Chronicle of Currency Collapses: Re-examining the Effects on Output

Matthieu Bussière, Sweta C. Saxena and Camilo E. Tovar[1]

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Abstract

The impact of currency collapses (i.e. large nominal depreciations or devaluations) on real output remains unsettled in the empirical macroeconomic literature. This paper provides new empirical evidence on this relationship using a dataset for 108 emerging and developing economies for the period 1960-2006. We examine the impact on output growth, and provide estimates of how these episodes affect output trend. The following empirical regularities are identified: i) Output growth tends to slowdown prior to and in the year of the collapse; ii) the likelihood of a positive growth rate in the year of the collapse is more than two times more likely than a contraction; iii) positive growth rates in the years that follow such episodes are the norm; and, finally, iv) the persistence of the crash matters, i.e. one-time events induce exchange rate and output dynamics that differ from consecutive episodes. In particular, two opposing effects are identified: a gross and a net effect. The gross effect leads to a statistically significant gain on the level of output of 6% in the three to five years that follow the event. However, these ex-post gains do not compensate for losses in trend output that occur prior to the collapse. Thus, one-time currency collapses are associated in net terms with a permanent loss in the level of output that average more than 6%.

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***Key words**: currency crisis, nominal devaluations, nominal depreciations, exchange rates, real output growth, recovery from crises.*

[1] *E-mail addresses*: matthieu.bussiere@banque-france.fr, ssaxena@imf.org and camilo.tovar@bis.org. The views expressed are solely the responsibility of the authors and do not necessarily reflect those of the Bank for International Settlements (BIS), the International Monetary Fund (IMF), the Banque de France or the Eurosystem. This is a revised version of a paper previously entitled: "Chronicle of large currency devaluations: re-examining the effects on output". We thank Andrew Berg, Claudio Borio, Carlos Capístran, Luis Felipe Céspedes, Giancarlo Corsetti, Mihaljek Dubravko, Martin Eichenbaum, Charles Engel, Már Gudmundsson, Jean Imbs, Gerardo Licandro, Ramon Moreno, Chris Papageorgio, David Romer, Antonio Spilimbergo, Alberto Torres, Jorge Tovar, Christian Upper and Goetz Von Peter for their useful comments. We also thank comments by seminar participants at the 2010 ASSA meeting, the BIS, the 2009 CEMLA Latin American Central Bank Researchers' Network, the ECB, the IMF Research Department, LACEA's 2008 Annual Meeting and the 2009 SNDE annual conference organised by the Atlanta Fed. Finally, we are grateful to Rodrigo Mora for his excellent research assistance in early stages of the project.

1 Introduction

The recent global crisis has placed currencies across the world under severe pressure. The Mexican peso jumped from 9.9 pesos per US dollar in August 2008 to nearly 14.4 pesos per US dollar in February 2009, a 46% depreciation rate in a matter of just six months. At about the same time, the Korean won jumped from just over a thousand wons per US dollar in July 2008 to over 1489 wons per US dollar in November 2008, a 48% depreciation rate in just four months. Such large swings in the value of these currencies vis-à-vis the US dollar are recent examples of a recurring phenomenon across advanced and developing economies over the past fifty years.

When thinking about currency collapses (i.e. large currency devaluations and/or depreciations)[2] it is natural to ask how these events affect a country's economic activity as measured by GDP. Several papers have examined the issue from different perspectives. For instance, there is a vast theoretical and empirical literature examining factors and shocks behind currency collapses as summarised by first, second and third generation models of currency crises, models of sovereign default, models of sudden stops or by the empirical work on early warning indicators of currency crises.[3] Theory has also identified specific channels through which such events affect output, e.g. the expenditure switching effect, export competitiveness or the balance sheet channel -when currency mismatches are in place- just to mention a few (see Agénor and Montiel (1999), Krugman and Taylor (1979), Burstein et al. (2007 and 2005) or Tovar (2005)). However, the literature has put much less attention to what happens to output after a currency collapse, a phenomenon that we will also refer to as a currency crash. In fact, there is no systematic study examining the dynamics of this relationship at different time horizons and, to our knowledge, no study explicitly quantifies the impact of these events on output trend. Key exceptions include Gupta et al (2007), Hong and Tornell (2005) and Hutchison and Noy (2005), but all these studies tend to focus on short-term dynamics.[4] Overall, a close examination of the existing literature indicates that the effect of currency collapses on output remains largely unsettled in the empirical macroeconomic literature.

The objective of this paper is to revisit the relationship between currency collapses and GDP. Given the complexity of the issue, we only aim at addressing the following questions. Conditional on a currency crash, i) what are the output dynamics in the short-, medium- and long-run?; and ii) how robust is this relationship over time, across regions and exchange rate regimes? As such, the paper aims at identifying empirical regularities on currency collapses, which future research can build upon. From a policy perspective, these stylised facts also provide important information on the recovery from currency collapses, which can help improve the output dynamics after the event. In general, the goal is modest, to the extent that

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[2] Unless otherwise stated, large losses in the value of a currency vis-à-vis the US dollar (i.e. large devaluations and or depreciations) will be referred to as currency collapses or currency crashes, indistinctively. The paper explores in one of the specifications the distinction between different exchange rate arrangements (e.g. peg, float, or other intermediate arrangements).

[3] For an empirical evaluation of early warning indicators of currency crises see Bussière and Fratzscher (2006); Berg et al (2005); or Berg and Patillo (1999)). For a summary of theoretical and empirical contributions of currency crises in emerging economies see Agénor and Montiel (2008).

[4] We refer to contributions with large sample sizes. An important contribution is Edwards (1989); see also Agénor and Montiel (1999) for a review of the earlier literature.

we do not aim at identifying the shock or shocks determining the currency crash, or the specific channels involved, which can change substantially from episode to episode.[5]

Unlike most of the existing literature this paper employs a large dataset that spans for nearly 50 years across a broad set of countries. More precisely, we rely on a panel for 108 emerging and developing economies for the period 1960-2006. As such, we avoid selection bias problems often found in the literature, which are associated with the use of small cross-section or short time series samples.

To assess the dynamics of output around a currency collapse we employ four complementary methodologies, each of which aims at addressing specific aspects of the issue at hand. In doing so we split the episodes on the basis of the currency collapse being a stand alone incident or one that repeats itself over time. *First*, we use *conditional probabilities* to determine whether expansionary devaluations or depreciations are more likely than contractionary ones, and whether initial business cycle conditions matter or not. These probabilities represent a convenient way of synthesizing the information on output growth, while conditioning on various events. *Second*, to get a sense of the short- and medium-run behaviour of exchange rates and output around the time of a currency crash we perform *event case analyses*. *Third*, to complement the previous analysis, we employ a *two-way fixed effects panel regression* as in Forbes (2002), and take it a step further by using the econometric results to simulate the effects of the dynamics of output trend around currency collapses. The analysis is relevant to the extent that i) it provides a basis to compare the short and medium-term impact of such episodes vis-à-vis a control group (i.e. countries where no large currency collapses occur) and ii) it allows us to identify whether such episodes can be associated with permanent gains or losses. *Finally*, to assess, *ceteris paribus*, the full impact of a currency crash on the level of output (from the short to the long run) we employ a *dynamic panel analysis* as in Cerra and Saxena (2008) and Romer and Romer (1989).

An aspect to notice is that our analysis explicitly takes into account two features that are usually left aside. On the one hand, we recognise that the short- and long-run effects of currency collapses on output are likely to differ.[6] On the other hand, we recognise that a persistent currency collapse (i.e. consecutive devaluations or depreciations) is likely to have a different impact on output than one-time episodes.

Our findings identify the following empirical regularities: i) Output growth tends to slowdown prior to and in the year of the collapse; ii) the likelihood of a positive growth rate in the year of the collapse is more than two times more likely than a contraction; iii) positive growth rates in the years that follow such episodes are the norm; and, finally, iv) The persistence of the crash matters, i.e. one-time events induce exchange rate and output dynamics that differ from consecutive episodes. In particular, two opposing effects are identified: a *gross* and a *net* effect. The *gross effect* leads to a statistically significant gain on the level of output of 6% during the three to five years that follow the event. However, these ex-post gains do not compensate for losses in trend output that occur prior to the collapse. Thus, in net terms currency collapses are associated with a permanent loss in the level of output that exceeds 6%.

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[5] These issues are not irrelevant. In fact, different shocks may induce divergent output dynamics (see Tovar (2005)), different channels may be involved, and their relative importance may change over time. Given their complexity, some of these complementary questions are examined in a companion paper (Bussière, et al (2009)).

[6] For example, the price elasticity of nominal trade flows is lower in the short run than in the long run (it actually switches signs for imports: import values first rise due to higher prices and subsequently decline as real imports fall). Hence, devaluations could deteriorate the trade balance in the short-run before improving in the long-run (J-curve effect). This would produce a lower growth in the short-run and higher in the long-run.

The robustness of results is assessed in different dimensions. First, the estimates are examined by sub-periods and by regions. Second, the role of alternative "de facto" exchange rate regimes, as classified by Reinhart and Rogoff (2004), is evaluated. We find that full-sample results are sensitive to sub-sample breakdowns. Indeed, not only do results differ across regions, but also the currency collapse–output relationship changes over-time. For example, the significant contemporaneous output slowdown associated with currency collapses in the full sample is particularly associated with Asia and Latin America. Similarly, the slowdown of output at the time of currency crashes is dominated by the events of the 1990s. By contrast, currency collapses during the 1960s and 1970s appear to be fundamental in explaining the positive impact on growth in the years following the currency collapse. Such variation across countries and over time provides an explanation for the wide variety of results reported in the literature and do not support the notion of a stable currency crisis-output relationship over time.[7] Equally important, our results indicate that, contrary to common perception, currency crashes are equally likely to occur, irrespective of the exchange rate regime in place.

The remainder of the paper is structured as follows. Section 2 reviews the empirical literature examining the link between currency collapses and output. Section 3 defines a currency collapse. Section 4 presents some stylised facts of currency collapses and presents a preliminary analysis of output dynamics in countries that experience such crashes. Section 5 complements the analysis with econometric evidence and simulations aimed at capturing the impact on output around the time of a currency collapse and its impact on output trend, while taking into account a control group. Section 6 examines the robustness of results across different dimensions: regional, time and exchange rate regimes. A final section concludes.

2 Review of the empirical literature

2.1 Preliminary considerations

Reviewing the empirical literature that examines the relationship between currency collapses and output is complex for several reasons. *First*, there is no unified treatment for defining the relevant currency episodes under consideration. As a matter of fact, not all studies focus on currency collapses. Furthermore, defining what we mean by a "collapse" or "crash" involves a certain degree of arbitrariness. This is evident when we consider that in his classical paper, Cooper (1971) defined a large currency devaluation as any episode in which the annual exchange rate change exceeded 10%. Such a definition, in high inflation environments as those seen during the 1970s and 1980s, would have led to the identification of a currency crisis episode every single month (Frankel (2005)). For this reason, more recent studies have employed alternative criteria; say, by including not just the change in the exchange rate, but also the acceleration in the exchange rate change and its initial level. Equally important is that studies differ on whether the explanatory variable is the nominal or the real exchange rate change. Certainly, not all nominal currency collapses translate into significant changes in the real exchange rate. However, the empirical evidence does support that nominal devaluations, more often than not, lead to real devaluations (see Bahmani-Oskooee and Miteza (2002) for developing countries).[8] The task of comparing currency collapses with

[7] For instance, the results reported by Gupta et al (2007) point out that such relationship is stable over time.

[8] This lends support to Goldfajn and Valdés' (1999) statement that, in the last 35 years, policy makers in most countries have preferred to correct large real appreciations through nominal devaluations.

currency crises episodes is further complicated when the latter event is identified by a combination of variables such as the magnitude of the exchange rate change, changes in interest rates or changes in international reserves (e.g. as captured by exchange rate market pressure (EMP) indices). Adding more variables only adds in complexity but does not necessarily improve the identification of crisis episodes. In this respect, it has been shown that the identifications of crises episodes based on commonly applied EMP indices is highly sensitive to the choice of weighting schemes or the parametric assumptions used in the construction of thresholds (Potines and Siregar (2008)).

Second, the literature has also treated the impact on output in very diverse manners. While many studies employ real GDP growth rates in a given year (or quarter), others define the impact of currency collapses on output by comparing the difference between the average output growth some period after the crisis (e.g. the year of the crisis and the year after it) and some "tranquil" period prior to it (Gupta et al (2007)) or only examine the average growth rate in the years that followed the event (Hong and Tornell (2003)). Aside from the arbitrariness of such an approach, its weakness is that the dynamics of the process is neglected, including any considerations about the persistence of the shock. Moreover, by doing so, many studies fail to establish a differentiated impact across the short-, medium- and long-run. Finally, using the difference of average post-crisis and pre-crisis growth rates as the dependent variable is a source of *endogeneity bias* (Hong and Tornell (2003)).

Finally, existing studies tend to be quite susceptible to selection bias, either due to a small sample of countries, a short sample period or the use of cross-sectional data (which precludes the use of a control group). As a result, a wide variety of statistical and econometric methods have been employed, creating additional hurdles for the comparison of results.

2.2 Expansionary or contractionary currency collapses?

In general, a significant number of studies for developing and emerging market economies (EMEs) support the contractionary impact of currency collapses on output. Classical studies such as those by Edwards (1989, 1987) and Morley (1992) reach such conclusion. For instance, in his classical book Edwards (1989) finds a contemporaneous contractionary effect associated to these events in developing countries and EMEs, a result that also finds echo by Hutchison and Noy (2002). However, Edwards also finds an expansionary effect the year after the crisis.

Other studies have looked at the dynamics of output around currency crises. For example, Milesi-Ferretti and Razin (1998) find that output during the year of the crisis is lower than the average during the three-year period preceding and following the crisis (V-shape).[9] They also find that the strongest predictor of output growth after a crisis is the average growth rate behaviour before the crisis. That is, there appears to be a "continuity" effect on output behaviour, which points out to a potential selection bias problem associated with the fact that countries devalue their currencies after entering a recession. However, such results differ from those reported by Gupta et al. (2007), who find that contractionary episodes are negatively correlated with a business cycle indicator, that is, recessions are worse if they follow an economic boom. Gupta et al. (2007) also report that large capital inflows prior to the crisis exacerbate output losses, although capital controls put in place prior to the crisis can dampen such adverse effects. Furthermore, they report that competitive devaluations also increase output losses, while export growth and trade openness may stimulate the recovery.

[9] They identify crises by different measures that involve the level, acceleration and past levels of devaluation rates.

In a related study, Hutchison and Noy (2002) find that contractionary effects are associated with real exchange rate overvaluation, slow growth of trading partners and substantial losses in international reserves.

The contractionary effects of currency crises have been qualified by testing the importance of some transmission channels, such as the balance sheet effect or the impact of financial dollarisation. For instance, Cavallo, et al (2002) find that devaluations in the presence of large foreign currency liabilities can increase the value of debt relative to revenues, crippling insufficiently hedged debtors and leading to business failures and output contractions. Bebczuk et al. (2007) find that devaluations are contractionary once dollarisation is controlled for. However, Cespedes (2005) finds that contractionary balance sheet effects from real exchange rate devaluations only operate in the short-run. In the medium term they have expansionary effects.[10]

However, the contractionary relationship between currency collapses and output is not as robust as suggested in the literature surveyed so far.[11] In a recent study, Gupta et al (2007) report that in a cross-section of 195 crises episodes in 91 developing countries from 1970-2000, contractionary and expansionary episodes tend to occur with almost the same frequency.[12] Furthermore, they find that "[…] there is no distinct change in the pattern of growth during crises in the 1970s, 1980s and 1990s (pp 435)". However, the lack of a control group may be biasing their results. In fact, using a data set of 155 countries for the period 1970-1999 with 264 devaluation episodes, Magendzo (2002) finds that the contractionary effect of currency devaluations vanishes once selection bias is taken care of. Using alternative definitions of devaluations and employing matching estimators to generate a control group, he concludes that "[…] *results are robust: devaluations show no statistically significant effect on output growth*".[13]

The literature is also inconclusive regarding the stability of the relationship over time or across regions. This is not surprising as it seems reasonable to expect changes in factors involved in the transmission channel over time. For instance, in the recent years there have been changes in the degree of exchange rate pass-through to inflation, currency exposures (thus affecting the relevance of the balance sheet effect) and the exchange rate regimes in place.[14] The impact may have also changed with financial deepening or as some countries de-dollarise their economies (Cespedes (2005) and Bebczuk et al (2007)). Not surprisingly, Kim and Ying (2007) find evidence of contractionary devaluations in Asia after 1998 but expansionary for the pre-1997 period. Nonetheless, they find a persistent contractionary relationship for Chile and Mexico. For such reasons it is quite surprising that Gupta et al.

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[10] The importance of alternative features of exchange rate behaviour has also been explored. For example, Chou and Chao (2001) find that devaluations have no effect on output for five Asian countries but exchange rate volatility has a negative impact on output growth in the short-run.

[11] See also the survey on the literature by Agénor and Montiel (1999).

[12] The definition of currency crisis used in their study is based on episodes identified by four other studies. They then apply a simple majority rule. We do not find this approach desirable. By combining definitions that involve different components their study is in some sense intractable.

[13] Hutchison and Noy (2002) try to control for a different selection bias problem: countries that experience a currency crises may be different in other respects from non-crises countries and episodes. In other words, they suggest that other factors contributing to the crises are causing the sample selection bias. To test for this possibility, they construct the inverse mills ratio statistic from a probit regression for crises episodes and add it as an additional regressor in the output growth regressions. However, their statistic turns out to be statistically insignificant.

[14] For instance, as economies become financially more open, firms can easily get exposed to currency mismatches, thus becoming vulnerable to currency collapses in a manner that was not possible in the previous decades, when economies were less financially integrated.

(2007) find a split expansionary/contractionary pattern that is stable across the three decades covered in their study.

The lack of robust results in the literature is not exclusive to EMEs. In fact, split expansionary and contractionary patterns have been reported for developed economies. Focusing on 23 OECD countries, Kalyoncu et al (2008) find that real depreciations are contractionary in the long-run in six countries and expansionary in three; and fail to find evidence of a long-run effect on output in the remaining countries. In contrast, Ahmed et al (2002) compare devaluation episodes across a group of developing and industrial economies, where industrial economies are split according to their exchange rate regime.[15] They find that for industrial countries both devaluations and depreciations are expansionary, while for developing countries devaluations are contractionary.

The lack of robustness of the results reported in the literature has also reinforced the idea that structural models may be more informative in answering the question at hand. For instance, Tovar (2006 and 2005) estimates a dynamic stochastic general equilibrium (DSGE) model to assess the relative importance of different transmission channels through which currency devaluations may affect output. Considering a model with expansionary expenditure-switching and contractionary balance sheet effects built-in, he concludes that policy induced devaluations in Chile, Colombia, Korea and Mexico have been expansionary, despite the contractionary balance sheet effect ─ a result consistent with the dominance of the expenditure-switching over the balance sheet effect. Burstein et al (2007 and 2005) have also looked into the impact of large exchange rate devaluations. Although their focus is the nominal exchange rate pass-through onto the real exchange, they do highlight that devaluations are often associated with negative wealth effects. In practice, this implies that to capture a contraction in economic activity, it is necessary to consider parallel adverse shocks, such a decline in export demand or one that captures a decline in real wealth, such as a decline in net foreign assets. The analysis presented here complements these structural approaches, which cannot be performed for a large number of countries.

Finally, the present paper is close in spirit to studies that empirically aim at investigating the relation between exchange rates and growth. Recently, Hausman et al (2005) and Rodrik (2008) have presented empirical evidence showing that undervalued currencies stimulates economic growth, especially for developing countries. An equally important strand of literature has aimed at examining how these events affect the dynamics of output (both in the short- and medium-run) and what characteristics shape its dynamics over time (e.g. Gupta et al (2007), Hong and Tornell (2005), Agénor and Montiel (1999) or Edwards (1989)).

3 Defining currency collapses

Defining a currency collapse event is a matter of controversy as it involves a high degree of subjectivity. This is also an inherent problem of the currency crises literature, which has relied on different definitions. In defining these episodes, a common approach is to construct a weighted index based on exchange rate changes, the loss of international reserves and changes in interest rates. Although desirable, this approach is not pursued here, partly because our main interest is related to the real effects of large currency collapses on output, and, also, because the lack of data on interest rates for different countries (at a quarterly or

[15] This allows them to consider differences between the effects of devaluation vis-à-vis depreciations.

monthly frequency) and for a long time span would severely reduce the sample size.[16] By contrast, the data on exchange rate is widely available across countries and over time.

In what follows, three alternative definitions based on nominal exchange rate fluctuations are considered. This aims at providing transparent and robust results. The first two definitions follow Milesi-Ferretti and Razin (1998); the third is introduced to reduce some of the subjectivity in defining currency collapses.

3.1 General definitions of currency collapses

Let S_t be a country's nominal exchange rate, expressed as units of local currency per unit of a foreign currency (the US dollar). Then, a *currency collapse* occurs if there is any month (*m*) in a given calendar year (*t*) in which the annual change in the exchange rate exceeds a positive threshold value. Formally, $\Delta S_{m,t} = \left(\frac{S_{m,t}}{S_{m-12,t-1}} \right) - 1 > threshold > 0$, where the *threshold value* is identified by one of the following definitions:[17]

Definition 1: A currency collapse occurs if the annual nominal exchange rate change, $\Delta S_{m,t}$, in any given month during a calendar year, satisfies the following three criteria:

a. The exchange rate change is at least 25 percent: $\Delta S_{m,t} \geq 0.25$

b. The exchange rate change at least doubles that of the previous year. Formally, $\Delta S_{m,t} \geq 2 \cdot \Delta S_{m-12,t-1}$

c. The exchange rate change during the previous year does not exceed 40 percent. More precisely, $\Delta S_{m-12,t-1} \leq 0.4$

Definition 2: A *currency collapse* occurs if the annual nominal exchange rate change in any month during a given calendar year, $\Delta S_{m,t}$, satisfies the following three criteria:

a. The exchange rate change exceeds 15 percent: $\Delta S_{m,t} \geq 0.15$

b. The exchange rate change exceeds by at least 10 percent that of the previous year. Formally, $\Delta S_{m,t} \geq 1.1 \cdot \Delta S_{m-12,t-1}$

c. The exchange rate change in the previous year must not exceed 10 percent. More precisely, $\Delta S_{m-12,t-1} \leq 0.1$

Definition 3: A large currency collapse occurs if the annual change in the exchange rate in any given month during the calendar year is in the top quartile of all the episodes in the sample in which there is a relative loss in the currency value. Notice that to implement this definition we exclude appreciation episodes.

These definitions deserve two comments. First, definitions 1 and 2 explicitly consider the change and acceleration of the exchange rate change as well as the initial level of the exchange rate. Second, definitions 1 and 2 differ in that the first one avoids capturing large

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[16] For this reason, Cerra and Saxena (2008) rely on a measure of this type that excludes interest rates to define currency crises.

[17] The nominal exchange rate is defined as the price of the local currency in terms of the US dollar.

currency fluctuations associated with episodes of high-inflation, while the second focuses on episodes in which the exchange rate was relatively stable during the previous year.

3.2 Controlling for the persistence of currency collapses

We now define two events, based on Definition 3, according to the persistence of the currency collapse. This allows us to examine the dynamics of output around the time of one or two consecutive collapses.

Event case 1 or one-time currency collapse: describes the average dynamics of output when a currency collapse occurs in a given year (*T*) and no collapse takes place within a three-year window before (*T-3, T-2, T-1*) and after the event (*T+1, T+2, T+3*).

Event case 2 or persistent currency collapse: describes the dynamics of output when a large currency collapse occurs consecutively in two years (*T-1* and *T*) and no collapse occurs around a three-year window before (*T-4, T-3, T-2*) and after (*T+1, T+2, T+3*).

Alternative specifications of currency collapses were also considered.[18] However, the number of episodes fell considerably (less than ten in each case) making their analysis and any inference from them not representative at all.

The manner in which we have defined each event case allows us to capture explicitly the role of the persistence of a currency collapse over time. In this respect, *event case 1* is not contaminated by other episodes, thus describing an episode with no persistence at all. By contrast, *event case 2* would explicitly incorporate into the analysis the role of the persistence of currency collapses.

Finally, it is worth highlighting that a further advantage of the definition for event case 1 is that it captures countries that have stable exchange rates before and after the currency crash. As such, it excludes episodes that could be driven by hyperinflation episodes or by other persistent macroeconomic imbalances, which could contaminate the effects on output.

4 Stylised facts of currency collapses and output behaviour

This section presents some stylised facts about currency collapses and output dynamics. We start by implementing the criteria discussed in the previous section for identifying currency collapses. For this purpose we use data for 108 countries from 1960-2006 (see *appendices A* and *B* for data sources and a list of countries included in the study).[19] Next we examine the data using descriptive statistics, including conditional probabilities and statistical event case analysis.

4.1 Frequency and threshold values of currency collapses

The threshold values determining a currency collapse and the number of episodes identified under the four alternative definitions are reported in the top panel of Table 1. Results are reported for the full sample and by decades, regions and exchange rate regimes, as

[18] For instance, those occurring in three or four consecutive years and no devaluation occurring around a three-year moving window before and after the episode.

[19] To deal with possible outliers we eliminate from our sample all countries for which we have less than ten usable observations. In addition, we drop those episodes in which the exchange rate devalued more than 600% or in which the change in output exceeded 20% in absolute value.

classified by Reinhart and Rogoff (2004). Full sample statistics show that *definition 3* (ie collapses in the top quartile of the sample) identifies by far the largest number of episodes, 571 in total. This definition is less restrictive than the alternative *definitions 1* and *2*, which capture fewer episodes (202 and 251, respectively).[20] Interestingly, these three definitions identify threshold values of similar magnitude and comparable with those found in the literature. That is, a currency collapse occurs *on average* when the nominal exchange rate loses more than 20 percent of its value in a given year.[21]

Summary statistics also indicate that currency collapses occurred with greater frequency during the 1980s and 1990s (Table 1). These episodes are also found to happen more frequently in Africa, followed by Latin America. Although the number of episodes varies depending on the definition employed, the percentage of episodes occurring in each region is fairly stable across definitions. In particular about two-fifths of total episodes occur in Africa and about a third in Latin America.

Finally, we also examine whether currency collapses are exclusively related to a type of exchange rate regime.[22] This addresses concerns that currency collapses are dominated by regime transitions such as those caused by the collapse of a peg or some form of soft pegs. The evidence reported in the bottom part of Table 1 shows that currency collapses are frequent across all exchange rate regimes. Nonetheless it is particularly notorious in what Reinhart and Rogoff classify as "free falling" regimes. This is not surprising given that in their classification this category includes exchange rate regimes in which the twelve-month inflation equals or exceeds 40 percent or in which there is a currency crisis as defined by a transition from a fixed (or quasi-fixed) regime to a managed or independently floating regime. The main point to take here is that i) a significant portion of currency collapses occur under all regimes, including countries with flexible exchange rate regimes in place; and ii) the threshold value defining a currency collapse is fairly stable across exchange rate regimes, although it tends to be relatively higher under the "freely falling" regime.

In general, the threshold value for a currency collapse to occur is fairly stable across definitions, in particular, over time and regions and to a lesser extent across exchange rate regimes. For these reasons, and with the purpose of simplifying the exposition of our results, in the remaining of the paper we emphasise the use of *definition 3*, which relies less on ad-hoc restrictive features. This is well illustrated, for instance, by the fact that *definition 1* would fail to capture an episode of currency collapse at time *T*, in which the devaluation rates at *T-1* and *T* were, say, 30% and 58%, respectively.

Table 2 reports results using *definition 3* to select the episodes to be included in *event cases 1* and *2 i.e. one-time and persistent currency collapses, respectively*. As shown, just over 13% of the 571 episodes identified by *definition 3* can be considered one-time events in a three-year window before and after the episode, and only 4% are considered consecutive episodes of currency collapses. This highlights that the dynamics of currency collapses on

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[20] In the data set, *definitions 1 and 2* were unable to capture an episode in which the exchange rate changed 50% the first year, and 200% in a second year.

[21] In a previous version of this paper we introduced an additional definition to consider extreme episodes, which we referred to as mega-collapses. Defined as those episodes in which the exchange rate change is in the top quartile of the top quartile of all currency collapses (i.e. top 6.25%), we found that these mega-collapses occurred when the value lost by a currency in a given year exceeds 93 percent.

[22] For this purpose we employ the updated database published in Reinhart and Rogoff (2004) available in their websites. In particular, we rely on what they call the *coarse classification*. According to it *exchange rate regimes* are split into six categories: currency boards and peg, soft-peg and crawling bands, managed floats, freely floating or flexible, free falling and missing data for dual markets to which we refer to as unclassified. For the purposes of our analyses we take as reference the exchange rate regime in place at the time the first currency collapse occurs.

output is easily contaminated by neighbouring currency collapses in time or by other factors e.g. hyper-inflationary episodes. Table 2 also confirms that currency collapses occur when the exchange rate changes by a magnitude that is close to 20%. This result appears again to be robust when considering the regional or exchange rate regime breakdowns. However, a breakdown by sub-periods shows that the threshold value for one-time currency collapses has a sustained an upward trend since the 1970s. According to our definition during the 1970s a currency collapse required at least a 22% decline of the currency's value. In the 2000s such threshold had increased to 26%, a 18% increase. The pattern is somewhat less stable when two consecutive currency collapses occur. Nonetheless, in general, it seems one can comfortably conclude that a crash occurs when the currency loses more than 20% of its value in a year.

4.2 Output behaviour around the time of currency collapses

4.2.1 Transition probabilities

A preliminary assessment of the dynamics of output following a currency crash can be obtained by, first, calculating the frequency and median size of the expansion or contraction in output during the years that follow the event and, second, by examining the conditional probabilities of certain growth dynamics taking place after a currency collapse. Among the conditioning events we include expansionary or contractionary episodes in the years that follow a currency collapse and accelerating or decelerating growth episodes. This approach allows to answer specific questions: i) how likely is it for a country to have an output expansion in *T+1* or in subsequent years given that the economy had a currency collapse at *T* and output growth in that year was negative? or ii) how likely is it for an economy to experience accelerating ($0 < g_T < g_{T+1} < g_{T+2}$) or decelerating ($0 < g_T < g_{T+1} < g_{T+2}$) growth rates once a currency crash takes place. Finally, iii) how do the initial business cycle conditions (e.g. expansion or contraction) influence output dynamics after a currency collapse.

We start by examining the frequency and the median growth rate of output expansions or contractions conditioning on i) having a currency collapse and ii) either a positive or negative growth rate in year *T* (Table 3). In addition we report the conditional probabilities for different events,[23] including: 1) a positive or negative growth the year after the currency collapse; 2) positive or negative growth rates during the two years that follow the currency crash; and 3) accelerating or decelerating growth dynamics during the two years after the crisis.

Our calculations show that the likelihood of observing a positive growth the same year of a collapse is more than two times greater than a recession (0.7 versus 0.3). Also, that there is a somewhat symmetric behaviour between the median growth rate of an expansion and a contraction (4 percent in absolute value versus -3 percent). The conditional growth probabilities show in turn that the likelihood of experiencing a positive growth in *T+1* is greater than observing a contraction independently of the initial conditions i.e. independent of whether the economy grew at *T* or not (0.84 or 0.62 vs. 0.37); that economies with positive growth rates in *T* have a higher probability of remaining in a positive growth path in a one or two year horizon, than those that had a recession in *T* (0.74 vs. 0.17 or 0.49); Finally, that it is unlikely to remain in a recession or to get into a recessionary growth dynamics in the two years that follow a currency collapse.

[23] Specifically, let A be the event in which there is a currency collapse and a positive or negative growth in T and N_A be the number of episodes satisfying event A. Let B be the conditioning event, and N_B the number of episodes satisfying event B. We thus report the conditional probability, P(A/B)= P(A and B)/P(B)= N_{AB} / N_B, where N_{AB} is the number of events satisfying event A and B.

The previous analysis is modified to examine the possibility of experiencing accelerating or decelerating growth episodes once a currency collapse takes place in *T.* We also report results controlling for the initial position of the business cycle. In particular, we condition either by the output growth the year prior to the currency crash (g_{T-1}) or by the three year average growth rate prior to the event taking place ($(g_{T-1} + g_{T-2} + g_{T-3})/3$). The calculations reported in Table 4 show that an economy is quite likely to experience an expansion in the short- and medium-run if the economy was growing prior to the currency collapse. By contrast, an economy has just over fifty percent chance of growing at *T* if the currency collapsed following a recession. In such cases, the median growth rate at *T* is lower than the median growth rates observed in economies that were already expanding prior to the currency collapse. In addition, we also find that an economy is more likely to observe accelerating growth dynamics if the currency crash takes place during an expansion.

Tables 5 and 6 report a similar calculation to those reported above, but restricting the currency collapse to be a one-time event (e*vent case 1*) or a two-year consecutive event (*event case 2*). Evidence in Table 5 confirms that accelerating episodes are more likely if the currency collapse took place after an expansionary period rather than during a recession. Also that the probability of observing accelerating growth after three years is higher (although low) for one-time currency collapses than for cases in which these episodes can randomly repeat themselves over time or when two-consecutive currency collapses take place (0.19 vs. 0.14 and 0.19 vs. 0.05, respectively, if we only take into account the year prior to the currency crisis). In fact, Table 6 shows that accelerating episodes following consecutive crisis episodes are unlikely to occur, even if the currency collapse took place during an expansion.

Therefore, our analysis of transition probabilities suggests that expansionary episodes at the time of a currency collapse are more than two times more likely to occur than contractionary ones; that the economy is more likely to witness sustained growth if the currency collapse occurs following an expansionary cycle; and, finally, that accelerating episodes are more likely to happen if the currency collapse is a one-time event.

4.2.2 Event case analysis

Turning now to the dynamics of output around the time of a currency collapse (as described in both event cases), the average time series is reported in Figure 1. To provide a better characterization of each event, the dynamics of the exchange rate change at the time of the currency collapse is also displayed (right-hand panel). Finally, the 25 and 75 percentiles of the distribution are also plotted.

The output growth dynamics for *event case 1* follows an s-type pattern (Figure 1, upper-right panel): on average growth slows down prior to the currency collapse, moderately picks up at the time of the devaluation and accelerates afterwards. This seems to confirm the "continuity effect" of currency crises on output identified by Milesi-Ferretti and Razin (1998). Notice also that *growth rates a year to three years after the episode are on average higher than before the event*. Regarding the exchange rate dynamics, we find that the currency falls in value by an order of just under 60% on average (upper right-hand panel), with devaluation/depreciations rates being quite low immediately before and after the episode.

Output dynamics around the time of two consecutive currency collapses, i.e. *event case 2*, follows perhaps less well defined pattern (Figure 1, bottom-left panel). Prior to the currency collapse, output growth is low (less than 1%), picks up notoriously at the time of the first crash, remains steady at the time of the second one, and then gradually increases. By contrast, the exchange rate dynamics shows a well-defined pattern (Figure 1, bottom-right panel) i) the first devaluation/depreciation (labelled T-1) is on average larger than the second one (labelled T); ii) following the currency collapse, the exchange rate change stays at a level that is on average slightly higher than the one before the event took place; and, finally, iii) on average, the magnitude of the first currency collapse in the *event case 2* is larger than that

occurring when the currency collapse is a one-time episode, i.e., during the *event case 1* (60% vs. 55%).

Taking these events together, it is possible to conclude the following about the growth dynamics before, during and after a currency collapse. First, there is a slowdown (either gradually as in *event case 1* or sharply as in *event case 2*) prior to the currency collapse. Second, the impact on output differs depending on the persistence of the currency crash. Finally, growth is positive after the currency collapse. In other words, on average, in the medium-term currency collapses are not associated with contractionary effects on output. The reader must keep in mind that since there is no control group, we cannot say anything about how growth rates compares between countries experiencing a currency collapse and those that do not. This is an issue that is dealt with in the next section.

5 Econometric evidence: impact of currency collapses on output

The goal of this section is to quantify the behaviour of output around the time of a currency collapse. In contrast with the previous sections, the econometric analysis that follows incorporates a control group (i.e. countries that do not experience currency collapses). This has two main advantages. First, it deals with possible *selection bias* problems, and, second, it allows determining whether growth dynamics differ between countries that experience a currency collapse vis-à-vis those that do not. To carry out the analysis, we employ two complementary econometric methodologies. The first is a static panel analysis, which is motivated by Forbes (2002). This methodology has an important advantage as it allow us to simulate the average behaviour of output trend following a currency crash. The second is a dynamic panel analysis, which allows to complement the previous results in a more stylised manner. This approach proposed by Cerra and Saxena (2008) in the same spirit as Romer and Romer (1989), has two main advantages. On the one hand, it allows evaluating, ceteris paribus, the permanent impact on output through impulse response functions to a currency shock. On the other hand, it explicitly controls for *endogeneity bias*.

5.1 A static econometric analysis

5.1.2 Specification and results

This sub-section examines the impact of currency collapses on output growth rates using two-way fixed effects panel regressions. The estimated benchmark equation is given by:

$$g_{i,t} = \sum_{j=-3}^{3} \beta_j D_{i,t-j} + \delta_1 Infla_{i,t} + \nu_i + \omega_t + \varepsilon_{i,t} \qquad (1)$$

where $g_{i,t}$ is real GDP growth rate in country *i* in year *t*, $Infla_{i,t}$ is the inflation rate and $D_{i,t-j}$ is the dummy for currency collapses. Specifically, $D_{i,t}$ is equal to one if country *i* had a currency collapse in period *t.* Finally, $\varepsilon_{i,t}$ is the two-way composite error which includes an unobserved effect, an idiosyncratic time-constant and a time-varying but cross-section constant factors. Notice that to avoid *selection bias* problems we employ the full sample. This also allow us to compare the performance of countries affected by the currency collapse vis-à-vis those that are not. In this sense, this analysis complements that reported in the previous section.

Table 7 reports the estimates of equation 1 for the three definitions of currency collapses described in Section 3.1. Several results stand out. *First*, countries experiencing a currency collapse witness output growth rates that are on average between 1.2 and 1.9 percentage points lower the year prior to the episode than in countries that experience no currency collapse. *Second*, these countries also display on average lower growth rates in the year of the event. The estimated coefficients are statistically significant, and their magnitudes suggest an output growth rate that is on average between several percentage points below those countries that do not witness a collapse. *Third*, output growth rates in countries with currencies collapsing vis-à-vis those that do not, are not statistically different two or three years prior to the episode. *Fourth*, under definitions three or four we find statistically significant positive effects on growth three years after the currency crash. *Finally*, inflation appears to be a statistically significant control. An aspect that readers must keep in mind is that results indicate that although growth experiences a slowdown on the year prior and the year of the collapse, on average the growth rate does remain positive. In other words, we do not find evidence in the full sample suggesting that currency collapses are in fact contractionary, not prior to and neither after the episode takes place. Equally important, these results tend to confirm those previously found in the paper, suggesting that growth rates after the currency collapse are higher than those prior to the event.

So far, we have not considered well defined events, as done in the previous section. In other words, we have not controlled for the persistence of currency collapses. Table 8 reports the same set of regressions, but now the currency crash is captured by the dummies for *event cases 1* and *2*. A robust result emerges: *countries experience a currency collapse after a strong slowdown.* Indeed, the regressions using the *event case 1* dummy display growth rates that are more than 2 percentage points below the control group in the two years prior to the currency collapse. In addition, regressions for *event case 1* show that output growth is statistically and significantly lower than the control group during the year of the currency collapse by a magnitude of two percentage points. However, regressions including the *event case 2* dummy show no contemporaneous effect. Finally, we find no statistically significant impact on output growth after the event. Overall, these results reveal that the *contemporaneous currency collapse-output relationship does change depending on the persistence of the devaluation*.

5.1.2 Simulation analysis

An alternative way of summarising the previous results is to use the econometric results to simulate the effects of currency collapses on output trend. To implement this, we construct an index for the level of output. Thus at T-4 the level of output is set to 100 and the statistically significant estimated growth rates are applied to this index. In this manner, we are able to construct output trend for an average economy that witnesses a currency crash as well as for one that remains unaffected, to which we will also refer to as potential output.

The simulated dynamics for output trend using the three definitions for currency collapses as well as for event case 1 are reported in Figure 2.[24] Several features arise. First, currency collapses are associated with a permanent loss in the level of output. After three years these losses range from an average of 1.9% under definition 3 to 6.3% in the case of one-time currency collapses (Table 9). Second, such losses materialise prior to the currency collapse. Indeed, the level of output begins to fall below potential output about two years prior to the currency crash. This leads us to the third feature: currency collapses trigger a correction in

[24] Results for event case 2 are not reported given that the coefficients reported in Table 8 are all statistically insignificant.

output trend. To put it differently, they acts as a corrective mechanism that restores trend output growth to the same path as potential output but at a lower level.

These elements allow us to decompose the medium-term effects of currency collapses in three main components: i) *Maximum potential loss in the level of output*. Such loss is depicted by assuming that after falling below its potential output (e.g. in T=-2 or T=-1) the economy does not experience the currency collapse at T=0, thus remaining on the same path as before the collapse. Graphically this is depicted by the vertical distance between the potential output level (blue line in Figure 2) and the imaginary output level that would have prevailed in the absence of the collapse (orange line in the same figure) at T=3; ii) *Output trend gain associated with the currency collapse*: This gain is captured by the vertical distance between the output level that prevailed after the currency collapse (green line) and the imaginary output trend that would have prevailed in the absence of the collapse (orange line) three years after the collapse; Finally, iii) *The net permanent loss*: Captured by the difference of the two previous effects. Graphically, this is the vertical distance between potential output (blue line) and the level that prevailed following the currency crash (green line). Table 9 summarises the impact of each of these effects on the level of output. As shown, in the absence of currency collapses, the potential losses ranged between 6.9% for definition 3 and 12.9% for event case 1. However, the gains associated with the currency collapse – which range between 1.9% and 6.3% - the net loss in output trend is much smaller.

In general three key conclusions should be highlighted about currency collapses. First, they play an important adjustment role, with positive effects on output trend. Second, despite such gains, after three years episodes of currency collapses are associated with a net permanent loss in the level of output.[25] Finally, that one-time currency collapses lead to the largest net losses, thus highlighting once again the importance of the persistence of these events.

5.2 A dynamic panel analysis

So far we have examined the output dynamics around the time of a currency collapse without making causality statements about the relationship. In this section we follow Cerra and Saxena (2008) to identify the impact of currency crash shocks on the level of output. For this purpose, we estimate a univariate autoregressive model in output growth rates using panel data with fixed effects and report the group averages of impulse responses of output to the shock. Such specification accounts for the non-stationarity of output and for serial correlation in growth rates.[26] The specific model estimated is given by:

$$g_{i,t} = \alpha_i + \sum_{j=1}^{4} \gamma_j g_{i,t-j} + \sum_{s=1}^{4} \delta_s D_{i,t-s} + \varepsilon_{i,t} \qquad (2)$$

This specification ensures that currency collapses only have a lagged effect on output, therefore, it controls for possible *endogeneity bias* problems associated with the previous methodologies.[27] The impulse response function of this forecasting equation provides an

[25] One should of course be cautious when interpreting these counterfactual experiments as we are not identifying the underlying shocks.

[26] The degree of serial correlation is determined by F-test, which suggested estimating an AR(4). The estimated equation is also extended to include the current and lagged impacts of the shock.

[27] The results do not change in any significant manner even when we include contemporaneous currency collapses in equation 2.

estimate of the total effect of a large currency collapse over a time horizon.[28] It thus provide a natural way of summarising the output response to currency collapses as it traces the effect of a unit shock to the currency collapse variable, D, including the feedback effect through lagged output.

The impulse responses of a currency collapse on output are reported for each definition of currency collapses and for each event case (Figure 9). To facilitate the analysis the impulse responses for the change in output are cumulated to ensure that they reflect movements in levels. Results suggest that in the short run depreciations have negligible effects on output. However, we do find a significant long run positive impact on output trend in the case of *definition 1* and *event case 1 i.e. a one-time currency collapse. However,* the long-run impact in this last case (3.77%) is almost three times the size of the impact from those identified by definition 1 (1.27%). More importantly, under these definitions positive effects are felt after two years and the maximum impact is fully materialised after five years. However, we do not find a statistically significant impact on output in the long-run under *definitions 2 and 3* and under event case 2.

It is worth noting that the contrasting differences between the impulse responses for event case 1 and event case 2 stresses once again the importance of considering the persistence of the event. Mainly, we find that after five years one-time currency collapses are associated with a level of output that is about 4% higher than the one that would prevail had no currency collapse occurred. By contrast, we find no evidence of an impact on growth when consecutive currency collapses occur.

Thus the evidence reported here suggests that one-time currency collapses are associated with a non-negligible permanent output growth gain in the long-run. This is in contrast with evidence reported by Hong and Tornell (2005) who report permanent losses associated with currency crisis on the basis that their average ex-post growth is below the ex-ante average growth rate. The differences between results may be related with the definitions and samples employed (they use a sample for the 1980s and 1990s); and more importantly, ii) with the manner in which the conclusion is reached, theirs is not a formal test as the one we carried out in this section. Finally, iii) our results are based on a larger data set, and results may be very sensitive to sample selection. However, this is an issue that we examine in the next section.

Explaining why growth picks up after a currency collapse is an open question. A possible explanation can be related to the fact that standard expansionary transmission channels "kick-in", such as the export competitiveness or the expenditure switching effect. Alternatively, expansions may simply reflect self-correcting mechanisms in the economy. That is important imbalances in the economy may be corrected following a currency collapse, which allow the economy to resume growth with better fundamentals i.e. a sort of "cleansing or balancing" effect. These arguments require further empirical analysis that are not examined here.

6 Robustness analysis

How robust are the patterns and results presented so far? In particular, we are interested in examining several questions in this subsection: i) How stable are the results over time and over regions?; and finally, iii) what is the role of exchange rate regimes?

[28] A caveat of this exercise is that this methodology does not control for how long the currency collapse lasted or differentiates the shocks by size. This also implies that we give each shock the same weight.

6.1 Time dimension

How stable are the patterns and results reported so far across time? To answer this question we carry out the same analysis by decades. The general conclusion is that the pattern of output growth around a currency collapse is not stable over time. This is evident when examining the dynamics for each event case by decade (Figures 3 and 4), the regressions by decade using *definition 3* and *event cases 1* and *2 (*Tables 10 and 11*)* or the impulse response functions (Figures 10-12).

In general, we find that currency collapses had positive impacts on growth (contemporaneously or ex-post) during the 1960s and negative effects in the medium-run in the 2000s. As for the other decades, the ex-post medium-rum impact is either insignificant or positive depending on the definition employed. Impulse responses using the *definition 3* indicate a long-run positive impact on output in the 1960s (over 3%), 1980s (over 1%) and 1990s (over 4% - Figure 10). The positive long-run impact on output during these decades is also present under *event case 1*, although with much larger magnitudes (Figure 11). Under consecutive currency collapses (*event case 2*), we find significant positive impact in the 1990s and 2000s (Figure 12).

The lack of robustness over time has interesting implications. A possibility is that the nature of the shocks, including their size and persistence has change over time, thus leading to different output dynamics in the presence of non-linearities. The evidence reported provides some support for this, although further analysis is required. Indeed, our results show that the size of currency collapses has increased over time as captured by *the magnitude of one-time events*. Specifically, on average one-time currency collapses became larger during the 1990s and 2000s, in both cases exceeding 60% versus an average of about 40% during previous decades (Figure 3, right-hand panels).

Another implication is that shifts of the relationship over time may reflect changes in the underlying conditions of the economies being considered i.e. the fundamentals of the economy have changed. This would in turn imply that the relative importance of the transmission channels has changed over the past four decades. Thus, for instance, changes in the degree of openness, degree of dollarisation, financial integration, or exchange rate pass-through, which are known to have changed, may have also altered the relative importance of transmission channels.

In general, we find no robust behaviour of output growth around the time of a currency collapse. This contrasts with Gupta et al (2007), who find a robust pattern over time. Several factors may explain this divergence of results. On the one hand, they identify currency crises on the basis of episodes identified by a number of different studies, to which they apply a majority rule. Although they claim that applying such rule windows out crises too close to each other, it appears that this might not be the case. Second, Gupta et al (2007) treat all crises episodes equally, independently of their persistence. Here, we have shown that one-time currency collapses induce output and exchange rate dynamics that differ from those associated with consecutive ones.

6.2 Regional dimension

Economic fundamentals may determine important differences in the patterns reported so far. Although it is beyond the scope of this paper to explore which underlying country-specific factors may shape these differences, it is possible to gain some insight of the role of economic fundamentals by exploring the robustness of our results across regions. The underlying assumption is that regional groupings capture to some degree common economic characteristics of the economies not present elsewhere.

Our results indicate show that, first, there are differences in *the magnitude of currency collapses across regions*. On the one hand, one-time collapses have been much larger in Africa (on average around 65%) and smaller in Asia (on average about 40%) ─ possibly

reflecting greater distortions or economic imbalances in Africa than in the Asia region. On the other hand, the size of the currency collapse for consecutive events varies considerably across regions. For example, consecutive currency collapses are smaller in magnitude in Africa than in Latin America.

Second, the econometric analysis by regions confirms that the currency collapse-output relationship varies by regions. In particular, we find evidence of growth slowdowns or recessions prior to or at the time of a currency collapse only in Asia and Latin America (Tables 12 and 13). While the evidence following the currency collapse is contractionary in Asia, but expansionary in Latin America and the Other region. However, possibly the most striking feature is that there appears to be *no association between growth and currency collapses in Africa*. Impulse response analysis on the other hand confirms that only in Asia does output fall significantly (about -2%) in the long run (Figure 13).[29]

These results have at least two important implications that complemented the result reported in the previous subsection, when we examine the stability of the relationship over time. On the one hand, it may suggest that the magnitude of shocks may vary across regions. On the other hand, that the transmission mechanisms involved in episodes of currency collapses varies across regions.

6.3 Exchange rate regimes

In section 4 it was argued that the frequency and magnitude of currency collapses could be related to the exchange rate regime in place. However, we showed that currency collapses was a frequent phenomena across all exchange rate regimes as classified by Reinhart and Rogoff (2004) and that the threshold for defining a currency collapse was fairly stable across exchange rate regimes.

The event case analysis across exchange rate regimes reveals some interesting features (Figures 7 and 8). First, currencies lose most of their value when they involve a peg (e.g. pegs or “free falling” regimes). Second, less flexible regimes (pegs, crawling pegs and managed floats) display higher growth rates after a currency collapse. However, this pattern tends to be more robust for one-time currency collapses. Finally, currency crises or hyper-inflationary economies (as captured by the “free falling” category) induce a severe output slowdown at the time of currency collapse. A phenomenon that is more severe if a second currency collapse occurs, i.e. persistent currency crashes.

The static regression analysis reveals the following: i) under less flexible regimes currency collapses occur once the economies have slowdown (Table 14); ii) when the episode is a one-time event, output growth falls relative to the control group one or two years prior to the currency collapse. This slowdown occurs independently of the exchange rate regime in place, but it becomes a recession under more flexible regimes (Table 15); iii) there appears to be some medium-term (after 3 years) growth gains when the currency collapse is persistent and the exchange rate regime is relatively rigid; finally, iv) output dynamics around the time of a currency collapse is not clearly related to the exchange rate regime in place. This is important as it indicates that the exchange rate regime by itself is not the main driver of output growth following a currency collapse. Possibly, the interactions of the exchange rate regime and other factors may be what matters for growth dynamics around these episodes (e.g. the collapse of a peg in the presence of currency mismatches).

[29] The results are qualitatively similar for *events 1 and 2*, except that impact is significantly positive for Africa (*event 1*) and Latin America (*event 2*).

7 Conclusions

This paper presents new empirical evidence to the literature that has grappled with the question of how currency collapses affect output. The relevance of answering this question has to do with two main issues: First, due to the theoretical ambiguity with various transmission mechanisms working in opposite directions, settling this question is an empirical exercise; and, second, existing empirical evidence so far has failed to provide conclusive evidence regarding the direction of this relationship.

The evidence reported relies on the largest data set assembled so far to study the currency collapse-output relationship. This has allowed us to reduce the possible criticisms associated with small samples or selection bias. In addition, and in contrast with existing studies, we recognise that the persistence of these episodes may matter, and that currency collapses may affect not just output growth but also its trend, an aspect that has been overlooked in the existing literature.

Using different and complementary methodologies, we find that currency collapses tend to be associated with a substantial slowdown in output growth in the short-run. Nonetheless, this decline often reverts at longer horizons. When the persistence of the event is explicitly taken into account, we find that stand alone episodes lead to positive gains in output trend that fully materialise in a five-year horizon, while successive currency crashes do not affect the trend level of output.

The evidence confirms that small cross-section or time samples do lead to different results. More precisely, we find that the impact of currency collapses have shifted over time in a non-uniform manner, which suggests that relevant transmission channels have changed over time. We also find that the effects of these episodes differ across regions. In this respect, a notorious result is that there is no clear association between these events and output growth in Africa. Thus growth dynamics in this region is possibly determined by fundamental growth factors, and currency collapses may be of second-order importance. Our results also indicate that the relationship is not clearly linked to the exchange rate regime in place at the time of the currency collapse. Overall, these results illustrate that studying the relationship between currency collapses and output is likely to be sensitive to the use of small samples, which can bias the results. In general these elements are indicative of the complexity surrounding the relationship under study.

Looking forward, our study opens important research questions, in particular, those that are necessary to explain the sensitivity of the results over time and across regions. For instance, questions that in our opinion would deserve attention in future research are: what is the relative importance of the different transmission channels involved in the currency collapse-output relationship? How has this relationship shifted over time? Or is it that the transmission channels have evolved? Finally, why would some mechanisms operate in some regions and not in others? We leave an answer to them for future research.

Appendix

A. Data

The paper uses data from 1960-2006 from the World Development indicators ─ WDI ─ of the World Bank (growth rates) and the International Monetary Fund's-International Financial Statistics ─ IMF-IFS ─ (the *monthly* average nominal exchange rate and the monthly consumer price index ─ CPI).

B. List of countries

For comparability purposes, we employ the same sample of countries as in Gupta, Mishra and Sahay (2007).[30]

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 (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, México*, Nicaragua, Panama*, Paraguay, Peru*, St. Vincent and the Grenadines, Trinidad and Tobago*, Uruguay*, Venezuela*.

Other Countries (13 countries, including the transition economies and the Middle East): Czech Republic*, Egypt*, Hungary*, Islamic Republic of Iran, Israel, Jordan*, Lebanon*, Malta, Oman, Romania*, Syrian Arab Republic, Turkey*, Yemen.

(Emerging market countries have been indicated by an asterisk.)

[30] Yugoslavia was dropped due to lack of data.

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Table 1

Currency collapses: stylised facts

	Definition 1		Definition 2		Definition 3	
	No. of episodes	**Threshold value**	**No. of episodes**	**Threshold value**	**No. of episodes**	**Threshold value**
Full sample	202	25.07	251	15.01	571	22.01
By decade						
1960s	17	27.45	26	15.27	39	22.06
1970s	23	25.31	33	18.45	62	23.12
1980s	72	25.50	78	15.34	214	22.52
1990s	75	25.07	78	15.10	205	22.01
2000s	15	26.14	36	15.01	51	22.02
Regions						
Africa	88	25.36	123	15.01	233	22.02
Asia	30	25.50	43	15.20	53	22.25
Latin America	66	25.07	66	15.27	219	22.01
Other	18	25.31	19	15.20	66	22.29
Exchange rate regime						
Peg	42	25.07	76	15.27	73	22.06
Crawling	30	25.15	48	15.01	74	22.01
Managed float	40	25.21	51	15.13	101	22.52
Flexible	4	28.28	6	18.45	19	22.02
Freely falling	68	30.53	41	19.04	255	22.70
Unclassified	2	35.67	2	16.01	8	24.19

For definitions see Section 3 and appendix.

Table 2

Currency collapses: stylised facts

	Event case 1		Event case 2		
	No. of episodes	**Threshold value**	**No. of episodes**	**Threshold value (1st devaluation)**	**Threshold value (2nd devaluation)**
Full sample	79	22.06	24	23.31	22.32
By decade					
1960s	6	22.06	3	23.31	23.95
1970s	12	23.12	6	23.40	30.16
1980s	24	23.04	3	29.69	42.32
1990s	32	22.29	6	23.67	22.32
2000s	5	26.14	6	23.81	24.75
Regions					
Africa	40	22.06	7	23.81	24.75
Asia	21	22.91	5	23.67	23.95
Latin America	12	23.12	10	23.31	22.32
Other	6	22.29	2	25.31	38.84
Exchange rate regime					
Peg	33	22.06	9	23.31	22.32
Crawling	14	22.29	2	35.38	42.32
Managed float	15	22.91	3	23.67	23.00
Flexible	1	42.64	1	23.81	24.75
Freely floating	5	31.94	4	29.69	31.51
Unclassified	2	24.19	1	59.28	45.66

For definitions see Section 3 and appendix.

Table 3

Annual growth performance and currency collapses

(Definition 3)

Conditioning event at T			**Output growth (g_t) dynamics following the conditioning event**			
			Growth dynamics		**Accelerating or decelerating growth**	
			$g_{T+1} > 0$	$g_{T+1} > 0$ $g_{T+2} > 0$	$g_T < g_{T+1}$	$g_T < g_{T+1} < g_{T+2}$
Output expansion and currency collapse	**Episodes**	398	335	296	187	68
	Conditional probability	0.70	0.84	0.74	0.47	0.17
	Median growth (%)	4.0	4.1 ; 4.6	4.1 - 4.7 - 4.7	3.2 ; 5.6	3.1 ; 4.6 ; 6.2
			$g_{T+1} < 0$	$g_{T+1} < 0$ $g_{T+2} < 0$	$g_T > g_{T+1}$	$g_T > g_{T+1} > g_{T+2}$
Output contraction and currency collapse	**Episodes**	173	65	29	38	9
	Conditional probability	0.30	0.37	0.17	0.22	0.05
	Median growth (%)	-3.0	-3.6 ; -4.0	-3.8 ; -4.6 ; -3.9	-1.6 ; -5.1	-2.7 ; -4.4 ; -6.9
			$g_{T+1} > 0$	$g_{T+1} > 0$ $g_{T+2} > 0$	$0 < g_{T+1} < g_{T+2}$	
Output contraction and currency collapse	**Episodes**	173	108	85	53	
	Conditional probability	0.30	0.62	0.49	0.30	
	Median growth (%)	-3.0	-2.8 ; 3.9	-2.6 ; 3.8 ; 5.1	-2.4 ; 2.9 ; 5.9	
Currency collapse as captured by *definition 3*. See section 3.						

Table 4

Likelihood of growth acceleration after a currency collapse

(Definition 3)

Conditioning event		**Output growth (g_t) dynamics following the conditioning event**		
		Accelerating output growth (g_t)		
		$0 < g_T$	$0 < g_T < g_{T+1}$	$0 < g_T < g_{T+1} < g_{T+2}$
Output expansion at T-1 and currency collapse at T	**Episodes (total 387)**	294	140	48
	Conditional probability	0.75	0.36	0.12
	Median growth (%)	4.1 ; 4.0	4.1 ; 3.4 ; 5.5	3.9 ; 3.2 ; 4.3 ; 5.8
Average output expansion between T-3 and T-1 and currency collapse at T	**Episodes (total 420)**	303	146	55
	Conditional probability	0.72	0.35	0.13
	Median growth (%)	3.7 ; 4.8	3.5 ; 3.2 ; 5.5	3.6 ; 3.1 ; 4.5 ; 6.1
		$0 < g_T$	$0 < g_T < g_{T+1}$	$0 < g_T < g_{T+1} < g_{T+2}$
Output contraction at T-1 and currency collapse at T	**Episodes (total 178)**	98	45	19
	Conditional probability	0.55	0.25	0.10
	Median growth (%)	-2.5 ; 3.8	-1.8 ; 1.8 ; 5.8	-1.3 ; 1.9 ; 4.8 ; 6.8
Average output contraction between T-3 and T-1 and currency collapse at T	**Episodes (total 128)**	75	31	11
	Conditional probability	0.58	0.26	0.08
	Median growth (%)	-1.8 ; 4.0	-2.2 ; 3.3 ; 5.9	-2.4 ; 1.5 ; 5.3 ; 6.9
Currency collapse as captured by *definition 3*. See section 3.				

Table 5

Growth acceleration after a one-time currency collapse

(Event case 1)

Conditioning event		**Output growth (g_t) dynamics following the conditioning event**		
		Accelerating output growth (g_t)		
		$0 < g_T$	$0 < g_T < g_{T+1}$	$0 < g_T < g_{T+1} < g_{T+2}$
Output expansion at T-1 and currency collapse at T	**Episodes (total 57)**	45	26	11
	Conditional probability	0.78	0.45	0.19
	Median growth (%)	3.9 ; 5.1	3.9 ; 3.9 ; 6.0	3.8 ; 3.8 ; 5.4 ; 9.1
Average output expansion between T-3 and T-1 and currency collapse at T	**Episodes (total 65)**	49	31	12
	Conditional probability	0.75	0.47	0.18
	Median growth (%)	4.3 ; 4.3	4.2 ; 3.2 ; 6.0	4.6 ; 3.5 ; 5.0 ; 7.5
		$0 < g_T$	$0 < g_T < g_{T+1}$	$0 < g_T < g_{T+1} < g_{T+2}$
Output contraction at T-1 and currency collapse at T	**Episodes (total 22)**	13	9	3
	Conditional probability	0.59	0.41	0.14
	Median growth (%)	-2.2 ; 1.3	-2.2 ; 0.9 ; 6.2	-0.8 ; 0.8 ; 5.3 ; 7.7
Average output contraction between T-3 and T-1 and currency collapse at T	**Episodes (total 13)**	8	4	2
	Conditional probability	0.61	0.31	0.15
	Median growth (%)	-3.4 ; 5.0	-1.2 ; 3.0 ; 7.2	-4.7 ; 0.9 ; 6.2 ; 11.7
Currency collapse as captured by Event Case 1.				

Table 6

Growth acceleration after a persistent currency collapse

(Event case 2)

Conditioning event		**Output growth (g_t) dynamics following the conditioning event**		
		Accelerating output growth		
		$0 < g_T$	$0 < g_T < g_{T+1}$	$0 < g_T < g_{T+1} < g_{T+2}$
Output expansion at T-1 and currency collapse at T and T+1	**Episodes (total 20)**	16	5	1
	Conditional probability	0.80	0.25	0.05
	Median growth (%)	3.9 ; 4.1	1.6 ; 3.6 ; 7.5	4.4 ; 3.4 ; 9.0 ; 9.7
Average output expansion between T-3 and T-1 and currency collapse at T and T+1	**Episodes (total 27)**	17	5	2
	Conditional probability	0.63	0.18	0.07
	Median growth (%)	2.9 ; 4.6	2.4 ; 3.4 ; 7.5	6.7 ; 2.7 ; 9.1; 10.2
		$0 < g_T$	$0 < g_T < g_{T+1}$	$0 < g_T < g_{T+1} < g_{T+2}$
Output contraction at T-1 and currency collapse at T and T+1	**Episodes (total 15)**	6	2	1
	Conditional probability	0.40	0.13	0.06
	Median growth (%)	-3.0 ; 6.7	-6.4 ; 2.0 ; 10.6	-1.9 ; 2.0 ; 9.3 ; 10.7
Average output contraction between T-3 and T-1 and currency collapse at T and T+1	**Episodes (total 8)**	5	2	0
	Conditional probability	0.62	0.25	0
	Median growth (%)	-4.4 ; 5.3	-7.1 ; 3.8 ; 13.7	-
Currency collapse as captured by Event Case 2. See section 3.				

Table 7

Output growth effects of currency collapses

(by definitions)

Dependent variable: output growth	Definition 1	Definition 2	Definition 3
Collapse $_{T+3}$	-0.36	-0.06	-0.43
	[0.42]	[0.40]	[0.34]
Collapse $_{T+2}$	-0.7	0.01	-0.39
	[0.43]	[0.36]	[0.41]
Collapse $_{T+1}$	-1.82***	-1.51***	-1.27***
	[0.55]	[0.49]	[0.35]
Collapse $_{T}$	-2.57***	-1.81***	-1.43***
	[0.47]	[0.38]	[0.40]
Collapse $_{T-1}$	-0.28	-0.24	0.47
	[0.37]	[0.41]	[0.31]
Collapse $_{T-2}$	-0.07	-0.17	0.54*
	[0.36]	[0.37]	[0.28]
Collapse $_{T-3}$	0.47	-0.04	0.72**
	[0.52]	[0.45]	[0.35]
Inflation	-0.00**	-0.00**	-0.00*
	[0.00]	[0.00]	[0.00]
Constant	5.59***	5.54***	5.55***
	[0.67]	[0.69]	[0.66]
Observations	3138	3138	3138
Countries	97	97	97

Note: Two-way fixed effects. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3.

Table 8

Output growth effects of currency collapses

(by event cases)

Dependent variable: output growth	Event case 1	Event case 2
Collapse $_{T+3}$	-0.46	-0.98
	[0.73]	[1.06]
Collapse $_{T+2}$	-1.77**	-3.83
	[0.73]	[2.41]
Collapse $_{T+1}$ [a]	-2.44***	-2.75
	[0.63]	[1.79]
Collapse $_{T}$ [b]	-2.12**	-2.14
	[0.92]	[1.33]
Collapse $_{T-1}$	0.43	-1.16
	[0.59]	[1.07]
Collapse $_{T-2}$	0.39	1.07
	[0.69]	[0.97]
Collapse $_{T-3}$	0.37	0.02
	[1.26]	[1.02]
Inflation	-0.00**	-0.00**
	[0.00]	[0.00]
Constant	5.42***	5.46***
	[0.67]	[0.67]
Observations	3138	3138
Countries	97	97

[a] For event case 2 this corresponds to the time of the first currency collapse. [b] For event case 2 this corresponds to the time of the second currency collapse.

Note: Two-way fixed effects. Currency collapse definition 3 employed. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3.

Table 9

Decomposition of the impact of currency collapses on output trend

(Three years after the collapse)

	Maximum potential loss had no currency collapse occurred at T	**Gain associated with currency collapse at T**	**Net permanent net loss**
Definition 1	-12.3	7.7	-4.3
Definition 2	-8.7	5.3	-3.2
Definition 3	-6.9	4.9	-1.9
Event Case 1	-12.9	6.3	-6.3
Note: All results based on two-way fixed effects panel estimates reported in Table 7 and 8.			

Table 10

Output growth effects of currency collapses

(by decade and definition 3)

VARIABLES	1960s	1970s	1980s	1990s	2000s
Collapse $_{T+3}$	0.24	-0.89	0.4	-0.26	0.62
	[0.87]	[1.35]	[0.55]	[0.62]	[1.43]
Collapse $_{T+2}$	1.11	-1.39	-0.48	-0.03	-1.52
	[0.96]	[0.87]	[0.41]	[1.03]	[1.43]
Collapse $_{T+1}$ [a]	-0.99	-0.18	-0.44	-1.29*	-1.82**
	[1.13]	[1.05]	[0.49]	[0.68]	[0.84]
Collapse $_{T}$ [b]	0.39	-0.23	-0.73	-0.77	-1.63**
	[0.85]	[0.82]	[0.60]	[0.77]	[0.67]
Collapse $_{T-1}$	1.33**	-1.53	0.02	0.78*	-0.02
	[0.54]	[1.11]	[0.55]	[0.46]	[0.84]
Collapse $_{T-2}$	0.37	2.68***	-0.07	0.26	-1.82*
	[1.45]	[0.98]	[0.53]	[0.46]	[0.93]
Collapse $_{T-3}$	0.81	-0.7	1.14**	1.27	-0.68
	[0.93]	[0.78]	[0.51]	[0.80]	[0.55]
inflation	-0.00**	-0.02***	-0.00*	0	-0.01**
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Constant	3.65***	7.24***	3.29***	3.82***	4.80***
	[0.64]	[0.78]	[0.74]	[0.68]	[0.37]
Observations	415	660	850	981	401
Countries	57	70	95	101	101

Note: Two-way fixed effects. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3. Grey areas indicate the period(s) in which currency collapses occurs.

Table 11

Output growth effects of currency collapses

(by decade and event cases)

Dependent variable: output growth	Event case 1					Event case 2				
	1960s	1970s	1980s	1990s	2000s	1960s	1970s	1980s	1990s	2000s
Collapse $_{T+3}$	0.44	1.27	0.72	-1.94*	-4.79	2.58***	-2.28	1.62	-0.12	-1.13
	[1.08]	[1.61]	[1.65]	[1.13]	[3.04]	[0.63]	[1.82]	[1.22]	[1.67]	[2.63]
Collapse $_{T+2}$	2.22	0.00	-2.70*	-3.89**	-8.43***	-6.77***	-1.4	-0.63	-10.84	-2.53
	[1.75]	[1.65]	[1.36]	[1.68]	[2.51]	[0.81]	[2.19]	[1.84]	[7.65]	[2.01]
Collapse $_{T+1}$ [a]	2.34**	0.85	-4.86**	-3.82***	-3.63	-3.83***	-0.37	1.12	0.73	-5.96**
	[0.98]	[1.57]	[2.27]	[1.16]	[3.39]	[0.84]	[2.84]	[2.05]	[5.56]	[2.63]
Collapse $_{T}$ [b]	2.42	1.03	-2.68	-3.20**	-4.84	2.65*	-1.39	0.67	-0.73	-2.8
	[1.66]	[1.02]	[3.45]	[1.27]	[3.67]	[1.42]	[1.17]	[2.28]	[4.15]	[2.68]
Collapse $_{T-1}$	3.72***	-1.34	0.55	-0.4	0.49	-0.88	-0.25	-2.74*	2.79	-3.42
	[0.70]	[1.72]	[2.82]	[0.76]	[2.09]	[0.87]	[2.37]	[1.64]	[2.66]	[2.14]
Collapse $_{T-2}$	4.16	3.88***	0.49	-0.51	-2.21	1.76*	2.3	0.04	3.83**	-1.87**
	[4.36]	[1.39]	[1.71]	[1.45]	[1.65]	[1.03]	[1.60]	[2.02]	[1.74]	[0.80]
Collapse $_{T-3}$	0.33	-0.21	3.12	1.46	-2.32**	0	-0.58	2.89*	3.77	-1.66
	[0.94]	[1.17]	[2.00]	[3.39]	[1.09]	[0.00]	[1.03]	[1.72]	[2.87]	[1.35]
Inflation	0.00	-0.02***	-0.00**	0.00	-0.01***	-0.00*	-0.02***	-0.00*	0.00	-0.01***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Constant	3.60***	7.07***	3.24***	3.82***	4.53***	3.75***	7.18***	3.28***	3.21***	4.60***
	[0.65]	[0.77]	[0.76]	[0.57]	[0.34]	[0.63]	[0.77]	[0.74]	[0.53]	[0.37]
Observations	415	658	850	981	401	415	660	850	981	401
Countries	57	69	95	101	101	57	70	95	101	101

[a] For event case 2 this corresponds to the time of the first currency collapse. [b] For event case 2 this corresponds to the time of the second currency collapse.

Note: Two-way fixed effects. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3. Grey areas indicate the period(s) in which currency collapses occurs.

Table 12

Output growth effects of currency collapses

(by region and definition 3)

Dependent variable: output growth	Africa	Asia	Latin America	Other
Collapse $_{T+3}$	-0.42	0.24	-0.19	-1.2
	[0.55]	[0.57]	[0.45]	[2.19]
Collapse $_{T+2}$	-0.9	-0.06	-0.2	-0.12
	[0.86]	[1.11]	[0.40]	[1.32]
Collapse $_{T+1}$ [a]	-1.04	-1.62**	-0.83*	-0.38
	[0.68]	[0.75]	[0.43]	[1.31]
Collapse $_{T}$ [b]	0.69	-2.31**	-2.22***	0.99
	[0.67]	[0.83]	[0.51]	[1.19]
Collapse $_{T-1}$	0.23	-0.55	-0.08	-0.6
	[0.46]	[0.76]	[0.43]	[0.81]
Collapse $_{T-2}$	0.03	-1.13**	1.19**	-0.37
	[0.59]	[0.54]	[0.48]	[1.18]
Collapse $_{T-3}$	0.67	0.21	0.53	4.26**
	[0.62]	[0.58]	[0.41]	[1.51]
inflation	0	-0.00*	-0.00***	-0.03**
	[0.00]	[0.00]	[0.00]	[0.01]
Constant	4.19***	3.24**	3.18**	5.96
	[1.31]	[1.48]	[1.19]	[3.81]
Observations	1326	619	1003	359
Countries	45	19	26	13

Note: Two-way fixed effects. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3.

Table 13

Output growth effects of currency collapses

(by region and event cases)

Dependent variable: output growth	Event case1				Event case 2			
	Africa	Asia	Latin America	Other	Africa	Asia	Latin America	Other
Collapse $_{T+3}$	0.25	0.31	-2.69**	2.03**	-2.57*	1.7	-1.19	4.24**
	[1.21]	[0.52]	[1.11]	[0.77]	[1.37]	[1.50]	[0.96]	[1.48]
Collapse $_{T+2}$	-3.48**	-1.07	-3.54***	-0.3	-6.77	-3.45**	-0.54	-0.05
	[1.62]	[1.39]	[1.02]	[3.35]	[4.30]	[1.42]	[0.95]	[0.91]
Collapse $_{T+1}$ [a]	-1.55	-1.97	-3.12**	-1.24	2.81	-4.45***	-4.71***	-0.07
	[1.28]	[1.24]	[1.45]	[2.53]	[2.77]	[1.40]	[1.47]	[0.86]
Collapse $_{T}$ [b]	0.83	-2.2	-3.99**	0.58	2.03	-5.85	-4.35***	2.21
	[1.29]	[1.28]	[1.64]	[3.10]	[1.47]	[4.10]	[1.36]	[1.26]
Collapse $_{T-1}$	0.53	0.59	-1.38	-0.17	-1.35	-5.04***	0.09	1.43
	[1.03]	[0.99]	[1.25]	[3.57]	[1.25]	[1.38]	[1.96]	[2.99]
Collapse $_{T-2}$	0.38	-0.41	1.42	-1.4	0.25	-0.33	3.13***	4.90***
	[1.63]	[1.08]	[2.00]	[1.99]	[1.94]	[0.80]	[1.02]	[1.22]
Collapse $_{T-3}$	-0.13	0.49	-0.09	5.54**	2.51	-1.61**	2.51	2.17
	[3.04]	[1.10]	[0.78]	[2.31]	[1.97]	[0.67]	[1.51]	[1.36]
inflation	0	-0.00*	-0.00***	-0.02	-0.00**	-0.00**	-0.00***	-0.02*
	[0.00]	[0.00]	[0.00]	[0.01]	[0.00]	[0.00]	[0.00]	[0.01]
Constant	3.22***	3.10**	3.25***	5.87	5.09***	2.85*	3.17**	5.98
	[1.17]	[1.34]	[1.15]	[3.73]	[1.60]	[1.55]	[1.18]	[3.46]
Observations	1326	619	1001	359	1326	619	1003	359
Countries	45	19	26	13	45	19	26	13

[a] For event case 2 this corresponds to the time of the first currency collapse. [b] For event case 2 this corresponds to the time of the second currency collapse.

Note: Two-way fixed effects. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3.

Table 14

Output growth effects of currency collapses

(by exchange rate regimes and event cases)

Dependent variable: output growth	Peg	Crawling peg	Managed float	Freely floating	Free falling	Unclassified
Collapse $_{T+3}$	-1.08*	0.35	-0.46	-1.08*	-1.51	-1
	[0.58]	[0.57]	[0.54]	[0.59]	[0.98]	[0.71]
Collapse $_{T+2}$	-1.39	-0.64	-0.29	-2.14	-1.04	-2.34
	[1.04]	[1.43]	[0.88]	[2.22]	[1.44]	[2.63]
Collapse $_{T+1}$ [a]	-2.45***	-2.02***	-0.91*	-1.61	-1.12	-2.03*
	[0.64]	[0.69]	[0.53]	[1.05]	[0.77]	[1.17]
Collapse $_{T}$ [b]	0.79	-0.04	-0.08	0.36	0.56	1.17
	[0.86]	[0.65]	[0.65]	[1.03]	[0.86]	[1.29]
Collapse $_{T-1}$	-0.25	1.42**	-0.05	0.42	-0.1	0.9
	[0.51]	[0.67]	[0.55]	[1.18]	[0.85]	[1.08]
Collapse $_{T-2}$	-0.07	0.2	0.33	-0.81	0.65	-0.48
	[0.68]	[0.59]	[0.55]	[1.14]	[0.75]	[1.22]
Collapse $_{T-3}$	1.03	-0.07	0.34	-1.89	0.12	-1.55
	[0.85]	[0.72]	[0.65]	[1.71]	[1.13]	[1.98]
Inflation	0.00	-0.01***	-0.01**	-0.01**	0.00	-0.01
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Constant	3.94***	2.84*	3.52**	2.74	1.74	1.55
	[1.08]	[1.49]	[1.61]	[2.60]	[1.80]	[2.56]
Observations	1586	1070	990	433	683	435
Countries	87	72	73	33	59	35

[a] For event case 2 this corresponds to the time of the first currency collapse. [b] For event case 2 this corresponds to the time of the second currency collapse.

Note: Two-way fixed effects. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3. Grey areas indicate the period(s) in which currency collapses occurs.

Table 15

Output growth effects of currency collapses

(by exchange rate regimes and event cases)

Dependent variable: output growth	Event case 1						Event case 2					
	Peg	Crawling peg	Managed float	Freely floating	Free falling	Unclassified	Peg	Crawling peg	Managed float	Freely floating	Free falling	Unclassified
Collapse $_{T+3}$	-1.22	-0.53	-1.41	-2.67*	-2.23*	-2.65	-2.75**	-3.16	0.32	-6.67	-10.92***	-7.61**
	[0.96]	[1.05]	[1.00]	[1.48]	[1.22]	[1.67]	[1.24]	[1.96]	[3.28]	[5.48]	[2.18]	[3.69]
Collapse $_{T+2}$	-3.07***	-4.78**	-2.78*	-5.41***	-5.03***	-4.86***	-6.18	-10.57	-6.39	-25.71	-27.53	-31.69**
	[0.99]	[1.93]	[1.47]	[1.72]	[1.87]	[1.71]	[4.00]	[7.18]	[7.79]	[19.91]	[18.69]	[15.54]
Collapse $_{T+1}$ [a]	-3.82***	-3.12***	-3.39***	-5.36***	-5.11***	-4.91***	0.97	-0.79	5.23	11.01	9.94	26.53***
	[1.26]	[1.17]	[1.21]	[1.70]	[1.64]	[1.69]	[2.40]	[5.34]	[5.32]	[7.76]	[6.89]	[5.49]
Collapse $_{T}$ [b]	-1.01	-2.68*	-2.17	-3.95	-2.32	-3.3	1.43	2.62	1.36	4.41*	1.62	10.01***
	[1.14]	[1.35]	[1.63]	[2.61]	[1.98]	[2.38]	[1.13]	[2.11]	[3.90]	[2.30]	[4.23]	[3.16]
Collapse $_{T-1}$	-0.1	-0.52	-0.74	-0.62	-0.64	-0.37	-1.08	1.66	4.55**	1.92	4.92	8.42***
	[1.01]	[1.28]	[1.08]	[2.38]	[2.27]	[2.52]	[1.21]	[2.83]	[2.15]	[3.33]	[3.20]	[1.57]
Collapse $_{T-2}$	0.75	-0.92	-1.31	-3.73	-2.66	-3.7	1.1	3.16**	3.42**	2.58	0.53	4.97***
	[1.43]	[2.23]	[1.51]	[3.33]	[3.18]	[3.19]	[1.60]	[1.22]	[1.44]	[2.56]	[3.26]	[1.65]
Collapse $_{T-3}$	-0.33	-2.25	-0.78	-5.71	-6.47	-6.53	4.07***	2.56*	1.40	1.08	-2.69	1.15
	[2.58]	[3.73]	[3.01]	[7.51]	[6.79]	[7.51]	[1.44]	[1.30]	[1.07]	[1.39]	[2.45]	[1.82]
Inflation	0.00	-0.02***	-0.01*	-0.02***	0.00	-0.01***	0.00	-0.02***	-0.01**	-0.02***	-0.00*	-0.02***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Constant	2.76***	3.18**	3.55**	2.41	1.07	1.27	3.79***	2.87*	3.40**	2.01	0.36	0.97
	[0.98]	[1.49]	[1.51]	[2.42]	[1.56]	[2.34]	[1.35]	[1.49]	[1.58]	[2.70]	[1.75]	[2.72]
Observations	1584	1070	990	433	683	435	1586	1070	990	433	683	435
Countries	87	72	73	33	59	35	87	72	73	33	59	35

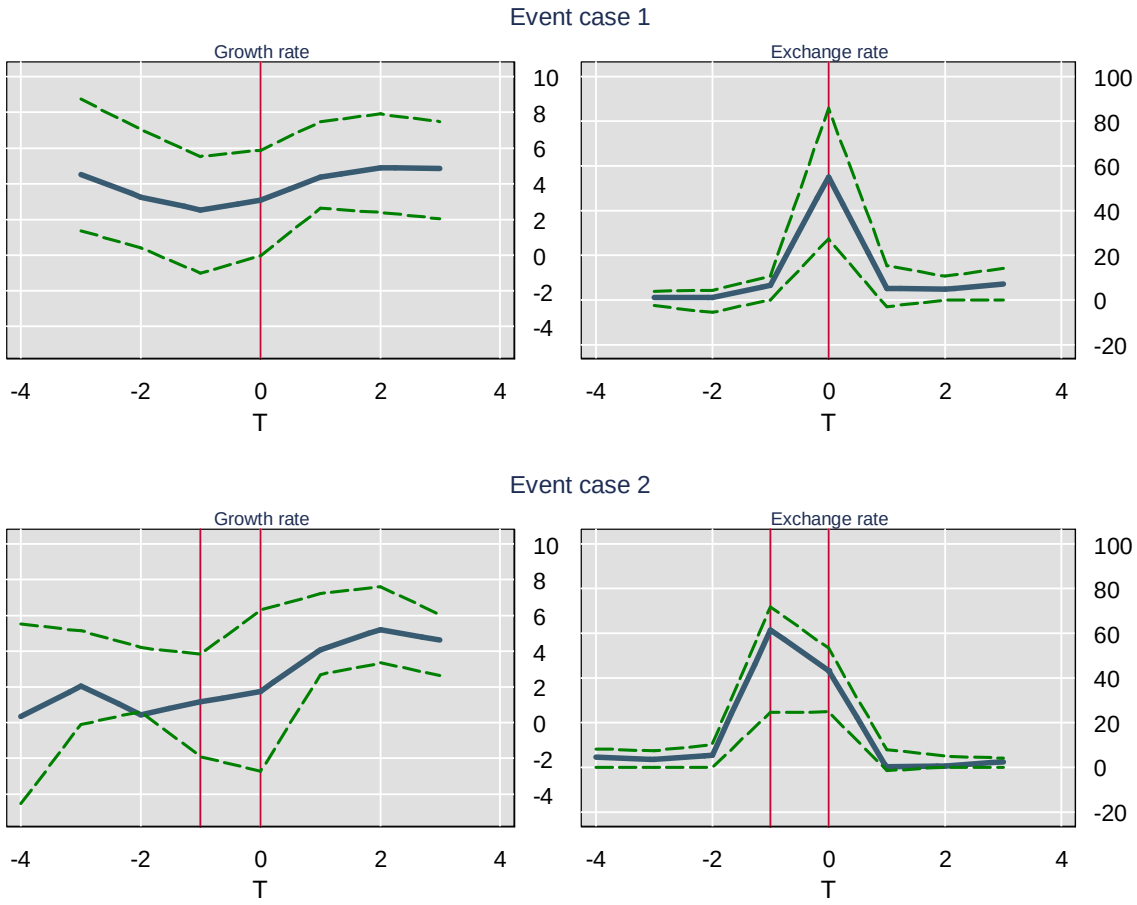
[a] For event case 2 this corresponds to the time of the first currency collapse. [b] For event case 2 this corresponds to the time of the second currency collapse.

Note: Two-way fixed effects. Robust standard errors in brackets. Significance levels: *** p<0.01, ** p<0.05, * p<0.1. For definitions, see section 3. Grey areas indicate the period(s) in which currency collapses occurs.

Figure 1

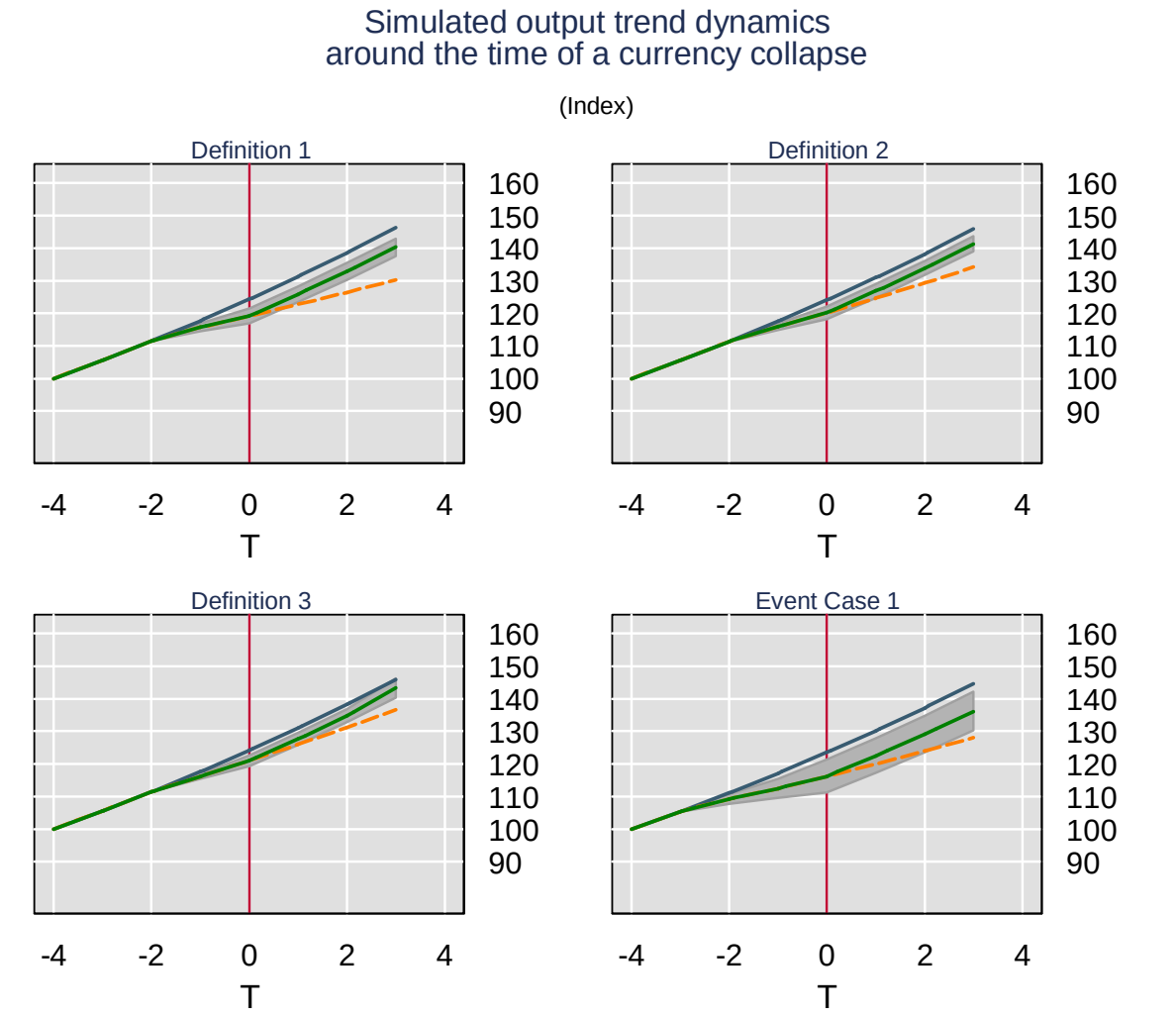
Output growth and exchange rate dynamics around the time of a currency collapse

(changes in percentage points)



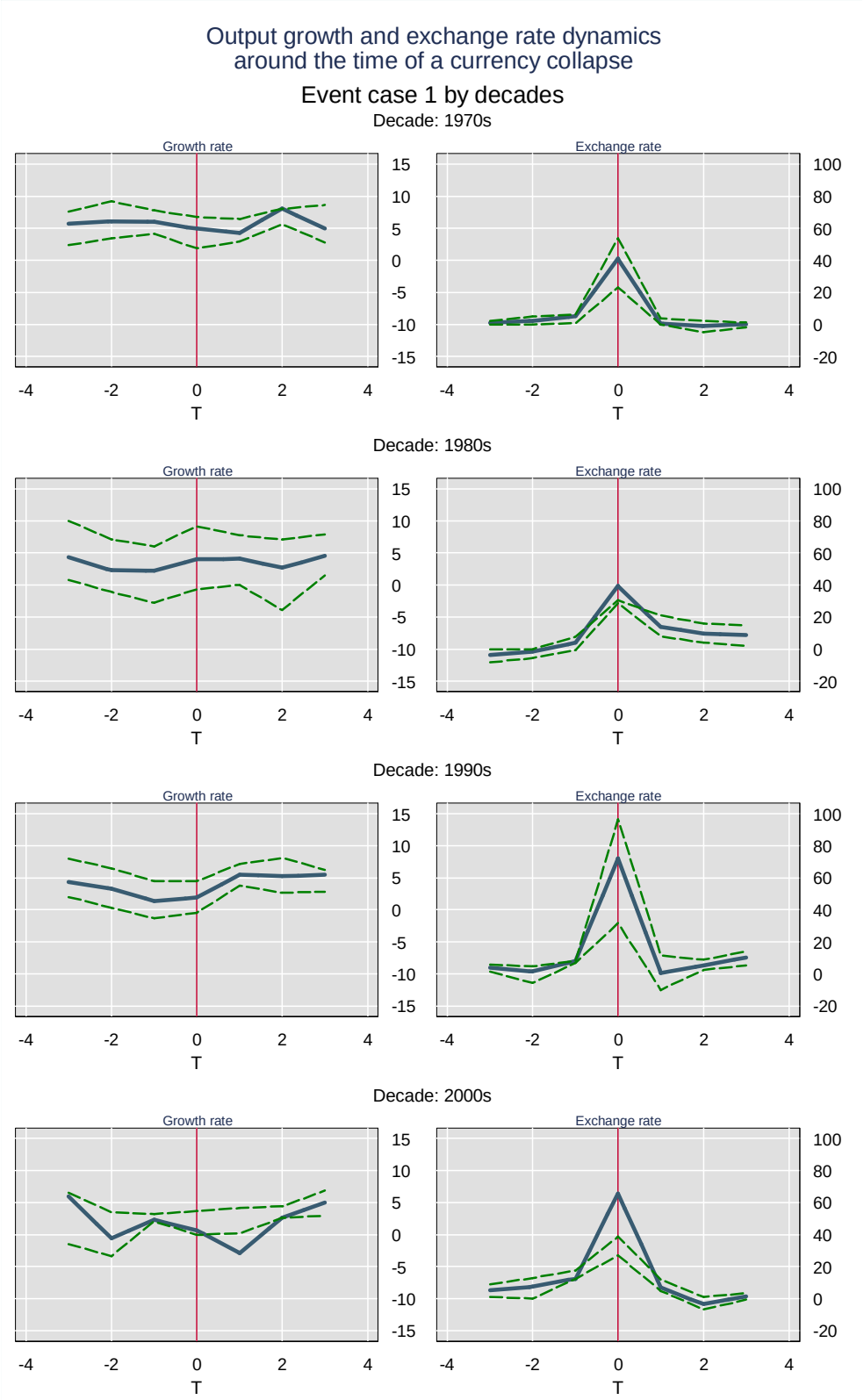
Event Case 1= currency collapse at time T and no collapse around a three-year window.
Event case 2= currency collapse at period T and T-1 and no collapse around a three-year window.
Note: The continuous line represents the sample average,while the dashed line represent the 25th and 75th percentiles.

Figure 2



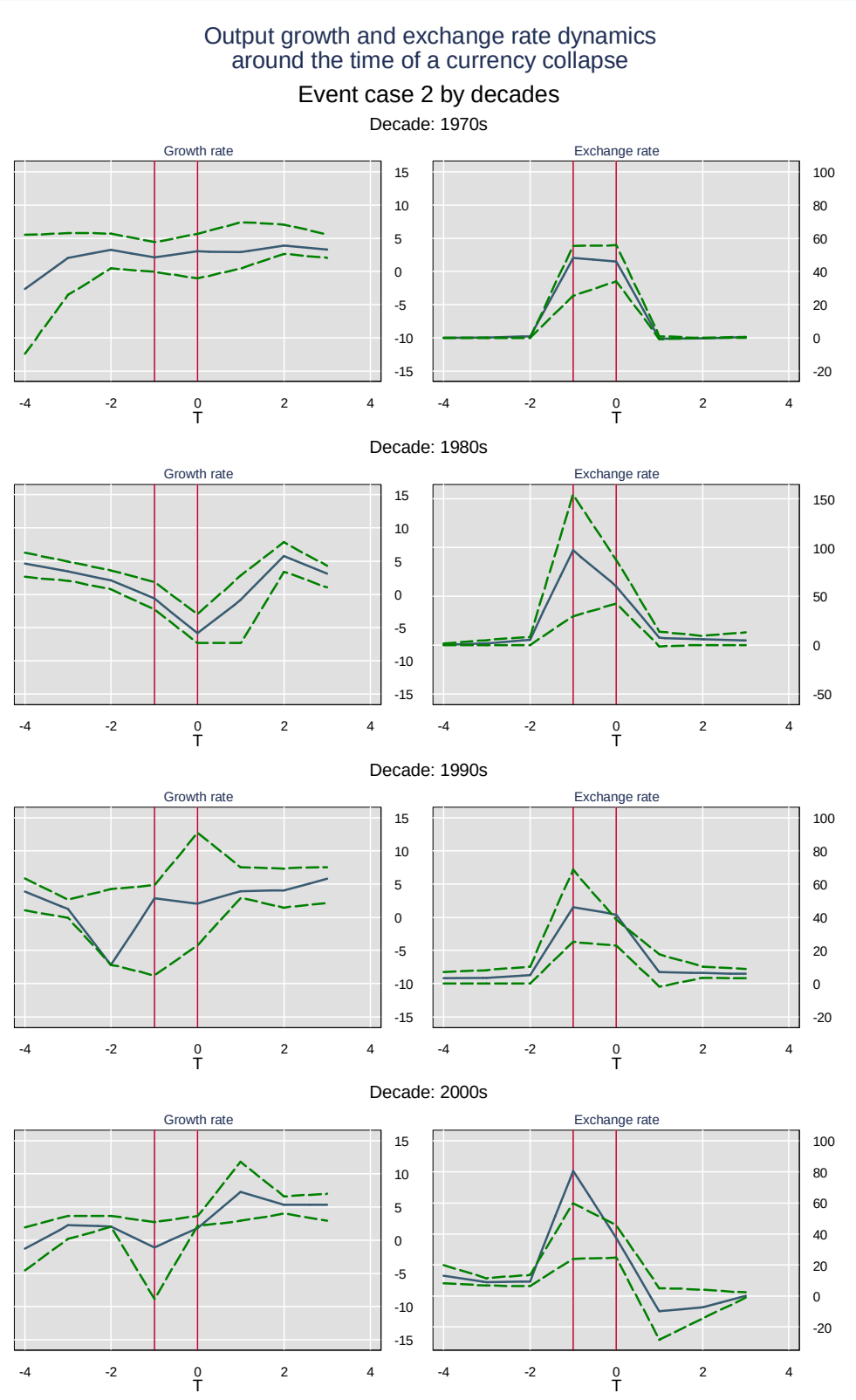
Blue line: Output trend for the control group ie. No currency collapse.
Green line: Output trend for countries that experience a currency collapse at T.
Shaded area: 95% confidence interval.
Orange line: Output trend that would have prevailed had there been no currency collapse at T.
Note: All results based on two-way fixed effects panel estimates reported in Table 7 and 8.

Figure 3



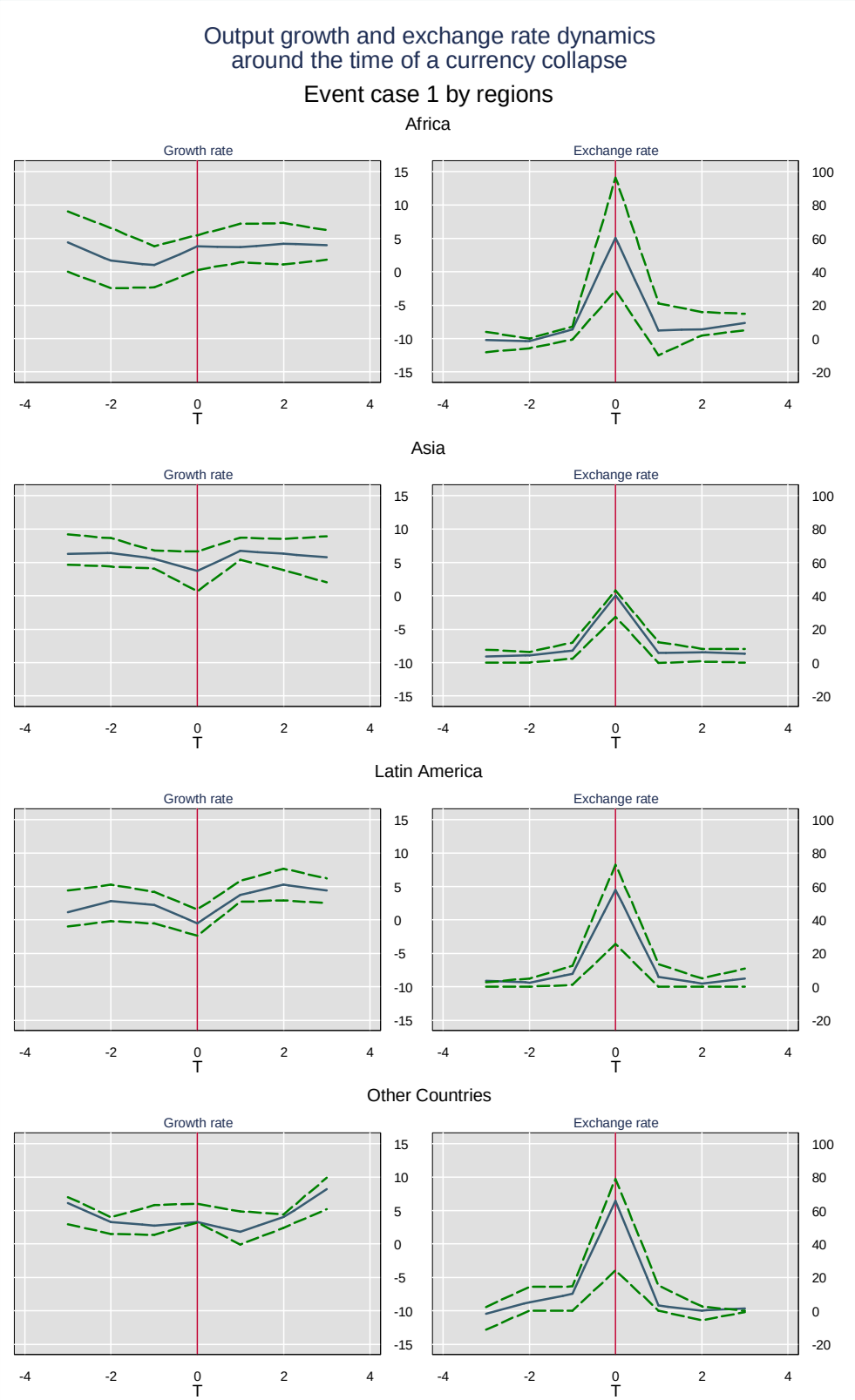
Event Case 1= currency collapse at time T and no collapse around a three-year window.
Note: The continuous line represents the sample average,while the dashed line represent the 25th and 75th percentiles.

Figure 4



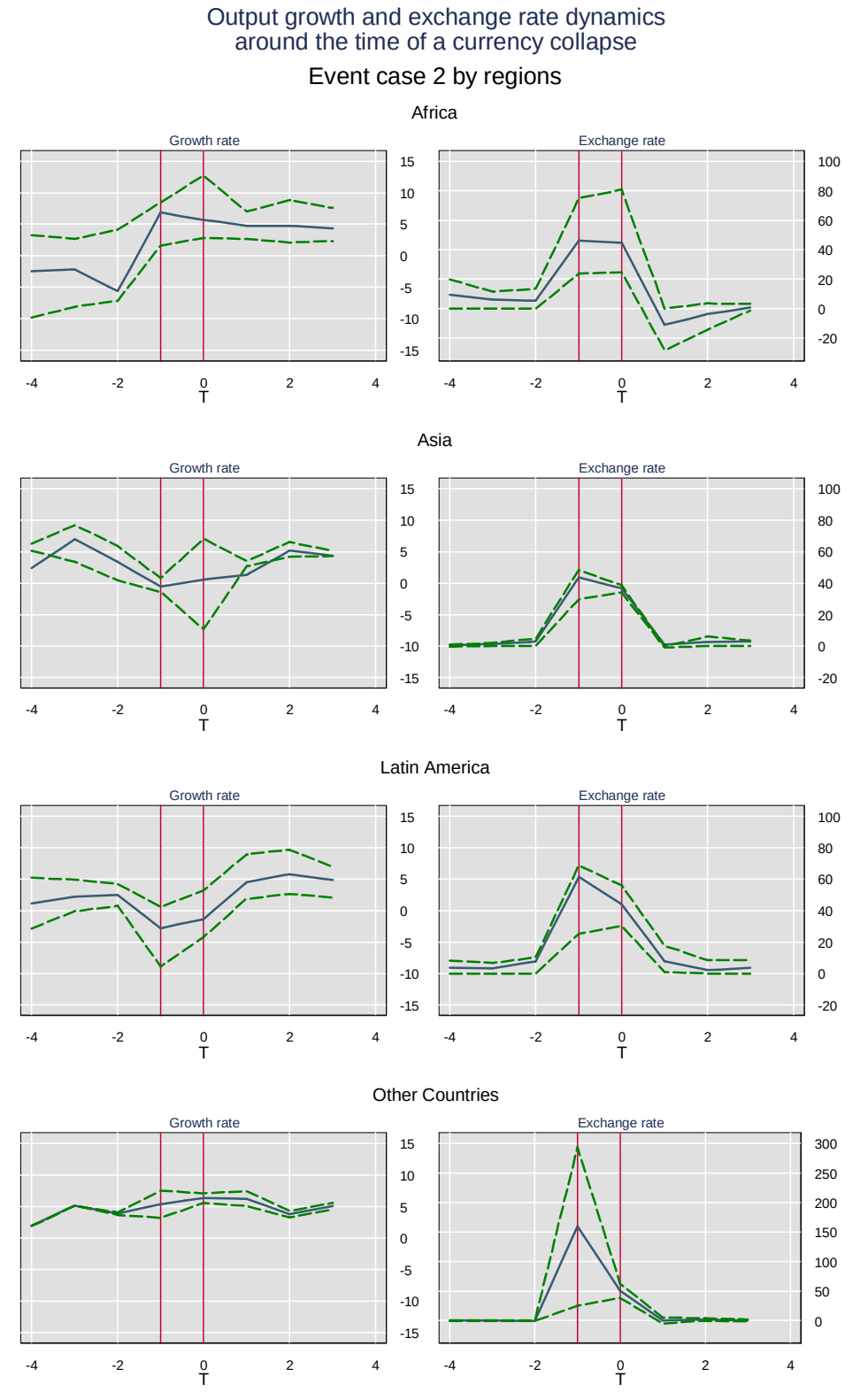
Event case 2= currency collapse at period T and T-1 and no collapse around a three-year window.
Note: The continuous line represents the sample average,while the dashed line represent the 25th and 75th percentiles.

Figure 5



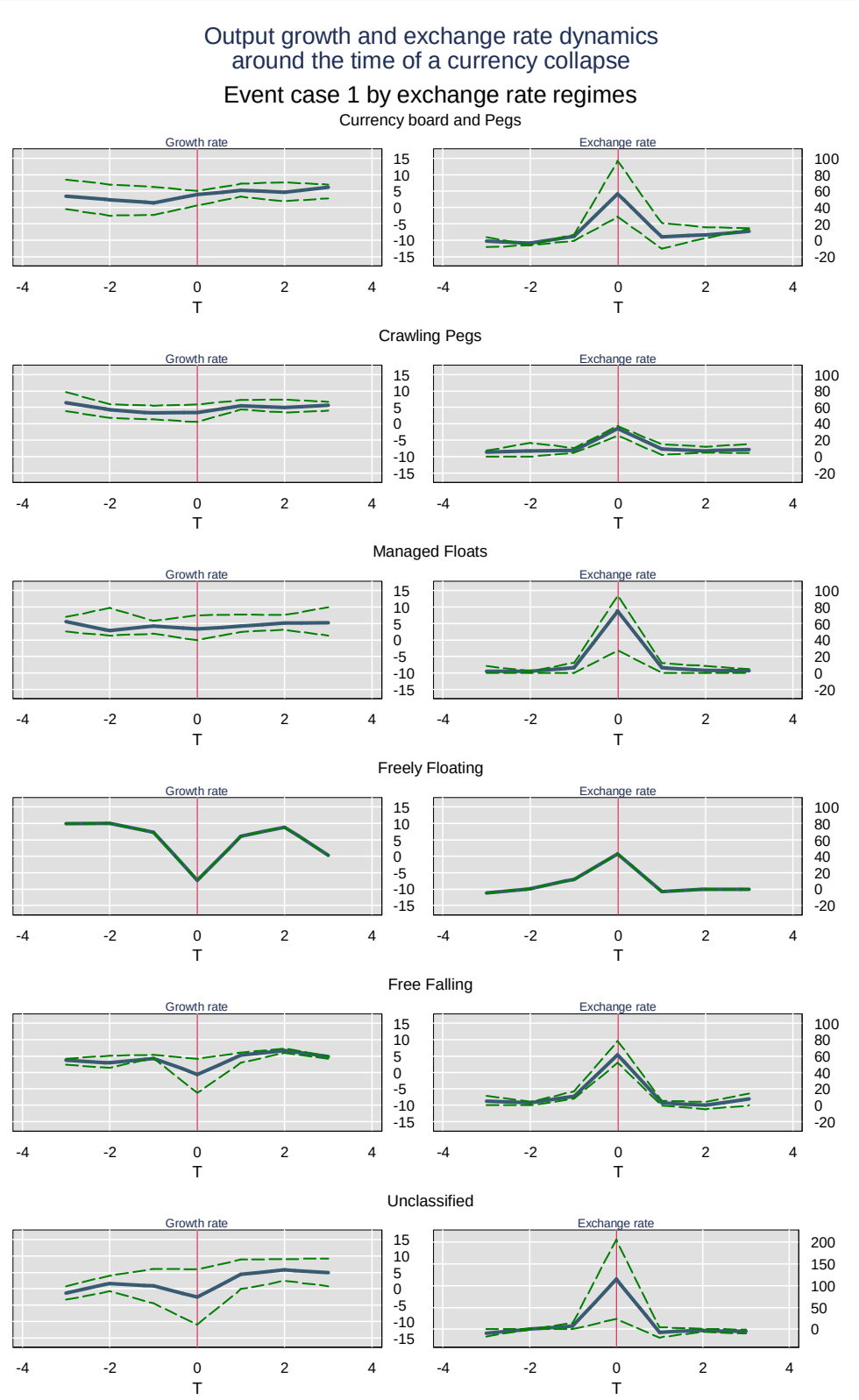
Event case 1= currency collapse at period T and no collapse around a three-year window.
Note: The continuous line represents the sample average,while the dashed line represent the 25th and 75th percentiles.

Figure 6



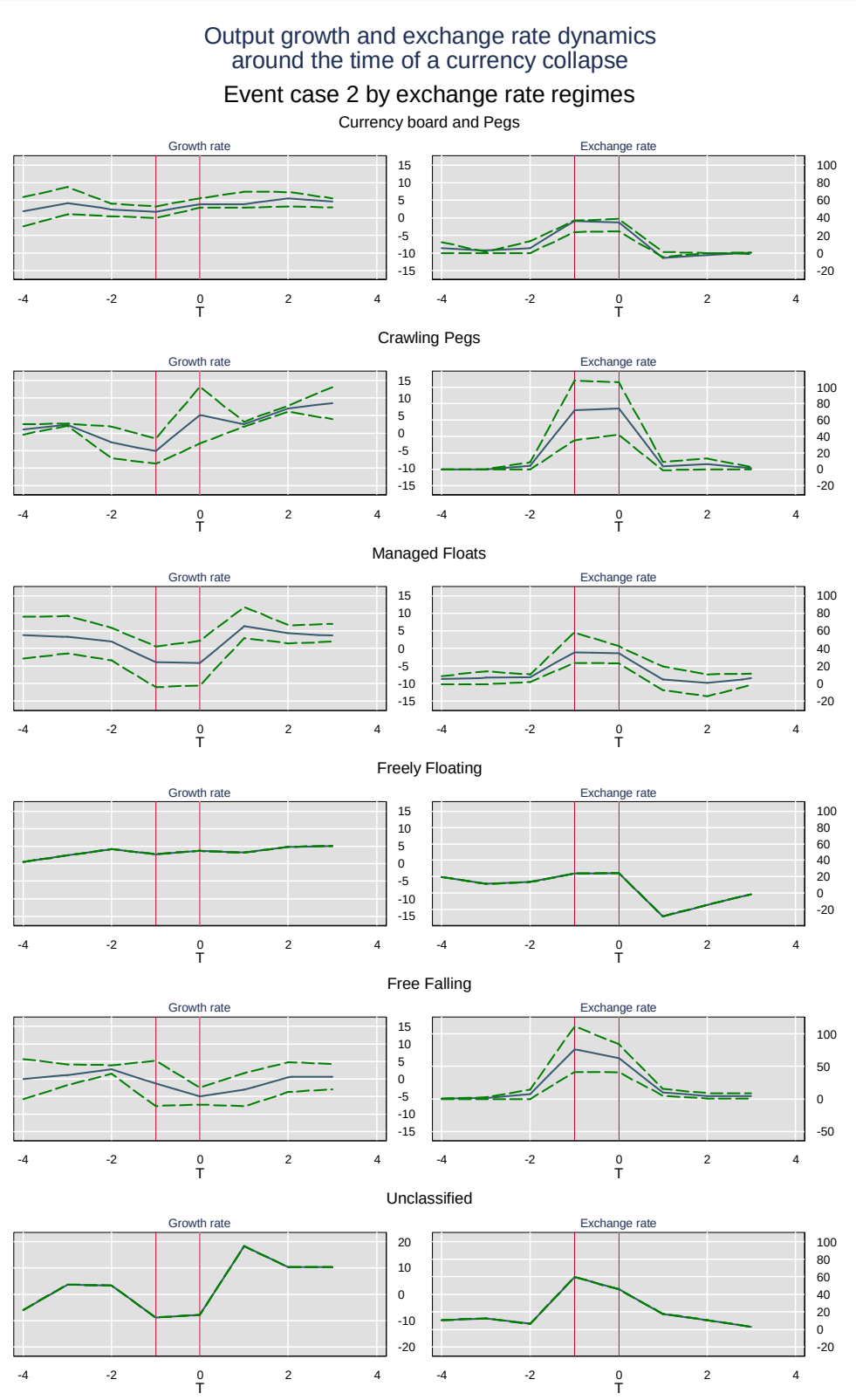
Event case 2= currency collapse at period T and T-1 and no collapse around a three-year window.
Note: The continuous line represents the sample average,while the dashed line represent the 25th and 75th percentiles.

Figure 7



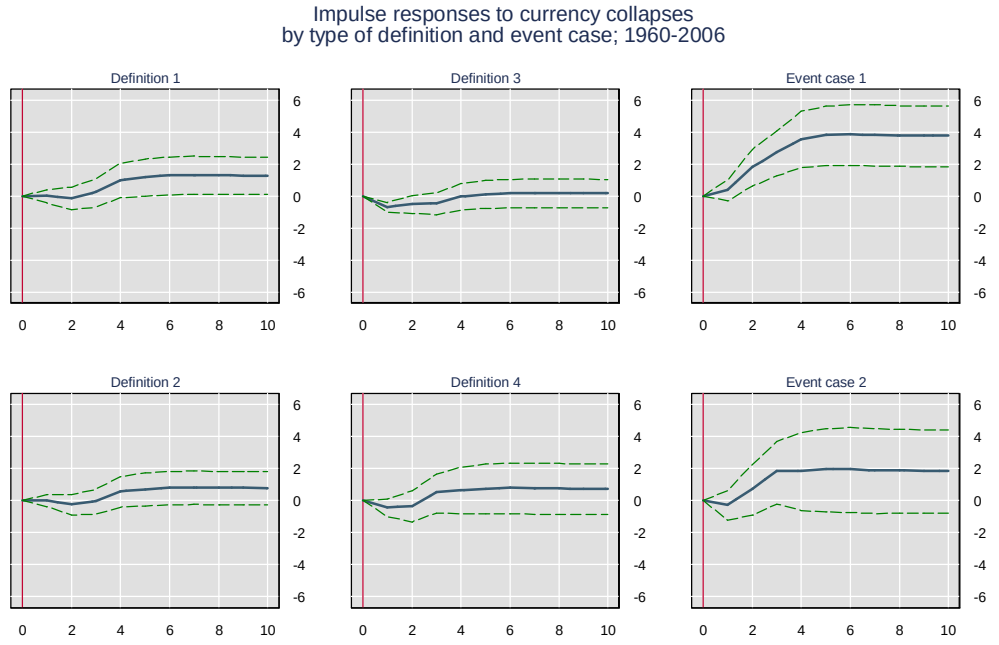
Event Case 1= currency collapse at time T and no collapse around a three-year window.
Note: The continuous line represents the sample average,while the dashed line represent the 25th and 75th percentiles.

Figure 8



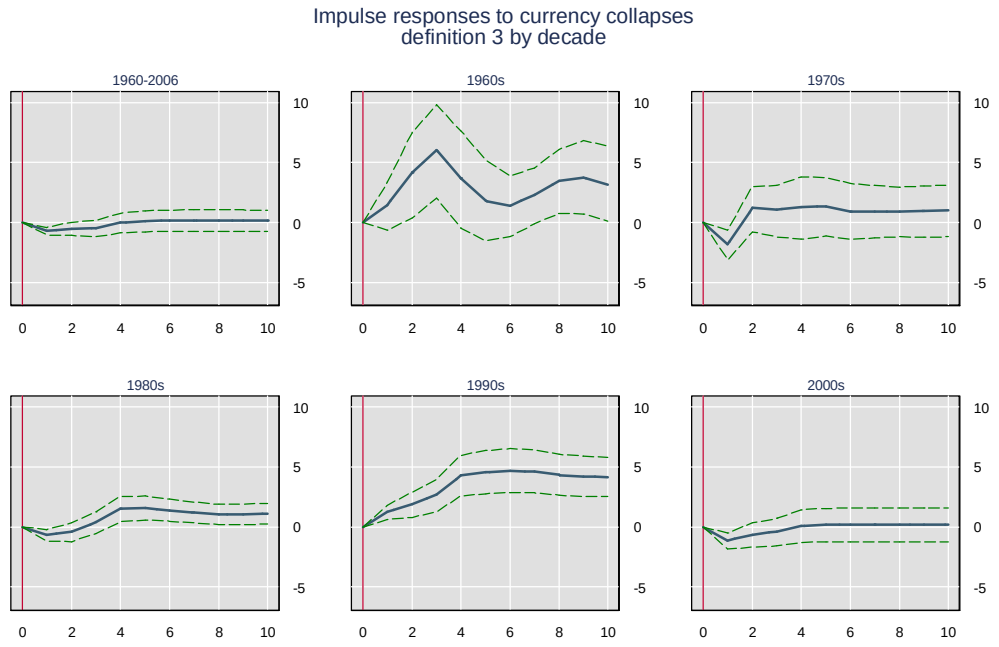
Event case 2= currency collapse at period T and T-1 and no collapse around a three-year window.
Note: The continuous line represents the sample average,while the dashed line represent the 25th and 75th percentiles.

Figure 9



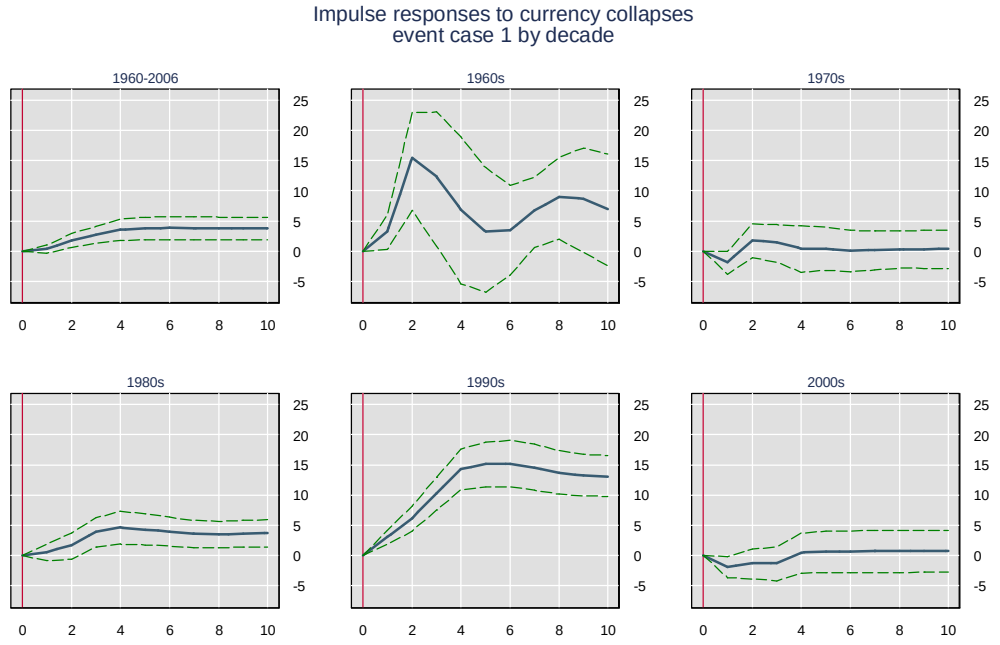
For definitions see text
Note: The blue line represents the difference between the shock and the baseline, while the dotted lines represent that difference plus/minus one standard deviation.
Source: Authors' calculations based on IMF and national data.

Figure 10



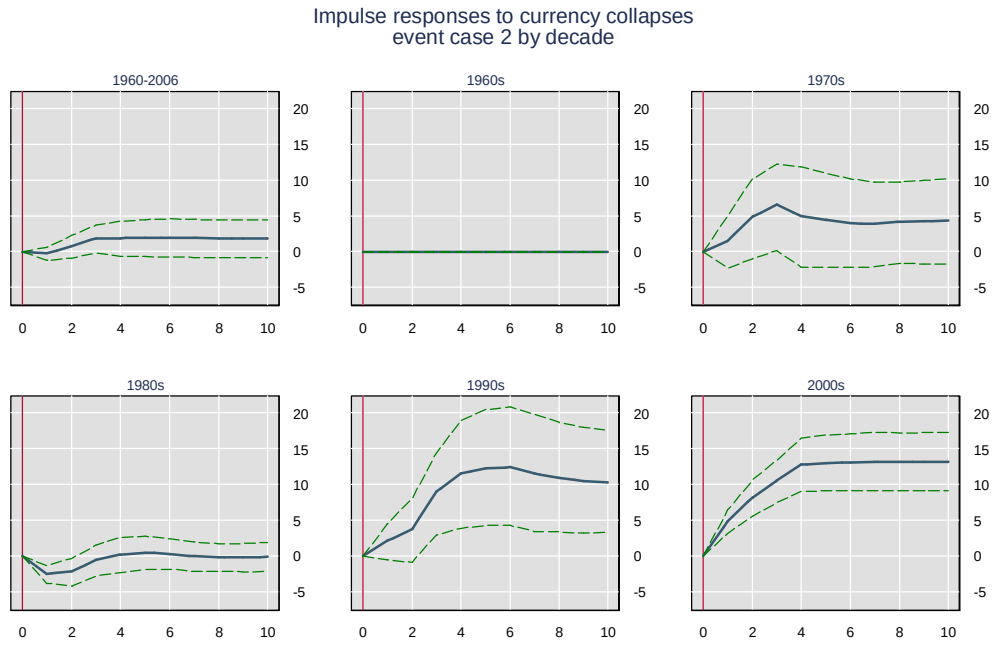
For definitions see text
Note: The blue line represents the difference between the shock and the baseline, while the dotted lines represent that difference plus/minus one standard deviation.
Source: Authors' calculations based on IMF and national data.

Figure 11



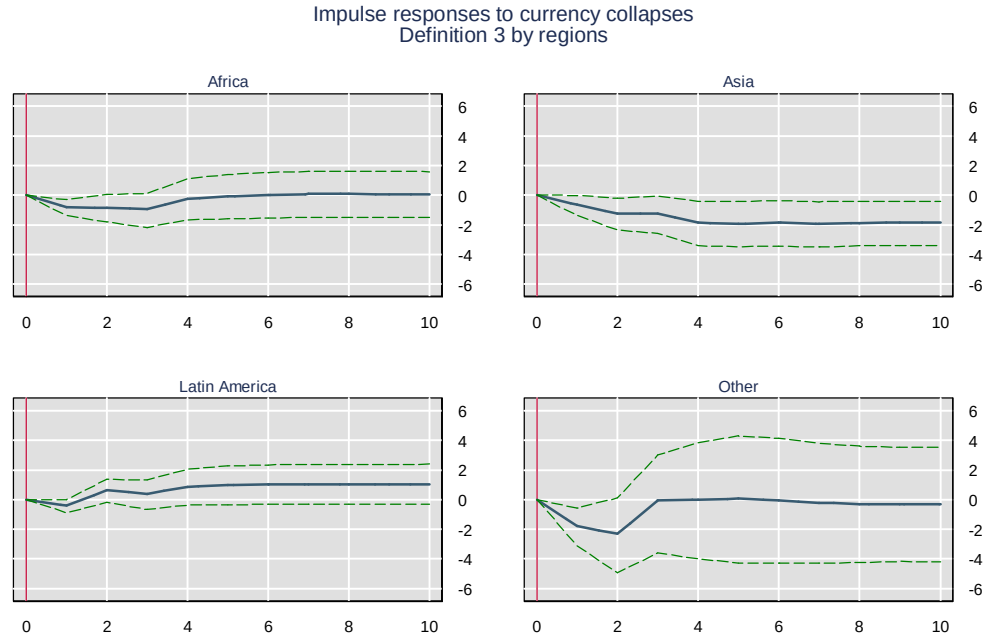
For definitions see text
Note: The blue line represents the difference between the shock and the baseline, while the dotted lines represent that difference plus/minus one standard deviation.
Source: Authors' calculations based on IMF and national data.

Figure 12



For definitions see text
Note: The blue line represents the difference between the shock and the baseline, while the dotted lines represent that difference plus/minus one standard deviation.
Source: Authors' calculations based on IMF and national data.

Figure 13



For definitions see text
Note: The blue line represents the difference between the shock and the baseline, while the dotted lines represent that difference plus/minus one standard deviation.
Source: Authors' calculations based on IMF and national data.