the presence of large capital inflows in pre-crisis years seem to help the economy recover faster.

A third notable result relates to the competitive devaluation variable. It is highly significant and quite invariant to alternative specifications. We find that if devaluation in one

country is accompanied by a concurrent devaluation in trade-competing countries, either from a deliberate action or because the other countries also suffered crises, the country in question will tend to contract following the crisis. This also sheds light on the reasons for concurrent crisis in multiple countries to be more contractionary than in individual cases (see Table 3).

A measure of currency overvaluation—the extent by which real exchange rate had appreciated prior to the crisis—was not significant in the multivariate regressions (not shown in Tables 5-8). We tried bilateral (with the U.S.) as well as multilateral (with trading partners) real exchange rate measures; we also computed changes in this variable over the previous five and three years. As it is not easy to compute equilibrium exchange rates, it is possible that this variable does not measure the overvaluation appropriately.

The remaining variables related to trade, that is, the export growth rate and the share of trade in economic activity exhibit a positive and significant influence on growth. The banking crisis dummy has the right sign, though it is largely insignificant[28]. In the regressions that exclude outliers for the nominal debt burden and short-term debt to reserves ratio, both these variables affect growth in the expected way. That is, a higher pre-crisis short-term debt to reserves ratio and a larger nominal debt burden lead to a contraction of economic activity; however, the results on the former are statistically significant while the latter are not.

The Domestic Control (DC) Variables: A higher pre-crisis growth rate predisposes an economy to a bigger contraction during the crisis period—this confirms the findings of Milesi-Ferretti and Razin (1998) that an economy experiences a boom at the time of the crises is more likely to be contractionary. While the foreign exchange reserve loss variable has a negative sign in all the specifications, it is not always significant. Interestingly, the per

[28] The banking crisis dummy has the right sign in all the various specifications, but it is significant, at 10 percent level, in only one regression when TM, DC and GC variables are

capita income variable shows a very robust and significant negative effect on growth during crises across all regressions. This indicates that economies that are at a more advanced stage of development (if per capita income is a good proxy) are more likely to suffer a contraction during a crisis. On reflection, this is not surprising since one can expect negative shocks to be transmitted much faster in more advanced economies as markets function more efficiently in these countries.

The Global Control (GC) Variables: Among the global factors, the only variable that seems to survive various specifications and has the expected (negative) sign, is the change in oil prices. While the U.S. interest rate has a negative sign, it is not significant in most cases. The terms of trade and the growth rate of G7 countries were also not significant. In some specifications these variables have counterintuitive, though insignificant, effects.

The Monetary and Fiscal Policy (MFP) Variables: These results indicate that tight monetary policies have been associated with a contraction while tight fiscal policies with expansion. While both the money supply and the interest rate variables used as proxies for monetary policy are found to matter, the only measure of the fiscal stance that is significant is the level of the post-crisis fiscal deficit. The change in the fiscal deficit variable between post- and pre-crisis years turned out to be insignificant, even when it was interacted with the level of the deficit. The introduction of the policy variables do marginally change some of our previous results; namely, those related to the nominal debt burden, the short term debt to reserve ratio, the foreign exchange reserve loss, the export growth, the size of the tradable sector and the oil prices, depending upon which policy variable is included in the regressions. However, given the endogeneity problems inherent in conducting a policy response analysis in our framework, we would like to caution the reader that they should interpret these result as nothing more than associations at this stage.

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included in the specification and the regression includes all the 157 data points (not reported

Figure 6 shows the relative contribution of the explanatory variable on the growth variable. It divides the set of explanatory variables into those which have a negative impact and those which have a positive impact on change in growth. The figure also shows the relative importance of the explanatory variables in explaining the difference between post- and pre-crises growth rates. While the pre-crisis cumulative capital flows variable has the strongest negative impact, its interaction with the measure of restriction on the capital flows has the strongest positive impact.

Figure 6 here.

Sensitivity Analyses: We perform a number of sensitivity analyses to further explore the issues raised in Section III, namely whether different "types" of crisis definitions imply different econometric results and whether these results change over time. To address the first of these, we conduct the regression analysis separately for different definitions of crises, namely, two samples are created, one on the basis of the definitions provided by the GKR and BP studies, and the other using the FR and MR studies. The results across these two samples are fairly similar (Table 8)[29].

Finally, in Table 9, we ask whether the regression results would change if we allowed for decade-specific factors. We re-estimated the regression equation, by including all the

here).

[29] The main differences across the two samples are for the following variables: short term debt to reserves, reserve loss, size of the economy, competitive devaluation and oil prices. In particular, short term debt is found to exert a bigger impact in GKR/BP sample, however, because of higher standard error, the coefficient is not found to be significant. Reserve loss is found not to have a significant impact in GKR/BP sample and a negative one in FR/MR sample. A bigger size of the economy implies better growth during crises in both the sample but the effect is larger and significant in GKR/BP sample; increase in oil prices predicts smaller growth in both the samples, but the effect is bigger and significant only in FR/MR sample. The competitive devaluation variable is negative and significant in FR/MR and positive but insignificant in GKR/BP. Among the rest of the variables, which are either significant or insignificant in both the samples, the signs are the same and the magnitudes are quite close.

TM, DC, GC, and the MFP variables along with the decade-specific dummies We conduct this exercise for all 141 crises for which the data are available and repeat it for 4 sub-sets of crisis episodes: only contractionary crisis, only expansionary crisis, crises that occurred in LEM, and those that happened in SEM. In all the different specifications we find that the average growth response is not significantly different across decades. We also find that in the general specification, the SEM and LEM dummies are not significant and that the presence of these dummies do not alter our previous results.

VI. Impact on Long Run Growth

Based on the analysis done so far, some of the capital account variables, such as the of private capital inflows, restrictions on current and capital accounts, and ratio of short term debt to reserves, are found to have a negative effect on short run growth during crises. However, at the same time, there is a large body of literature that indicates that some of these variables, especially private capital flows, are beneficial for long term growth. It is therefore important that we assess the impact of these capital flow-related variables on long run growth in order to avoid inferring incorrect policy conclusions from our paper.

We estimate the following cross-section, cross-country regression, which is common in the growth literature. We regress average growth rate of GDP (alternatively, per capita income) between 1970-98, on the following three variables: average private capital inflows as a percentage of GDP between 1970-98; average short-term debt to reserves during the same period; and a variable showing the average number of years the capital and current accounts were closed. We follow Levine and Renelt (1992) in choosing our control variables for the growth regression, namely, the average investment to GDP ratio, initial per capita income, initial secondary school enrollment, and average growth rate of population.

The results are reported in Table 10. The coefficient of private capital flows is positive and significant and that of short-term debt variable is negative and significant. The results show that even though large inflows of private capital contract growth in the short-run following a crisis, they contribute to a higher growth rate in the long run. The effect of short-term debt variable on growth is, however, found to be similar in both long and short run. That is, higher levels of this variable is always associated with lower long run growth. On the other hand, the capital and current accounts restriction dummy has a positive sign, but is found to be statistically insignificant[30].

While our long-run growth analysis is highly limited in scope, it is illustrative in corroborating the findings in the growth literature that private capital flows have a positive and significant impact on long run growth (see, Borensztein, De Gregorio and Lee (1998)), posing an important "short-versus-long-run" policy trade-off for developing countries.

VII. Concluding Remarks

This paper analyzes, 195 episodes of currency crises in 91 developing countries during the last three decades and finds that currency crises are associated with diverse output behavior. Not only is there diversity in the severity of the contractionary effects of the crises, but a significant proportion turn out to be expansionary. It shows that the ratio of expansionary to contractionary crises has not changed much across the last three decades—both for the large as well as for the small emerging markets -- and that this ratio is found to be independent of the methodology used to identify a currency crisis.

This paper identifies factors whose presence (or absence) contributed to the diverse output growth behavior. We find that a combination of factors including the extent of private

[30] Similar findings have been reported in some previous studies, including Rodrik (1998) and Kraay (1999).

capital flow prior to the crises, degree of liberalization of the capital and current accounts, the size of the pre-crisis business cycle boom, and per capita income of the country significantly impact the short-run growth dynamics during currency crises. Trade-related factors contribute positively to growth. The expansion is found to be stronger, the bigger the tradable sector and larger the growth of exports in response to devaluation. While external factors together are found to account for a much smaller explanation of the growth outcomes during crises, competitive devaluation (measured in terms of third country real devaluation) and change in crude oil prices are found to have a negative, and significant relationship with growth during crises periods. Regarding monetary policy, we find that high interest rate or tight money supply is generally associated with larger contractions. Unlike monetary policy, tight fiscal policy following crisis is found to have a positive and significant association with short-run growth during crises.

Before concluding, we would like to raise a few issues that need further thought. Previous studies from which we have drawn our sample do not distinguish between anticipated and unanticipated currency crises. The economic effects of the two should, in theory, differ. If a large devaluation occurs because the authorities have planned it ahead of time, is one to treat it differently from one which was truly unanticipated? A subjective criterion such as this one is not easy to implement.

A second point relates to the policy endogeneity issue. What became clear in this paper is that the policy endogenety issue cannot be satisfactorily addressed in a framework with low frequency data. Hence, the best way to look at the output effects of monetary and fiscal policy response to currency crises would be do an in-depth analysis with high frequency data in case studies.

Third, it may be useful to identify a control group of countries which did not experience any currency crises and compare the relationship between growth and variables

identified in this paper in a non-crisis (tranquil) environment. While a useful suggestion, it is not obvious how the control group should be selected. Besides, in our case, we were not interested in the question of how the short-run determinants of output varies between tranquil and crisis periods. The main purpose of this paper had been to ask: given that a country has already had a crisis, what are the factors that contribute to a contraction or expansion of output in the short run.

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Appendix A: Countries in the Sample

Africa (47 countries): Algeria, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Dem. Rep. of, Congo, Rep. of, Cote d'Ivoire, Djibouti, Equatorial Guinea, Ethiopia, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Morocco, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Tunisia, Uganda, Zambia, Zimbabwe.

Asia (excluding Middle East, 21 countries): Bangladesh, Bhutan, China, Fiji, India, Indonesia, Korea, Rep., Lao PDR, Malaysia, Maldives, Myanmar, Nepal, Pakistan, Papua New Guinea, Philippines, Samoa, Solomon Islands, Sri Lanka, Taiwan POC, Thailand, Vanuatu.

Latin America (26 countries): Argentina, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Grenada, Guatemala, Guyana, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, St. Vincent and the Grenadines, Trinidad and Tobago, Uruguay, Venezuela.

Other Countries (14 countries): Czech Republic, Egypt, Hungary, Islamic Republic of Iran, Israel, Jordan, Lebanon, Malta, Oman, Romania, Syrian Arab Republic, Turkey, Yemen, Yugoslavia.

Large Emerging Markets

Algeria, Argentina, Bolivia, Brazil, Chile, China, Colombia, Costa Rica, Czech Republic, Dominican Republic, Ecuador, Egypt, Hungary, India, Indonesia, Jordan, Korea, Rep., Malaysia, Mexico, Morocco, Nigeria, Pakistan, Panama, Papua New Guinea, Peru, Philippines, Romania, South Africa, Thailand, Trinidad and Tobago, Tunisia, Turkey, Uruguay, Venezuela.

Small Emerging Markets

Bangladesh, Barbados, Belize, Benin, Bhutan, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Dem. Rep. of, Congo, Cote d'Ivoire, Djibouti, El Salvador, Equatorial Guinea, Ethiopia, Fiji, Gabon, The Gambia, Ghana, Grenada, Guatamala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Islamic Republic of Iran, Israel, Jamaica, Kenya, Lebanon, Lesotho, Liberia, Madagascar, Malawi, Maldives, Mali, Malta, Mauritania, Mauritius, Myanmar, Nepal, Nicaragua, Niger, Oman, Paraguay, Rwanda, Samoa, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Solomon Islands, Somalia, Sri Lanka, St. Vincent and the Grenadines, Sudan, Swaziland, Syrian Arab Republic, Taiwan POC, Tanzania, Togo, Uganda, Vanuatu, Yemen, Yugoslavia, Zambia, Zimbabwe.

Appendix B: The Crises Episodes

The crisis episodes used in the paper are defined in 5 different ways: two definitions used by Milesi-Ferretti-Razin (1998) and one each by Frankel-Rose (1996), Berg-Pattillo (1998), and Goldstein-Kaminsky-Reinhart (1999). The crisis-identifying criteria used in these papers are outlined below.

Milesi-Ferretti and Razin (MR): (i) A crisis occurs when the nominal depreciation of the currency is at least 25 percent, which is at least double the previous year's depreciation, and the latter is below 40 percent. (ii) A crisis occurs when the nominal depreciation of the currency is at least 15 percent, at least 10 percent higher than the previous year's depreciation, with the latter below 10 percent. Their sample includes 105 low and middle income countries, and the time period covered is 1970-96.

Frankel and Rose (FR): A crisis occurs when the nominal depreciation of the currency is at least 25 percent, which is at least 10 percent higher than previous year. The sample includes 105 developing countries, and the time period covered is 1971-1992.

Berg and Pattillo (BP): A crisis occurs when the index of speculative pressure is at least two standard deviation higher than the mean. An index of speculative pressure is constructed as a weighted average of exchange rate and foreign exchange reserve changes, with weights assigned such that the conditional volatilities of the components are equal. The sample includes 23 emerging market economies, and the time period covered is 1970-97.

Goldstein, Kaminsky and Reinhart (GKR): A crisis occurs when the index of speculative pressure is at least two standard deviation higher than the mean. The index of speculative pressure is constructed as a weighted average of exchange rate changes, interest rate changes and reserve changes, and the weights are assigned such that the conditional volatilities of the components are equal. The sample includes 25 countries, 1970-1998.

Note: Some of these studies window out crises dates that are “too close” to each other. For our purposes we use the original dates as the majority rule automatically windows out many of such crises.

Appendix C: Data Sources and Construction of Variables

Variable Name	Definition	Unit of measure	Variable is construct using data from following years[31]
$g_{post\_2} - g_{pre\_3,tranq}$	Difference between the average real GDP growth rates in the crisis and first post-crisis years and three pre-crisis tranquil years.	Percentage	T-3, …., T+1[32]
CAPFLOWS_GDP	Three year cumulative capital flows as a percentage of GDP	Percentage	T-3, ….., T-1
CONTROL_DUM	Pre-crisis restrictions on foreign exchange and capital account transactions. The Index was constructed by taking an average of the dummies for restriction on Capital account or exchange rate during the three years prior to the crisis.[33]	Index Range: 0 to 1, where 0 implies no controls.	T-3, ….., T-1
ΔDEBT_BURDEN	Change in external long-term debt burden, calculated as the percentage growth rate of the total real external long term debt (the real debt is calculated as the nominal debt deflated by the exchange rate) in the crisis year over the previous year.	Percentage	T and T-1
STD_RESERVES	Pre-crisis ratio of short-term debt to international reserves	Ratio	T-1
BANK_DUM	Banking crisis dummy. Used three existing studies to identify the dates of banking crises, the same majority rule as for the currency crises dates was used to select the banking crises dates. A twin crisis is defined when a banking crisis occurs with in a year of a currency crisis.	Index takes a value 0 if no crisis and 1 if twin crisis	T
X_GROWTH	Export growth rate during the crisis and one post crisis year.	Percentage	T and T+1
XIM/GDP	Size of the tradable sector, that is exports plus imports as a share of GDP	Percentage	T-1
ΔREER_3RDCOUNTRY	Competitive Devaluation Effect.[34]	Percentage	T and T-1
PCY	Purchasing power adjusted GDP per capita in year t-1.	Value in US $	T-1
GDPUS$	Size of the economy in terms of US dollars	Value in US $	T-1
BC_DUM	Pre-crisis business cycle conditions. We use a dummy that takes a value of -1 if the three year pre-crisis average growth rate is less than 0 percent, 0 if the growth rate is between 0 and 3 percent, and +1 if the growth rate exceeded 3 percent.	Index takes a value –1, 0 or 1.	T-3, …., T-1
ΔRES	Percentage Foreign Reserves Lost during the crisis year over the previous year.	Percentage	T and T-1
US_Int_rate	The US Federal Fund Rate	Percentage	T
GR_G7	Growth rate in G7l countries, calculated as the weighted	Percentage	T and T-1

[31] T refers to the crisis year.

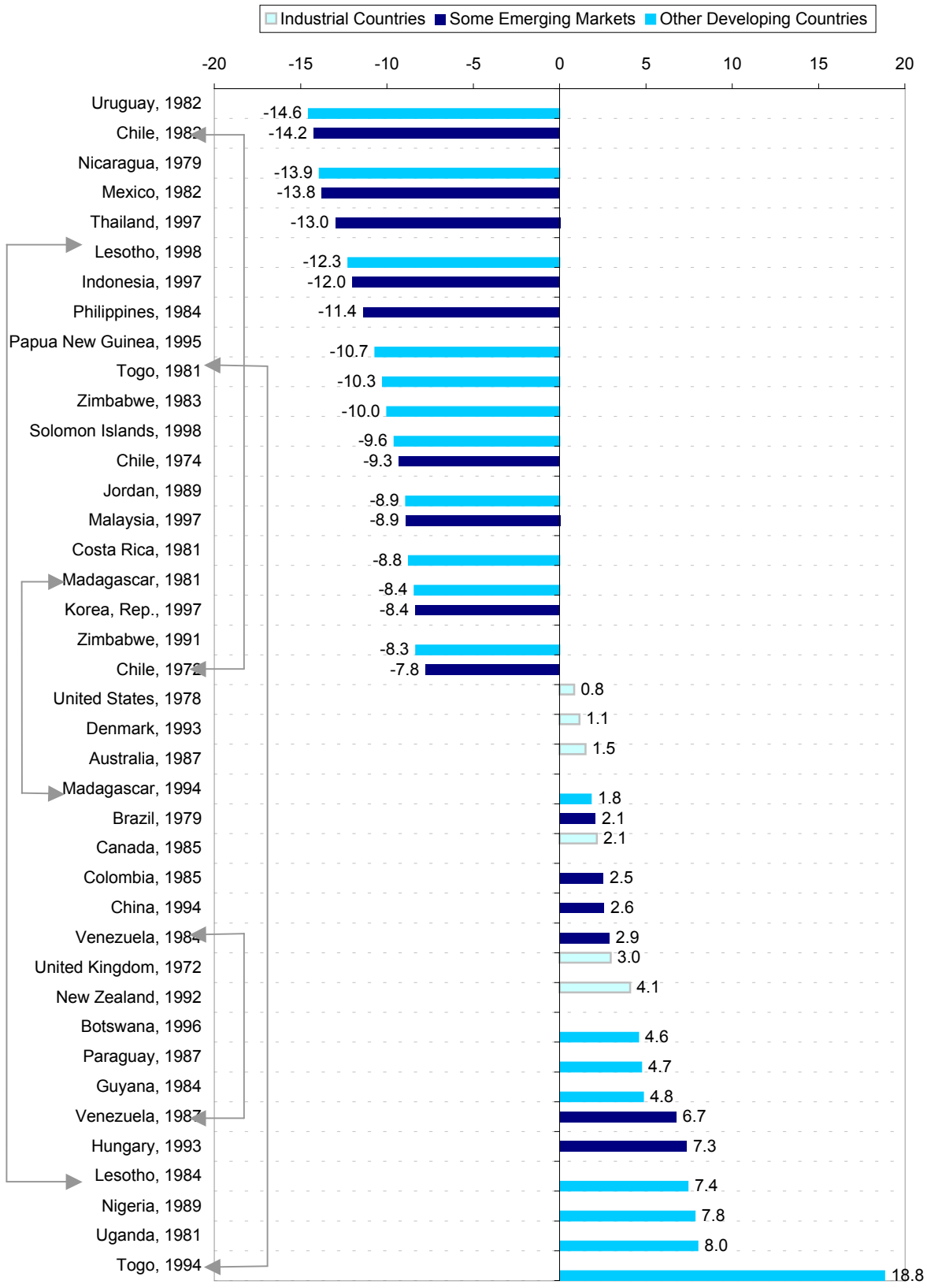
[32] In case there was a crisis between T-3 and T-1 years, then the growth rates during the previous 3 tranquil periods are used.

[33] Capital account restriction refers to the lack of convertibility of the domestic currency for capital account transactions. Exchange rate restriction refers to the regulation of nominal exchange rate or when the country maintains dual or triple exchange rates.

[34] Using the data on REER for 21 LEM from JP Morgan, the following variable is constructed $\text{REER (competitor)}_j = \frac{\sum_{i \neq j} \text{REER}}{20}$. The percentage change in REER (competitor)$_j$ is used as a measure of the average real devaluation in competitor countries. For the rest 70 countries, the REER (competitor) variable is based on all 21 observations.

	average of real growth rate of the G7 countries, weighted by the GDP of the respective countries .			
ΔOil_PRICE	Percentage change in crude oil price during the crisis year over the previous year.	Percentage	T and T-1	
ΔToT	Percentage change in terms of trade during the crisis year over the previous year.	Percentage	T and T-1	
ΔM2$	Change in the real growth rate of broad money supply during crisis year over the previous year.	Percentage	T and T-1	
D_REAL_INTERST_RATE	Change in the real interest rate over the previous year.	In percent	T	
BUDGET DEFICIT	Budget deficit as a percentage of GDP.	Percentage	T+1	

Figure 1: Magnitude of Contraction / Expansion during Selected Currency Crises

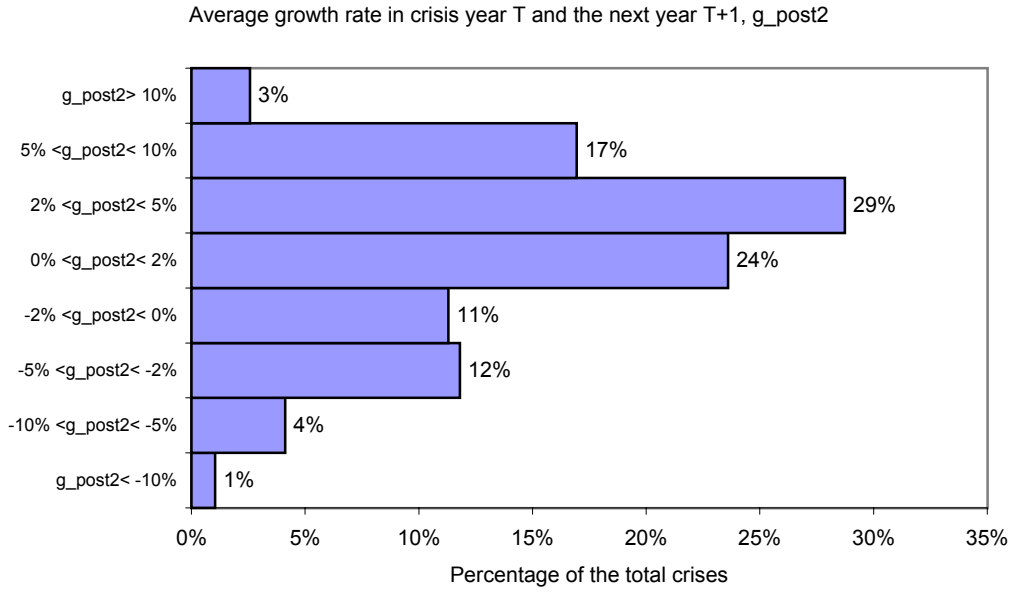


Magnitude of Contraction / Expansion = g_post2 - g_pre3 (tranq), where

g_post2 is the average growth rate in T and T+1, T being the crisis year.

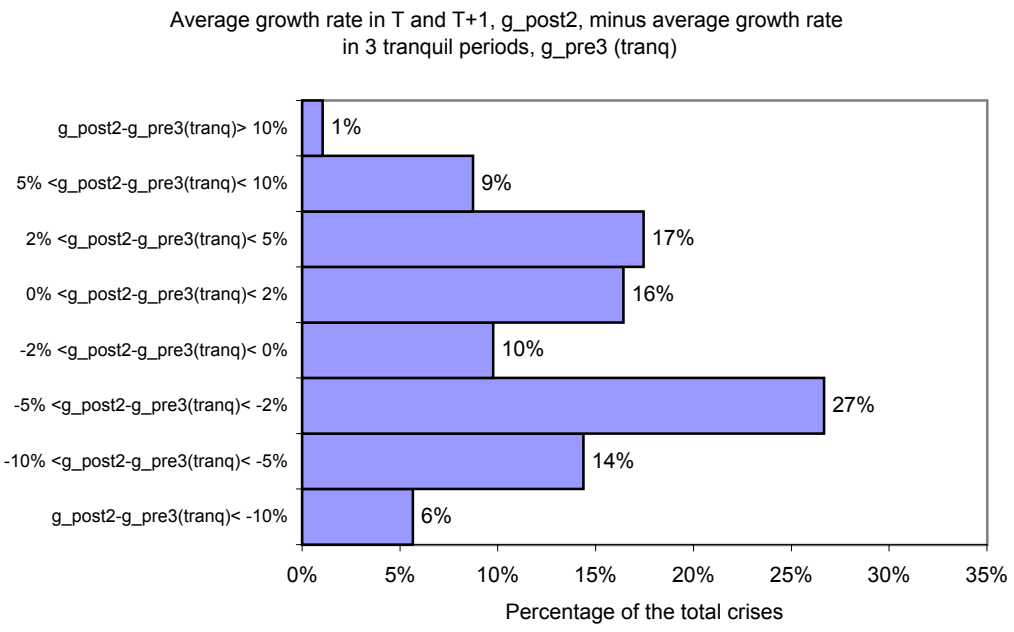
g_pre3 (tranq) is the average growth rate in T-1, T-2, and T-3 years. But when there is a crisis between T-1 and T-3, the nearest 3 consecutive tranquil (non-crisis) periods are used instead.

Figure 2: Frequency Distribution of g(post_2)



Some Descriptive statistics of g_post2	
Mean	1.65
Median	1.80
Maximum	12.30
Minimum	-11.14
Std. Dev.	4.04
Skewness	-0.29
Kurtosis	3.56
Jarque-Bera	5.26
Probability	0.07
# of Crises	195
# of Countries	108

Figure 3: Frequency Distribution of [g(post_2) - g(pre_3,tranq)]*

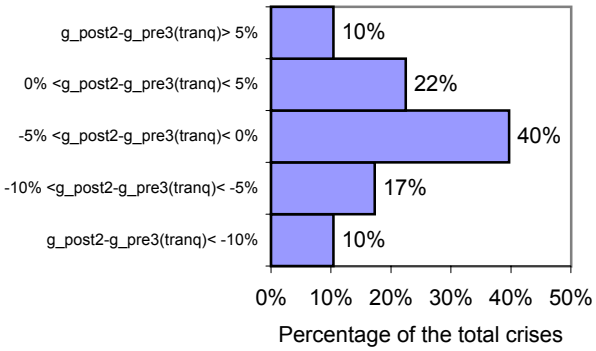


Some Descriptive statistics of g_post2-g_pre3(tranq)	
Mean	-1.20
Median	-0.47
Maximum	18.82
Minimum	-14.55
Std. Dev.	5.30
Skewness	0.01
Kurtosis	3.56
Jarque-Bera	2.51
Probability	0.28
# of Crises	195
# of Countries	108

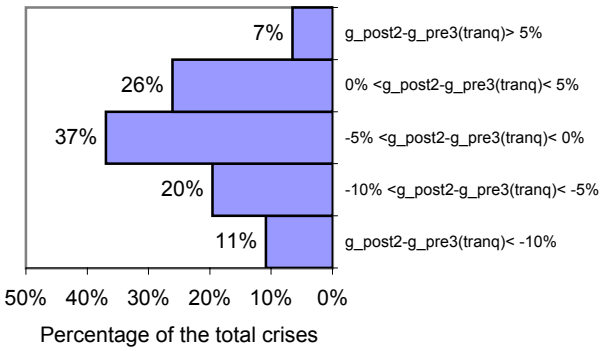
*Magnitude of Contraction / Expansion = g_post2 - g_pre3 (tranq), where
g_post2 is the average growth rate in T and T+1, T being the crisis year.
g_pre3 (tranq) is the average growth rate in T-1, T-2, and T-3 years. But when there is a crisis between T-1 and T-3, the nearest 3 consecutive tranquil (non-crisis) periods are used instead.

Figure 4: Frequency Distribution of [g(post_2) - g(pre_3, tranq)] Under Alternative Crisis Identifying Criteria

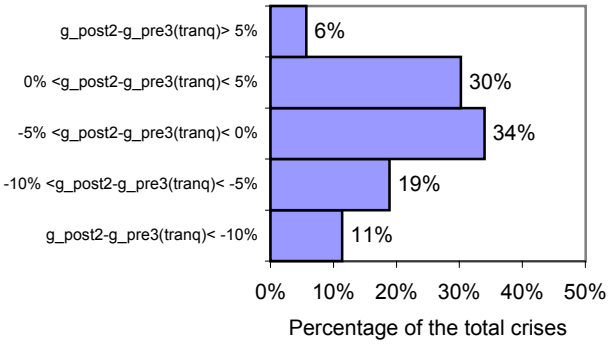
Goldstein, Kaminsky, and Reinhart (1999):
Total crisis episodes - 58



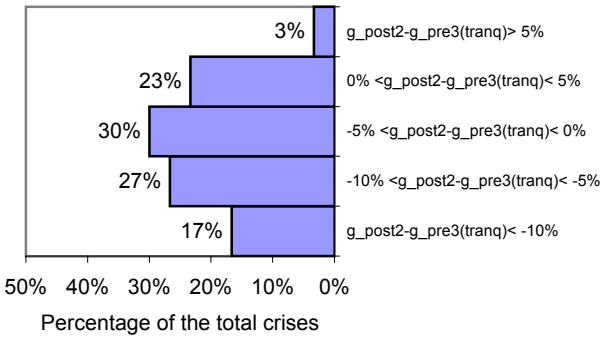
Berg and Patillo (2000):
Total crisis episodes - 46



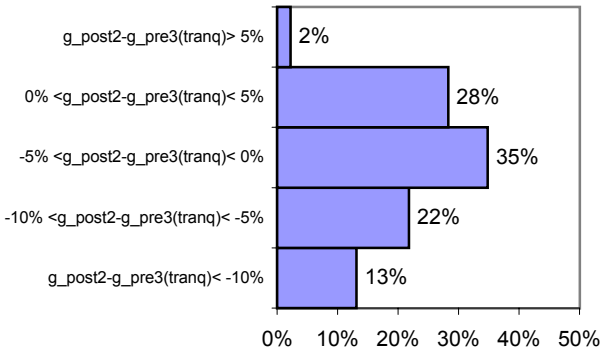
Frankel and Rose (1996):
Total crisis episodes - 53



Milesi-Ferretti and Razin (1999):
Total crisis episodes - 30



Based on Dates Used in this paper (See Appendix B), Total crisis episodes - 46

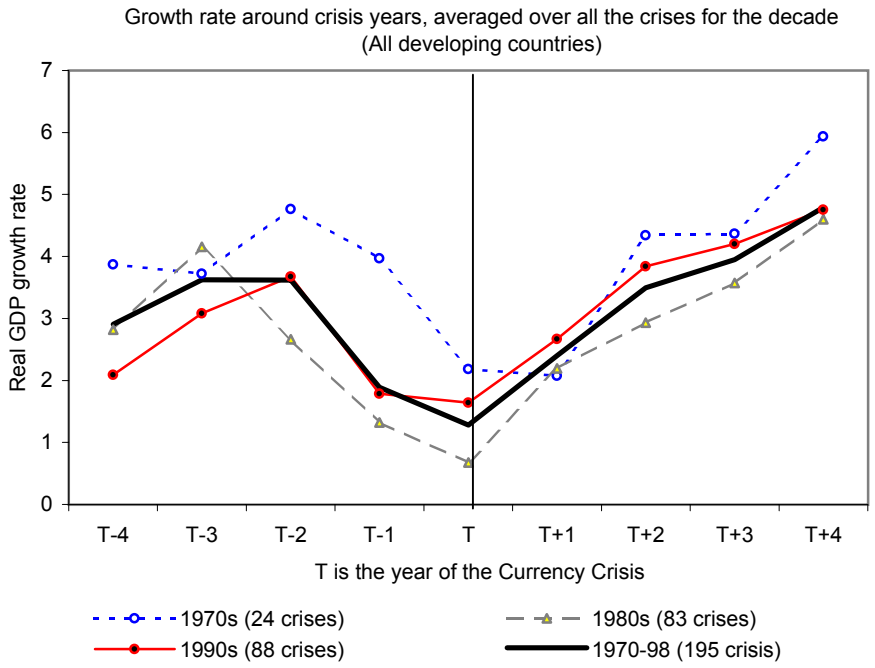


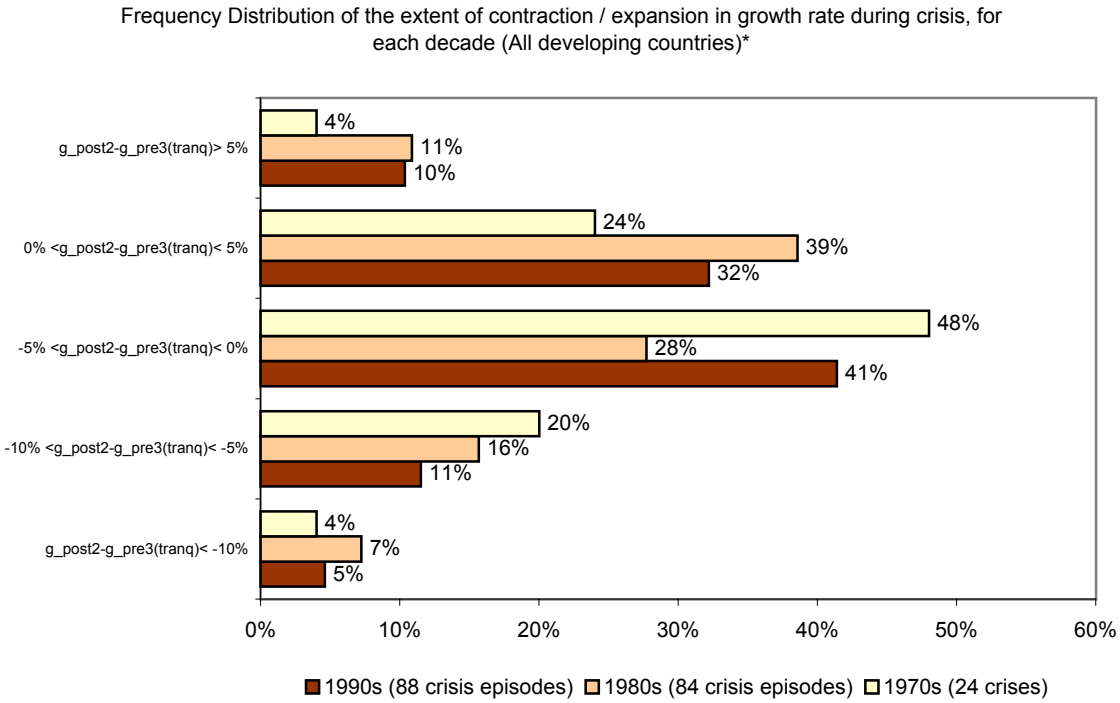
Note

* Magnitude of Contraction / Expansion = g_post2 - g_pre3 (tranq), where
g_post2 is the average growth rate in T and T+1, T being the crisis year.
g_pre3 (tranq) is the average growth rate in T-1, T-2, and T-3 years. But when there is a crisis between T-1 and T-3, the nearest 3 consecutive tranquil (non-crisis) periods are used instead.

**- The above estimates are based on the following fourteen countries: Argentina, Bolivia, Brazil, Chile, Colombia, Indonesia, Korea, Mexico, Peru, Philippines, Thailand, Turkey, Uruguay, and Venezuela

Figure 5: Severity of Crisis : A Comparison across Three Decades





* Magnitude of Contraction / Expansion = g_post2 - g_pre3 (tranq), where
g_post2 is the average growth rate in T and T+1, T being the crisis year.
g_pre3 (tranq) is the average growth rate in T-1, T-2, and T-3 years. But when there is a crisis between T-1 and T-3, the nearest 3 consecutive tranquil (non-crisis) periods are used instead.

Figure 6: Contribution of Various Factors to Short-run Growth Following a Currency Crisis

(Based on results shown in Table -6, Case -3)

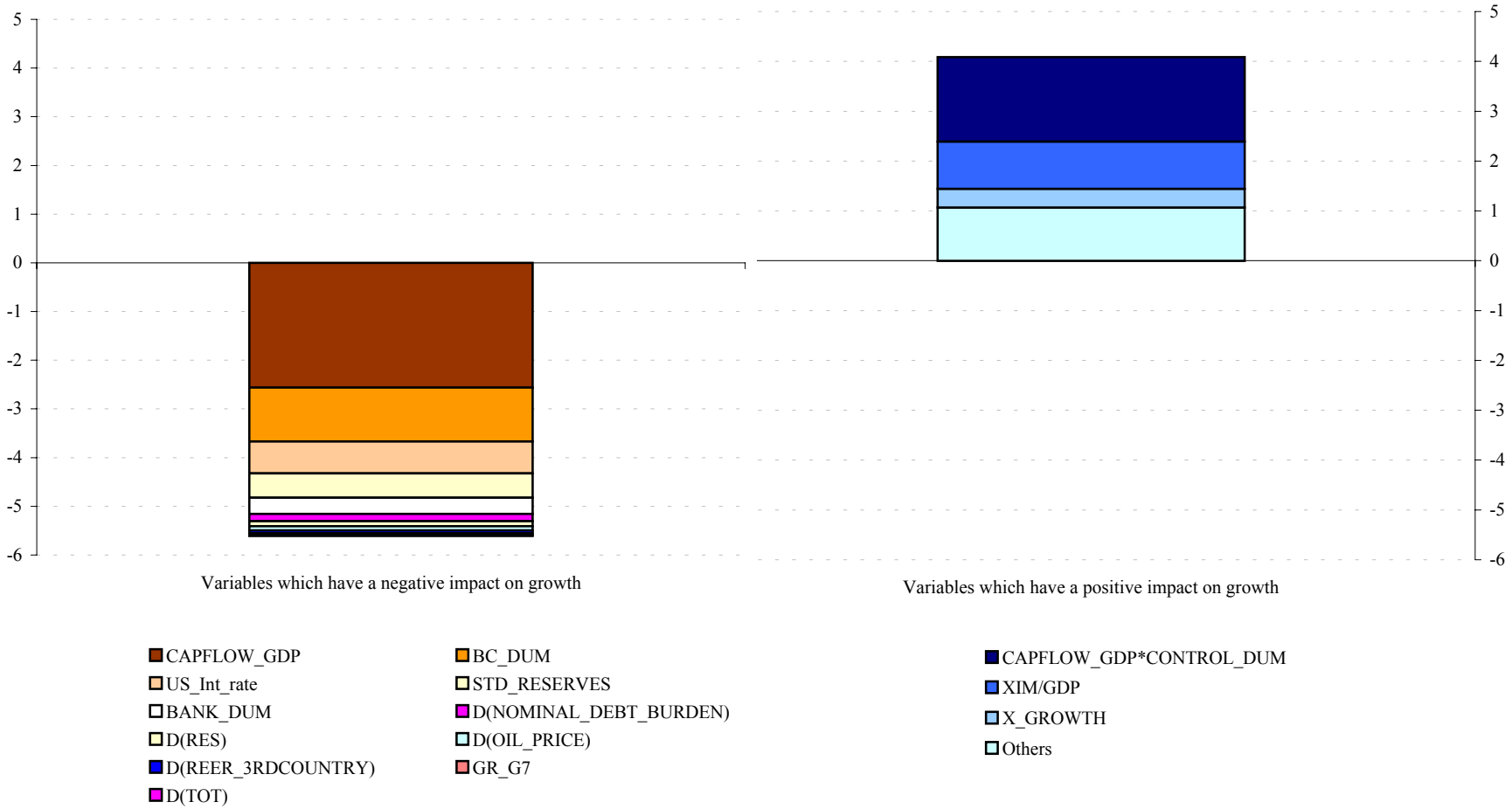


Table 3: Regressions Establishing Stylized facts Concerning Crises and Growth

Dependent Variable: g(post2)-g(pre3, tranq)
Methodology: Least Square
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	t-Statistic	P-value*.	Wald Coefficient Restriction Tests (b1 = b2) P-value*.	(b1 = b3) P-value*.	(b2 = b3) P-value*.
[A] Are there any Decadal variations? (All Crises, 196 episodes)						
D(1970s)	-2.99	-2.77	**0.006**	0.132	**0.080**	0.716
D(1980s)	-1.14	-1.97	**0.050**			
D(1990s)	-0.84	-1.49	0.138			
[B] Are Contagious Crises more Severe?						
D (East Asia,1997)	-8.27	-4.93	**0.000**	0.412	0.111	0.553
D (Latin America Debt, 1980s)	-6.30	-3.53	**0.001**			
D (Tequila,1994-95)	-5.06	-4.14	**0.000**			
[C] Are there any Decadal variations? (Only Contractionary Crises, 111 episodes)						
D(1970s)	-4.92	-6.49	**0.000**	0.584	0.488	0.124
D(1980s)	-5.43	-9.78	**0.000**			
D(1990s)	-4.29	-8.89	**0.000**			
[D] Are there any Decadal variations? (Only for Crises in Large Emerging Markets)						
D(1970s)	-4.04	-5.52	**0.000**	0.349	0.258	0.879
D(1980s)	-2.96	-3.35	**0.001**			
D(1990s)	-2.77	-3.31	**0.001**			
[E] Are there any Decadal variations? (Only Expansionary Crises, 84 episodes)						
D(1970s)	2.79	2.98	**0.00**	0.578	0.349	0.534
D(1980s)	3.37	7.56	**0.00**			
D(1990s)	3.81	6.76	**0.00**			
[F] Are Crises in LEMs Severe than the SMEs?						
LEM	-3.07	-5.94	**0.00**	**0.000**		
SEM	0.24	0.48	0.63			

*If the P-value is less than 0.1, then the estimate is significantly different from zero at least at 10% significance level

Table 4: Bi-variate Regressions

Dependent Variable: g(post2)-g(pre3, tranq)
Methodology: Least Square
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Coefficient	t-Statistic	P-value*.	R square	No. of Crisis	Mean of the Dep. variable
Theoretically Motivated (TM) Variables						
CAPFLOW_GDP	-0.15	-3.87	**0.00**	0.12	173	-1.364
CONTROL_DUM	2.58	1.72	**0.09**	0.02	188	-1.133
CAPFLOW_GDP*CONTROL_DUM	-0.11	-1.69	**0.09**	0.02	166	-1.253
D(NOMINAL_DEBT_BURDEN)	0.00	-17.35	**0.00**	0.01	178	-1.003
D(REAL_DEBT_BURDEN)	0.00	-5.14	**0.00**	0.02	161	-1.178
STD_RESERVES	0.00	4.12	**0.00**	0.02	180	-1.188
BANK_DUM	-0.36	-0.43	0.67	0.00	182	-1.064
OVERVALU (REER)	-1.83	-3.47	**0.00**	0.03	124	-0.683
OVERVALU (BILATERAL RER)	-2.02	-2.95	**0.00**	0.04	161	-1.160
X_GROWTH	0.01	0.30	0.77	0.00	193	-1.220
XIM/GDP	-0.01	-0.72	0.47	0.00	194	-1.192
D(REER_3RDCOUNTRY)	-0.05	-1.09	0.28	0.00	195	-1.235
Domestic Control (DC) Variables						
BC_DUM	-3.90	-9.93	**0.00**	0.34	195	-1.235
D(RES)	-0.01	-2.68	**0.01**	0.04	189	-1.235
PCY	-2.08	-4.84	**0.00**	0.11	182	-1.284
GDPUS$	-0.66	-3.66	**0.00**	0.06	193	-1.269
Global Control (DC) Variables						
US_Int_rate	-0.22	-1.78	**0.08**	0.02	195	-1.235
GR_INDUSTRIAL	-0.01	-0.02	0.99	0.00	195	-1.235
GR_G7	0.19	0.60	0.55	0.00	195	-1.235
D(OIL_PRICE)	-0.01	-1.32	0.19	0.01	195	-1.235
D(TOT)	0.05	1.67	**0.10**	0.02	193	-1.269
Monetary and Fiscal Policy (MFP) Variables and Interaction with Twin Crisis						
D(M2$)	0.00	1.30	0.20	0.00	185	-1.25
D(REAL_INTEREST_RATE)	0.00	1.28	0.20	0.00	147	-1.15
BUDGET DEFICIT	0.03	0.39	0.70	0.00	113	-1.99
D(BUDGET DEFICIT)	-0.08	-0.96	0.34	0.01	106	-1.85
D(M2$)*BANK_DUM	0.02	1.25	0.21	0.01	172	-1.07
D(REAL_INTEREST_RATE)*BANK_DUM	0.00	1.10	0.27	0.00	135	-0.95

* If the P-value is less than 0.1, then the estimate is significantly different from zero at least at 10% significance level

Table 5: Multivariate Regressions
(Theoretically Motivated (TM) and Domestic Control (DC) Variables)

Dependent Variable: g(post2)-g(pre3, tranq)
Methodology: Least Square
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Case - 1 Coefficient	Case - 1 P-value*.	Case - 2 Excluding Hyper Devalu '-tion episodes Coefficient	Case - 2 P-value*.	Case - 3 Excluding Hyper Devalua -tionary episodes and high short-term debt to reserves Coefficient	Case - 3 P-value*.
Theoretically Motivated (TM) Variables ***						
CAPFLOW_GDP	-0.32	**0.000**	-0.32	**0.000**	-0.31	**0.000**
CAPFLOW_GDP*CONTROL_DUM	0.35	**0.000**	0.36	**0.000**	0.35	**0.000**
D(NOMINAL_DEBT_BURDEN)	0.00	**0.000**	0.00	0.122	0.00	0.289
STD_RESERVES	0.00	0.299	0.00	0.334	-0.17	**0.029**
BANK_DUM	-0.60	0.287	-0.71	0.224	-0.62	0.287
XIM/GDP	0.03	**0.005**	0.02	**0.013**	0.02	**0.055**
X_GROWTH	0.05	**0.050**	0.05	**0.059**	0.06	**0.032**
Domestic Control (DC) Variables						
BC_DUM	-3.48	**0.000**	-3.51	**0.000**	-3.45	**0.000**
D(RES)	-0.01	0.115	-0.01	0.166	-0.01	**0.072**
PCY	-1.15	**0.005**	-1.06	**0.010**	-1.37	**0.001**
GDPUS$	0.23	0.296	0.27	0.213	0.21	0.348
R square		0.562		0.554		0.572
Adjusted R square		0.526		0.519		0.536
Mean of the Dependent variable		-1.229		-1.210		-1.520
Number of Crises		157		153		142

* If the P-value is less than 0.1, then the estimate is significantly different from zero at least at 10% significance level
** Crises with nominal debt burden exceeding 5000% and STD_Reserves exceeding 30 are excluded.

Table 6: Multivariate Regressions
(Theoretically Motivated (TM), Domestic Control (DC), and Global Control (GC) Variables)

Dependent Variable: g(post2)-g(pre3, tranq)
Methodology: Least Square
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Case - 1 Coefficient	P-value*.	Case - 2 Excluding Hyper Devalua-'-tion episodes Coefficient	P-value*.	Case - 3 Excluding Hyper Devalua-tionary episodes and high short-term debt to reserves Coefficient	P-value*.
Theoretically Motivated (TM) Variables						
CAPFLOW_GDP	-0.31	**0.000**	-0.31	**0.000**	-0.31	**0.000**
CAPFLOW_GDP*CONTROL_DUM	0.37	**0.000**	0.37	**0.000**	0.36	**0.000**
D(NOMINAL_DEBT_BURDEN)	0.00	**0.000**	0.00	0.362	0.00	0.451
STD_RESERVES	0.00	0.890	0.00	0.994	-0.14	**0.078**
BANK_DUM	-0.95	**0.090**	-0.94	0.106	-0.79	0.189
XIM/GDP	0.02	**0.012**	0.02	**0.023**	0.02	**0.066**
X_GROWTH	0.05	**0.052**	0.05	**0.061**	0.06	**0.035**
D(REER_3RDCOUNTRY)	-0.08	**0.038**	-0.08	**0.055**	-0.07	**0.076**
Domestic Control (DC) Variables						
BC_DUM	-3.54	**0.000**	-3.54	**0.000**	-3.50	**0.000**
D(RES)	0.00	0.191	0.00	0.253	-0.01	0.126
PCY	-1.22	**0.005**	-1.13	**0.010**	-1.34	**0.003**
GDPUS$	0.26	0.230	0.28	0.199	0.23	0.324
Global Control (DC) Variables						
US_Int_rate	-0.17	**0.067**	-0.14	0.159	-0.08	0.433
D(OIL_PRICE)	-0.02	**0.064**	-0.02	**0.071**	-0.02	**0.076**
D(TOT)	0.02	0.338	0.02	0.414	0.02	0.538
GR_G7	-0.16	0.542	-0.07	0.772	-0.02	0.951
R square		0.589		0.583		0.592
Adjusted R square		0.542		0.534		0.540
Mean of the Dependent variable		-1.229		-1.210		-1.520
Number of Crises**		157		153		142

* If the P-value is less than 0.1, then the estimate is significantly different from zero at least at 10% significance level
** Crises with nominal debt burden exceeding 5000% and STD_Reserves exceeding 30 are excluded.

Table 7: Multivariate Regressions

(Theoretically Motivated (TM), Domestic Control (DC), Global Control (GC), and Monetary and Fiscal Policy (MFP) Variables)

Dependent Variable: g(post2)-g(pre3, tranq)
Methodology: Least Square
White Heteroskedasticity-Consistent Standard Errors & Covariance

	A		B		C	
	Monetary Policy (Instru--ment: Money Supply		Monetary Policy (Instru--ment: Interest rate		Fiscal Policy (Instrument Budget Deficit	
Variable	**Coefficient**	**P-value*.**	**Coefficient**	**P-value*.**	**Coefficient**	**P-value*.**
Theoretically Motivated (TM) Variables						
CAPFLOW_GDP	-0.35	**0.000**	-0.26	**0.000**	-0.30	**0.002**
CAPFLOW_GDP*CONTROL_DUM	0.38	**0.000**	0.31	**0.001**	0.37	**0.011**
D(NOMINAL_DEBT_BURDEN)	0.00	0.705	-0.02	**0.053**	0.00	0.375
STD_RESERVES	-0.14	**0.070**	-0.17	**0.035**	-0.17	0.110
BANK_DUM	-0.70	0.232	-0.72	0.293	-0.85	0.313
XIM/GDP	0.02	**0.025**	0.01	0.301	0.00	0.864
X_GROWTH	0.04	0.107	0.06	**0.060**	0.06	**0.079**
D(REER_3RDCOUNTRY)	-0.07	**0.079**	-0.09	**0.061**	-0.11	**0.069**
Domestic Control (DC) Variables						
BC_DUM	-3.41	**0.000**	-3.79	**0.000**	-3.97	**0.000**
D(RES)	-0.01	**0.009**	-0.01	**0.084**	0.00	0.400
PCY	-1.43	**0.001**	-1.00	**0.037**	-1.97	**0.002**
GDPUS$	0.32	0.167	-0.02	0.927	0.41	0.142
Global Control (DC) Variables						
US_Int_rate	-0.09	0.391	-0.08	0.505	-0.17	0.162
D(OIL_PRICE)	-0.02	0.067	0.00	0.908	-0.02	**0.011**
D(TOT)	0.01	0.772	-0.01	0.643	0.01	0.743
GR_G7	-0.03	0.907	0.00	0.991	-0.16	0.624
Monetary and Fiscal Policy (MFP) Variables						
D(M2$) -during crisis	0.01	**0.000**	-	-	-	-
D(REAL_INTEREST_RATE)	-	-	-0.02	**0.037**	-	-
BUDGET DEFICIT	-	-	-	-	0.19	**0.037**
R square		0.621		0.642		0.600
Adjusted R square		0.569		0.574		0.507
Mean of the Dependent variable		-1.539		-1.400		-1.915
Number of Crises**		141		107		96

* If the P-value is less than 0.1, then the estimate is significantly different from zero at least at 10% significance level
** Crises with nominal debt burden exceeding 5000% and STD_Reserves exceeding 30 are excluded.

Table 8: Sensitivity Analysis
(Sub-samples Based on Currency Crisis Identifying Criteria)

Dependent Variable: g(post2)-g(pre3, tranq)
Methodology: Least Square
White Heteroskedasticity-Consistent Standard Errors & Covariance

Variable	Case - 1** Only Those Crises Which Were Identified by GKR or BP		Case - 2** Only Those Crises Which Were Identified by FR or MR	
	Coefficient	P-value*.	Coefficient	P-value*.
Theoretically Motivated (TM) Variables				
CAPFLOW_GDP	-0.34	**0.015**	-0.39	**0.000**
CAPFLOW_GDP*CONTROL_DUM	0.43	**0.004**	0.43	**0.000**
D(NOMINAL_DEBT_BURDEN)	0.00	0.288	0.00	0.762
STD_RESERVES	-0.24	0.351	-0.15	**0.059**
BANK_DUM	-1.26	0.299	-0.87	0.183
XIM/GDP	0.02	**0.400**	0.01	0.154
X_GROWTH	0.03	0.602	0.03	0.187
D(REER_3RDCOUNTRY)	0.09	0.433	-0.08	**0.063**
Domestic Control (DC) Variables				
BC_DUM	-3.57	**0.002**	-3.39	**0.000**
D(RES)	0.00	0.792	-0.01	**0.009**
PCY	-2.32	**0.038**	-1.44	**0.002**
GDPUS$	1.28	**0.015**	0.22	0.373
Global Control (DC) Variables				
US_Int_rate	-0.09	0.695	-0.03	0.763
D(OIL_PRICE)	-0.01	0.403	-0.02	**0.078**
D(TOT)	0.02	0.640	0.00	0.861
GR_G7	0.37	0.434	-0.10	0.693
Monetary Policy Variable				
D(M2$) -during crisis	0.02	**0.016**	0.01	**0.000**
R square		0.671		0.642
Adjusted R square		0.464		0.574
Mean of the Dependent variable		-4.828		-1.400
Number of Crises**		45		107

* If the P-value is less than 0.1, then the estimate is significantly different from zero at least at 10% significance level
** Crises with nominal debt burden exceeding 5000% and STD_Reserves exceeding 30 are excluded.

Table 9: Sensitivity Analysis

(Based on the Stylized Facts Identified in Section 3)

Dependent Variable: g(post2)-g(pre3, tranq)
Methodology: Least Square
White Heteroskedasticity-Consistent Standard Errors & Covariance

All explanatory variables used in Table 6, Case 1 are included in the regressions, except the constant term is replaced by a number of exhaustive dummies.

Variable	Coefficient	t-Statistic	P-value*.	R square	No. of Crisis	Mean of the Dep. variable
Is there any Decadal variation? (All Crises)						
D(1970s)	5.07	1.11	0.27	0.562	141	-1.539
D(1980s)	5.26	1.10	0.27			
D(1990s)	4.91	1.04	0.30			
Is there any Decadal variation? (Only Contractionary Crises)						
D(1970s)	1.36	0.27	0.78	0.305	84	-4.924
D(1980s)	-1.13	-0.23	0.82			
D(1990s)	-0.16	-0.03	0.97			
Is there any Decadal variation? (Only Expansionary Crises)						
D(1970s)	10.51	1.79	**0.08**	0.299	57	3.451
D(1980s)	10.94	1.89	**0.07**			
D(1990s)	10.38	1.77	**0.08**			
Is there any Decadal variation? (Only for Crises in Large Emerging Markets)						
D(1970s)	5.67	0.48	0.64	0.555	70	-3.186
D(1980s)	6.30	0.50	0.62			
D(1990s)	5.17	0.41	0.69			
Is there any Decadal variation? (Only for Crises in Small Emerging Markets)						
D(1970s)	-2.55	-0.20	0.84	0.452	71	0.085
D(1980s)	-3.03	-0.23	0.82			
D(1990s)	-2.45	-0.18	0.85			
Do Contagious Crises Continue to be more Severe?						
D (East Asia,1997)	2.62	0.43	0.67	0.567	141	-1.539
D (Latin America Debt, 1980s)	2.56	0.49	0.63			
D (Tequila,1994-95)	7.43	1.29	0.20			
D (Rest All Crises)	4.04	0.83	0.41			
Do Crises in LEMs Continue to be More Severe than in SEMs?						
LEM	2.62	0.43	0.67	0.567	141	-1.539
SEM	2.56	0.49	0.63			

* If the P-value is less than 0.1, then the estimate is significantly different from zero at least at 10% significance level or lower significance level.

Table -10: Long Run Growth Results

[1]	[2] Growth rate of aggregate output Coeff. (T-stat)	[3] Growth rate of per capita output Coeff. (T-stat)
Variable of Interest		
Average level of Short-term External Debt / Reserves, 1970-98	-0.18***	-0.12***
	(-4.47)	(-2.71)
Average level of private capital inflow/GDP(%), 1970-98	0.39**	0.31**
	(2.09)	(2.35)
Average number of years capital and current accounts are closed	-0.90	-0.77
	(-0.89)	(-0.93)
Control Variables , Source: Levine and Renelt (1992).		
Average Investment - GDP ratio, 1970-98	0.12***	0.11***
	(3.45)	(3.48)
Intial per capita income, 1975	-0.001***	-0.001***
	(-3.73)	(-3.94)
Secondary School enrollment, 1970	0.02	0.02
	(0.09)	(0.90)
Average population growth, 1970-98	0.52	-0.56
	(1.03)	(-1.29)
Intercept term	0.64	0.93
	(0.41)	(0.68)
No of countries	58	66
Adjusted R square	0.38	0.43