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Financial Crises and Economic Growth – A Long Run Perspective

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Abstract

In the economic literature the costs of financial crises are typically defined as cumulative output losses until the resolution of the crisis. Given this definition, majority of the empirical studies have documented significant economic costs associated with currency, banking and the twin crises. Few studies, however, looked at the long-term effect of various types of crises. In this paper I estimate the effect of currency, banking and twin crises episodes on the probability of initiating the periods of prolonged and significant growth spurs and downturns – the growth take-offs, and the growth collapses.

I find that currency crises are significant positive predictors of growth take-offs, especially in the post World War II period. The currency crises episodes, however, were reducing the probability of growth take-offs during the Gold Standard era. I also find that the average export growth in the five years following a currency crisis was 5.6% above the historical mean in post-World War II years, whereas during the Gold Standard era, the corresponding deviation of export growth from the mean was not statistically different from zero. This may be interpreted as the evidence in favor of the hypothesis that the "resumption rule" of the Gold Standard era – the implicit rule prescribing a prompt return to of the original parity with gold following a currency crisis- may have contributed to the overvaluation of the real exchange rate and dampening of the economic activity in the long run.

The results of the paper confirm the intuition that twin crises are likely to significantly dampen economic activity even in the long run. Twin crises are found to be positive predictors of growth collapses during 1980-2003, and negatively influencing the probability of growth take-offs during the Gold Standard years.

JEL codes: G01, F43, F33, O11, O43

I. Introduction

The question of how financial crises impact economic growth has long been debated in the economic literature. The empirical studies have documented significant costs associated with the currency, banking and the twin crises episodes since the 1870s. The studies also find that these financial upheavals have had different impact on the output depending on the type of crisis in question. For example, the stand-alone currency crises are estimated to be the least costly in terms of the output lost. The currency crises are also on average shorter in duration, as compared to for example the twin crises, the combined banking and currency crises episodes. These episodes are found to be the most durable and costly. The stand-alone banking crises typically fall in the mid-range in terms of both duration and the output loss.

Few papers, however, investigated the long-run effect of financial crises on growth – the impact lasting beyond the average crises duration. The aim of this paper is to fill the gap in the literature, and present a unified framework for empirically assessing the potential positive and negative long-run effects of various types of financial crises on economic growth.

II. Review of the Empirical Evidence

The current empirical evidence points unambiguously to the substantial costs associated with financial crises. Typically the costs of crises are represented as the cumulative output losses associated with deviation from the growth trend at the onset of the crisis until the time GDP growth reverts to the trend. Bordo et. al. (2001) report that output losses associated with financial crises can range from 3.81% of GDP to 15.67% of GDP[1].

[1]Bordo et. al. (2001) report that during the first era of financial globalization, the period from 1880 to 1913, financial crises (currency, banking and twin crises) on average were associated with 9.8% of cumulative output loss. The second era of financial globalization, 1973-1997 was associated with the average of 8.3% cumulative GDP loss. Of these crises twin crises were the most damaging, averaging 14.5% output loss prior to 1914 and 15.67% after 1973. Currency crises were least damaging of the three types, averaging 8.31% cumulative loss prior to 1913 and 3.81% after 1973. The output losses from financial crises reported by G. Kaufman (1999) follow a similar pattern – twin crises after 1975 are the most damaging, with 14.4% cumulative output loss, while currency crises are the least damaging with 4.3% output loss.

The authors estimate the output cost of crises to be the highest during the twin episodes, when currency and banking crises occur simultaneously or follow very closely in each others' wake. The currency crises are determined to be the least costly, while the costs from stand-alone banking crises typically fall in the mid-range. Other measures of crises costs have also been introduced. Some studies have focused particular attention on estimating the fiscal costs of banking sector bailout and growth shortfall associated with banking crises.[2]

According to the evidence, longer crises typically mean more severe output losses for the economy.[3] In addition, when the severity and duration of crises for both the industrialized countries and emerging markets are assessed, the emerging markets seem to experience deeper crises (higher cumulative output losses) but shorter recovery times [4] than their industrialized counterparts.

Recent studies, however, have emphasized the positive aspects of the financial upheavals. Viewed in this light, the crises are a common byproduct of financial liberalization episodes. To the extent that the countries' institutions are weak in the years following liberalization, occasional crises might be expected. However, the cost of the occasional crises is potentially outweighed by the benefits of relieving the credit constraint. This view in particular has been articulated in Ranciere, Tornell and Westermann's (RTW) widely sited paper "Systemic Crises and Growth" (2008). The authors argue that credit constraints generated by weak institutions may lead to financial

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A recent paper by Hutchinson and Noy (2006) distinguish between various types of balance of payments crises. The authors estimate the output costs of currency crises, the sudden stop episodes and capital inflow reversals. They find that while currency crises are associated with 2-3% output drop, while a sudden stop reduces output by further 6-8%. The cumulative costs of a sudden stop episode is 13-15% over a 3 year period.

[2] Reinhart and Rogoff (2008b) report that bailout costs are difficult to pinpoint, and difference in estimates can be as wide as 51% of GDP, depending on the methodology used. Frydl (1999) estimates that growth shortfall during the crisis can be substantial. The difference between average growth rate 10 years prior to the crisis and the average growth rate during the crises can reach 4.22% for a 7 year long crisis.

[3] The average recovery from various types of crises has been summarized in Bordo et al (2001), Eihengreen and Bordo (2002) and Kaufman (1999). According to the evidence from twin crises lasted on average between 3.2 and 3.8 years since 1973 and 2.2 years prior to 1914. Currency crises lasted on average between 1.6 and 2.1 years since 1973 and 2.6 years before 1914. Banking crises duration once again fell in the mid range – between 2.6 and 3.1 years in the second era of globalization as compared to 2.3 years prior to 1914.

[4] Eihengreen and Bordo (2002) Reinhart and Rogoff (2008c)

bottlenecks and low growth, whereas financial liberalization and explicit or implicit bailout guarantees in the case of a systemic crisis may lead to higher risk taking, credit growth, and alleviation of the financial bottleneck.

The authors are careful to point out that crises in themselves are not good for growth. Rather they are a common feature of financial liberalization process. In addition, systemic risk-taking is growth enhancing only in countries where institutions are "weak but not too weak" – suggesting that in the countries with initially low contract enforceability financial constraint cannot be alleviated enough in good times to compensate for the high cost of crises.

Empirically, RTW (2001) estimate that lower credit skewness is associated with higher long run GDP growth. In other words, the countries which had been subject to occasional significant declines in credit, have also experienced higher average growth rates in the period from 1960-2000. These results are also supported by the empirical findings[5] that financial boom and busts cycles are severe in the early years following financial liberalization, but with time become less pronounced in the liberalized economies.

The argument that crises may pave the way to enhanced growth in the future is an intriguing one, due in part to powerful policy implications: setting up institutions in a way that encourages risk-taking may put a country on a higher growth path, help perfect financial institutions, and alleviate credit market imperfections in the long run. In the same time, the debate raises important questions, hitherto rarely addressed in the empirical literature, about a long-term impact of financial crises on growth, beyond the typical measures of crisis duration.

The empirical studies so far have focused either on the classification of financial crises based on their duration and the associated output losses in different historical periods[6], or, as RTW (2001), looked at the average growth rates for nations which experienced significant downturns of credit availability (associated primarily with banking crises). In this context, it is important to systematically address the possibility of

[5] Kaminsky and Schmukler, 2007
[6] Bordo et. al. (2001)

both positive and negative long-term effects associated with different types of financial crises.

Another question suggested by the current research is the possible differences in the way crises might have affected the economy in different historical periods (namely, the Gold Standard period between 1870-1913, as well as the inter-war period and the post WWII years).

Some studies, including Goodhart and Delargy (1998), McKinnon (2000), McKinnon (1996) maintained that during the Gold Standard era (unlike in the Bretton Woods or post-Bretton Woods periods) countries adhered to the so called "resumption rule" – the implicit commitment to return to the original pre-crisis exchange parity with gold. This implicit rule arguably facilitated the return of gold flows, as the investors took advantage of the decreased asset prices. Eihengreen and Bordo (2001), however, point out that despite the existence of the resumption rule, currency crises prior to 1914 were deeper and of longer duration than the currency crises in the post-WWII era.

My paper investigates how the long-run impact of currency crises (as well as banking and twin crises) differed in the different eras of financial development as well as discusses the possible reasons behind the Eihengreen and Bordo findings.

III. Methodology.

Estimating the effect of crises on growth take-offs and growth collapses.

One of the ways to gauge the long-run effect of financial crises is to assess whether they are associated with the long-term events in the country's growth history – growth take-offs as well as growth collapses.

Growth take-offs are defined as sufficiently long periods (8 years or above) during which the country's average growth rate is significantly higher than its historical rate of growth. The take-offs are relatively rare in a country's overall economic history, yet focusing on these events in the context of crises is particularly important, The take-offs are seen as the turning point episodes that can put the country on a higher growth path and help avoid the poverty trap.[7]

[7] Hausmann, Pritchett and Rodrik (2005).

Equally important are the episodes of growth collapses, defined as the prolonged periods of below-average growth, which can suspend the country's economic progress, stifle technological development and contribute to the income divergence with the rest of the industrialized world.

At first I will consider the formal way to identify both growth take-offs and growth collapses.

1. Identifying growth take-offs.

Several prior studies have proposed ways to identify take-off episodes. Jones and Olken (2005), for example, use the Bai-Perron structural break method to define both the up- and down-turns. The problem with using this method is the inclusion of many pseudo-take-offs, which are simply recoveries from bad shocks. Hausmann, Pritchett and Rodrik (2005) propose a method which eliminates the episodes of pure recoveries. This method, however, has limitations insofar it cannot be applied in the historical context. The HPR method adapted to accommodate historical data is based on the following conditions[8]:

1) $g_{t, t+n}$, defined as the average forward looking growth rate at time t over horizon n (typically set to be 8 years) must be at least 1 standard deviation above the mean growth rate up to time t. This condition ensures that the growth is rapid and above average based on the country's own growth experience.
2) $\Delta g_{t, t}$ (defined as the difference between the forward looking 8 year average at time t and the 8 year average growth preceding time t) must be greater that the average growth rate of countries in the top 50^{th} income percentile. This condition ensures that growth is accelerating – i.e. rules out the cases when the growth improves only slightly compared to a very low level of growth in the past.
3) y_{t+n} defined as level of GDP per capita at the end of the 8 year window starting from time t must be higher than any value of GDP per capita in the years prior to time t. This condition rules out pure recovery episodes.

In the event that several consecutive years are thus identified as the possible rapid growth initiation years, a linear spline regression is fitted through the log GDP series with

[8] For the detailed discussion and comparison of the two methods see Babych (2008)

a break in one of the years in question. The spline regression with the best fit (highest F statistic) determines the growth take-off initiation year.

2. Identifying growth collapses.

Very few papers have tried to empirically identify growth collapses. The Bai-Perron structural break method could be employed, except that as in the case of take-off, one is in danger of identifying pseudo-collapses, the periods of economic cool-down, following the burst of a speculative bubble or a short-term boom with unsustainable initial growth rates. These episodes may ultimately turn out to be growth collapses, however not necessarily so.

In a recent paper, Becker and Mauro (2006) analyze the "output drops" – collapses in output which are defined as events "starting in the year of a decline in GDP per capita and ending when GDP per capita returns to its pre-event level"[9]. In order to rule out the drops associated with temporary growth booms, the authors set additional set of restrictions: output drop must last at least 2 years and the total loss of output must be at least 5% of the pre-event GDP. Such definition is likely to capture many smaller events - recessions, which may not be necessarily prolonged, given a 2 year time window. Therefore, they would not capture the long-run effect of financial crisis on growth.

For the sake of the consistency of the results, the methodology for identifying an output collapse in this paper follows closely HPR historical method for identifying take-offs.

The year of the initiation of an output collapse is defined using the following set of conditions:

1) The average growth rate in a country from time to time t+n (typically an 8 year window) must be at least one standard deviation below the historic average growth rate for that country prior to time t.
2) The output in one of the final three years of the 8-year window following time t, must be less or equal to the minimum output in the preceding decade.

As before, the year of the initiation of a growth collapse is determined via a spline regression with a break in each of the candidate years.

[9] Becker and Mauro (2006) , p.10

The first condition ensures that the period of low growth is prolonged and results in below-average growth for a given country. The second condition ensures against counting growth collapses which were followed by periods of high growth and a complete recovery of output towards the end of the 8 year window.

The GDP series with the years of collapse for select countries are presented in the appendix.

3. The Base Model.

The base model for estimating the long-term effect of crises on growth take-offs and growth collapses is the distributed-lag random effects probit model of the following form:

$$Y_{it} = \alpha + \beta_1' D_{i,t-1} + \beta_2' \sum_{k=1}^{n} Z_{i,t-k} + \beta_2' \left(\sum_{n}^{d} Z_{i,t-n+1} \right)/d + \beta_3' \overline{Z}_{t-1} + (u_i + e_{i,t}) \qquad (1)$$

Y_{it} – is a binary indicator which takes the value of 1 in the year of a growth take-off (or growth collapse) initiation, as well as years t-1 and t+1 around the initiation year.

$D_{i,t}$ – the dummy variables in the regression– this is the indicator which takes the value of 1 in the year of the financial crisis (and the year t-1 and t+1 around the crisis episode). The war control dummies take the value of one in the years 1907-1918 and 1932-1945. The reason for extending the set of war dummies is to control for possible years of output collapse (or output take-off) initiation due to the two world wars of 1914-1918 and 1939-1945. For the same reason the Great Depression dummy variable takes the value of one in the years 1922-1933.

Z_{it} – other own-country factor potentially contributing to the take-off (collapse) initiation, such as volume of trade, total government expenditure and investment as a share of GDP and the level of a country's polity (measure of political development).

These variables enter the regression with lags to partially control for endogeneity.

The distributed lags (the lagged 3 or 4 year averages of variables) of total government expenditure and the GDP level capture the cumulative effect of these variables on take-off and collapse probabilities, the effect which is manifested over several periods.

$\overline{Z}_{t-1}$ - the time averages of continuous variables used to control for the time specific effects in the regression in lieu of year dummies.

IV. Data and Results

1. Summarizing growth take-offs and growth collapses

The data is a panel of 61 of countries from 1820-2003. In various years some countries enter and some exit the dataset, such that there are at most 57 countries in any given year.

The countries can be grouped into 4 main regions: Western Europe – 15 countries[10] account for about 46% of all country – year observations, Eastern Europe – 24 countries (11 countries until 1990) account for 19% of all country-year observations ; the Americas[11] - 10 countries account for 22.5% of observations ; Asia and Oceania – 8 countries account for 12.5% of all country-year observations.

Tables 1 and 2 summarize the number of growth take-off and growth collapse episodes by region and time period. The time periods roughly correspond to the pre-World War I years, encompassing the first era of financial globalization and the Gold Standard from 1870 to 1913, The World War I and the inter-war period prior to 1939; World War II and the Bretton Woods era, as well as post-Bretton Woods period from 1974 to 2003.

Overall there are 76 episodes of growth collapses, the earliest collapse initiation year occurring in 1854 (Netherlands) and the last one in 1996 (Argentina, Uruguay and Venezuela). There are 154 episodes of growth take-offs the earliest occurring in 1842 (Denmark, Sweden, United Kingdom), the latest growth take-offs taking place in 1996 (Sweden, Hungary, Albania, Canada, Spain).

The majority of growth collapses happened before World War II: 33% prior to 1914, and 30.3% in the World War I and the inter-war years prior to 1939. The take-off occurrence, on the other hand was just slightly above 50% prior to 1939, with about 47.5% taking place after World War II.

Most of the takeoffs – 50.6% took place in Western Europe, with only 10.4% in Eastern Europe, and 10.3% in Asian and Oceania. The Americas accounted for 28.6% of all take-off episodes. Western Europe also accounted for 39.5% of all growth collapses (less than the share of country-year observations for this region), while Eastern Europe

[10] For the list of countries see data appendix
[11] Including Latin America, Canada and the US.

accounted for 19.7% of all collapse episodes. The America's share of growth collapses is 31.6%, Asia and Oceania accounted for 9.2% of all growth collapses.

2.1 Crises and take-offs.

Table 5 (a -b) reports the coefficients and the marginal effects of the base model regression respectively, with the take-off initiation year as the dependent variable. The marginal effects (Table 5b) represent the percentage change in probability associated with one standard deviation increase from the estimated sample mean (for continuous variables); with the increase from 0 to 1 (for dummy variables); or with 1 point increase from the mean (for polity index variables) .

The crises are classified according to Eichengreen and Bordo (2002) financial crises dataset. Since Eichengreen and Bordo classification does not start until 1870s, the regression sample period also begins in 1870. The crises enter regression with 2 or 3 lags. The choice of the lag structure is motivated by the fact that all types of crises are typically damaging in the short run. The GDP per capita would not reach the local minimum until a short time after the crisis.

The results (Table 5(a-b), columns 1 and 2) for the entire sample show that currency crises are significant positive predictors of growth takeoffs. This result is interesting, as it supports the idea that crises, damaging as they are in the short run, may be paving the way to growth-spurs in long-run.[12] The result appears to be in unison with the Rancier, Tornell and Westerman's idea that crises can be predictor of growth in the long run, although RTW (2001) emphasized the credit constraint easing properties of the banking crises, rather than the currency crises.

In particular, a currency crisis increases the probability of a growth take-off by 3.1- 3.8%. This is significant, considering that the unconditional probability of a takeoff for the base model's sample is approximately 8.75%.

The coefficients on the banking crises are positive, but not significantly different from zero. The twin crises' (3^{rd} lag) effect on takeoffs is, on the other hand, statistically

[12] Gupta, Mishra, Sahay (2006) using the sample from 1970-2000 showed that about 60% of currency crises are contractionary in the first tranquil years, while 40% of the currency crises in that period are expansionary. The authors, however, do not discuss the behavior of output following the currency crises in the long-run. Using a comparable sample, Milesi-Ferretti, Razin (1998) report that output growth on average recovers in the 3 years following a currency crash; and the post-crisis growth is higher in countries more open to trade, as well as in countries which exhibited higher output growth rates before the crisis.

significant and negative. This result is consistent with the fact that twin crises are typically the most costly and protracted of all three types of crises. This result suggests that twin crises, although commonly preceded by growth in credit availability and investment booms, may do little to promote higher growth in the future, and would dampen rather than stimulate the economic activity in the long-run.

The estimation shows that a twin crisis episode initiated 3 years prior to time t, reduces the probability of a growth take-off in time t by about 2.74%.

When the sample is further subdivided into different time periods (i.e. the Gold Standard years (controlling for World War I and the Great Depression years); The Bretton Woods period, and the years since the oil shock of 1973-1974), interesting results emerge. In particular, during the Gold Standard years the coefficient on currency crises is negative and significant, suggesting that during this particular period currency crises were strong negative predictors of take-offs. This result is consistent with Bordo et. al (2001) finding that currency crises during this period were more severe and lasted on average longer than their mid-20th century counterparts. In the same time, currency crises during the Bretton Woods era and the post-oil shock years are strong positive predictors of growth take-offs. For example, during the Gold Standard era (including the inter-war period, but controlling for the years of World War I and the Great Depression) a stand-alone currency crisis ***reduced*** the probability of a growth take-off by 8.04%, while a currency crisis from 1946 on ***increased*** the probability of a growth take-off by approximately 3-4%. [13]

Certain features of the international monetary system suggest an explanation to this result. In the 1993 article "The Rules of the Game" R. McKinnon describes the various salient features of the monetary system under the Gold Standard versus the Bretton Woods system. He points out that during the Gold Standard years, if the official parity to gold were temporarily suspended, the convertibility would usually be restored at the original parity as soon as possible. This is the so called "resumption rule" of the Gold

[13] Interestingly, the banking crises in the post World War II era are also strong predictors of growth takeoffs (associated with a 7.1% increase in the probability of a takeoff). This result confirms the empirical findings of Rancier Tornell and Westerman (2008)

Standard period. During the Bretton Woods system, on the other hand, the long-run exchange rate was not expected to return to the original parity with the anchor currency.

The Bretton Woods system called for maintaining the par value of the currency "only in the short run, leaving open the possibility that exchange rates could change substantially in the long run"[14]. Does the difference between the two "rules of the game" help explain the difference in the currency crises coefficients during these different periods?

Goodhart and Delargy (1998) argued that the resumption rule would have a positive effect on growth, as the expectation of the return to the original parity would restore the capital flows quickly. The countries could thus avoid the burden created by the currency mismatch prior to the crisis. Bordo et. al (2001), however, have pointed out that this idea runs contrary to the empirical evidence, at least in the case of currency crises. The results of my paper suggest that the lack of commitment to the long-run parity may have produced beneficial effects on growth following a stand-alone currency crisis. The lack of commitment to the original parity in the long run could have helped to align the currency value and the interest rates more closely with the fundamentals, and allow the automatic stabilizer effects to set in.

Thus, the difference in the "rules of the game" may explain the difference in the long-run impact of currency crises on output growth "then" and "now".

2.2 *Testing the "rules of the game" hypothesis:*

One way to test whether implicit financial system "rules of the game" played a role in changing the way financial crises impact long run growth, is to examine the trajectory of export and import growth in the years prior to and after the currency crises.

From a theoretical standpoint, a "resumption rule" of the Gold Standard era could have contributed to the misalignment of the nominal exchange rate with its long-run value, and consequently to the overvaluation of the real exchange rate and the slowdown in export growth. To see this, consider the standard textbook definition of the real exchange rate (i.e. the price of the domestic good in terms of the foreign goods):

$$q = P/EP^* \qquad (2)$$

[14] McKinnon (1998) p.14

Where q is the real exchange rate defined as the price of a domestic good in terms of foreign goods; P is the domestic price level; P* - foreign price level; E – nominal exchange rate defined as the price of one unit of foreign currency in terms of the domestic currency. Thus an increase in E (nominal depreciation of the domestic currency) would lead to a decrease in q – real depreciation, or the lowering of the value of a domestic good in terms of foreign goods.

According to the relative purchasing power parity condition the change in q is zero in the long run. Either a change in the nominal exchange rate or the price level would cause q to deviated from its long run level. Thus, a currency crisis (an increase in E) initially causes real depreciation – lowering of the value of domestic goods vis-à-vis the foreign goods. The depreciation would cause increase in exports and inflow of foreign capital (gold) into the country. The domestic price level would then trend up, restoring the real exchange rate to its original value. However, if the monetary authorities strive to restore the original parity with gold, and E declines, the real exchange rate would appreciate as a result, and consequently lead to a drop in exports/ increase in imports. The effect on the domestic price level in this case would remain ambiguous. On one hand, real appreciation should lead to the outflow of gold and the eventual decrease in the price level. However, in accordance with the argument by Goodhart and Delargy (1998), the expectation of the return to original parity is likely to lead to the restoration of capital flows into the country. This could for some time prevent the domestic price level from falling in response to real appreciation of the domestic currency.

In order to test whether the "resumption rule" during the Gold Standard era may have stalled the growth of exports in the aftermath of the currency crisis, I examine the trajectory of export and import growth around the currency crises episodes. I compare the results for the period prior to 1933 (controlling for World War I years and the Great Depression).

2.3 Exports and Imports growth around the crises episode.

Table 7 summarizes the import and export growth in different time periods – in terms of deviation from the historical mean. The quantities in rows I, II and III represent the

deviation of the forward looking 5 year average export (import) growth rate from the mean, and can be calculated according to the following formula:

$$\left\{1/5\sum_{t}^{t+4}\exp(imp)-1/t\sum_{t=0}^{t}\exp(imp)\right\}_{Crisis_{t-1}} \quad (3)$$

i.e. the difference between a 5 year forward looking average of export(import) growth (from time t to t+4) and the historical growth rate (average growth rate of exports(imports) from time t= 0 to t) ***conditional*** on the currency crisis occurring at t-1. For tranquil times the same formula is used – excluding the years of the crisis as well as one year before and after the crisis.

$$\left\{1/5\sum_{t}^{t+4}\exp(imp)-1/t\sum_{t=0}^{t}\exp(imp)\right\}_{Tranquil_{t-1}} \quad (4)$$

The results show that export growth in the 5 years after currency crises was above the historical mean by about 4.3% for the entire sample. During the Gold Standard era, however, the deviation of export and import growth from the mean is indistinguishable from zero. In the same time, the post-currency crises export growth was positive and significant at 5.6% above the mean in the years after World War II. The post-currency crises import growth is around 4.2% above the mean during this time period.

Moreover, in the years after 1946, the post-currency crises export and import deviation from the mean are significantly above the equivalent measures during the tranquil times – i.e. the difference between equations (3) and (4) is significantly greater than zero for both exports and imports. The same is not true for the Gold Standard period.

These results may be interpreted as the evidence that the precipitant return to the original parity with gold, i.e. the "resumption rule" during the Gold Standard era, may not have allowed exports to recover after a currency crisis episode in the same way they did during the Bretton Woods period as well as during the post- Bretton Woods years.

However, in accordance with Goodhart and Delargy (1998) argument, the resumption rule may have benefited economic growth in the aftermath of the twin crises episodes. The expectation of a return to the original parity with gold could have had a positive effect on the capital flows from abroad, making the impact of twin crises less severe. The evidence can again be found by comparing the export and import growth rates in the years after the twin crises in the two periods. During the Gold Standard years,

exports recovered more quickly in the aftermath of a twin crises, as compared to the post World War II period. The significant drop of import growth in the aftermath of twin crises is once again associated with the post World War II era, but not the Gold Standard era. The drop in imports is likely to have been precipitated by the drying up of capital flows from abroad. This result goes hand in hand with the findings of Bordo et al (2001), which showed that twin crises were less severe during the Gold Standard era, as compared to the post World War II years.

2.4 Other determinants of growth take-offs.

Table 5 (a-b) also summarizes the effects of other economic variables on the probability of growth take-offs. The results presented in the table are consistent with the theory. For example, in the overall sample, the higher volume of trade in the previous period helps predict the take-off episode, while higher government expenditure reduces the probability of the take-off initiation. In particular, a one standard deviation increase of the volume of trade from 47% of GDP to 86.7% of GDP increases the probability of a growth take-off by as much as 10.3%. A more modest increase in the volume of trade from 47% to 57% of GDP (roughly equal to the change in the volume of trade in Thailand from 1983 to 1987) increases the probability of a take-off by nearly 2%. A one standard deviation increase in the country's own total government expenditure over 3 years period from 19% of GDP to 32% of GDP (roughly equivalent to the change from the level of total government expenditure in Portugal in 1995 to the level of Ireland in the same year) reduces the probability of a take-off by about 2.1%. Once again, the results are economically significant, given that the unconditional probability of a take-off is about 8.75%

Coefficient on country's investment is negative and significant, possibly capturing the negative effects of the investment booms. For example, and increase in the investment share of GDP from 19% to 26% (level of Brazil in 1969 to Brazil in 1974) reduces the probability of a growth takeoff by nearly 5%. The country's polity score (the level of democratization) is a positive and significant predictor of growth take-offs, pointing to a beneficial role of stronger representative political institutions, even though the impact of institutional change on growth is quantitatively small – a 1 standard

deviation increase in the country's own polity score (from 3 points – Portugal in 1975 to 10 points – Portugal in 1982) increases the probability of a take-off by about 1.89%.

3 Crises and collapses.

Table 6(a-b) presents the results of the base model regression, where the dependent variable is the growth collapse episode. Unlike the growth takeoffs, growth collapses depend mostly on the external factors – such as wars, global economic shocks and growth rates in the global financial centers. Notable exceptions are the coefficients on the country's own investment as a share of GDP (Investment), total government expenditure (TGE), and the country's own Polity score – the level of democratization. As one would expect, both the War dummy and the Great Depression dummy variables have coefficients that are positive and highly significant, increasing the likelihood of a growth collapse by 16.6% and 18.7% respectively. The coefficient on twin crisis initiation year dummy is positive but insignificant in the base model specification. This is primarily due to the inclusion of the dummy variables capturing the two world wars and the Great Depression, including the seven years prior to their start

In Table 6a-b columns 7 and 8, US and UK interest rates and growth rates are added as additional controls for the external economic conditions. The inclusion of these variables is important in light of the empirical studies which highlight the effect of high US (large countries') interest rates on the capital outflows from the rest of the world[15]. According to the argument presented in these studies, high interest rates in large industrialized countries lead to the reallocation of the investors' portfolio and withdrawal of funds from developing and emerging markets. By the same argument, periods of high growth in large industrialized countries would have similar effect on the emerging markets' capital flows.

The inclusion of the UK (before 1913) and the US (after 1913) rates of return and growth rates do not significantly change the results of the basic model. It is worth noting, however, that an increase in the UK/US growth rate significantly increases the probability of a growth collapse for the other countries in the sample.

An increase in the country's investment as a share of GDP from 0.19 to 0.26 in the previous period, increases the likelihood of a growth collapse by 1.8-1.9%. Once

[15] Calvo and Reinhart (1996), Giovanni and Shambaugh (2006)

again, this result most likely highlights the effect of over-investment in the years prior to a severe economic downturn.

An increase in the total government expenditure as a share of GDP from 0.19 to 0.32 increases the probability of a collapse by 0.75%. Theses results are consistent with those presented in numerous other empirical studies, which typically documents a negative link between economic growth and the size of the government sector[16].

In the same time, a shift in regime toward democratization - an increase in the country's polity score by 3 points – decreases the probability of a growth collapse by 0.3%. This result is interesting, given that most of the previous studies linking democratization and growth find a positive relationship between the level of democratization and the country's growth outcomes. However, none of the studies discuss the evidence on the possible "protective" effects of democratization.

In the period from 1870-1933, growth collapses were driven primarily by the external factors (Table 6(a-b) columns 3 and 4). In this period none of the country's own characteristics had significant effect on the probability of a growth collapse. The internal factors start playing a role in the period 1980-2003[17]. For example, an increase in the total government expenditure as a share of GDP by one standard deviation from the mean (from 0.27 to 0.4) increases the probability of a growth collapse by 0.038%, whereas an increase in the country's own polity score decreases the probability of a collapse by 0.017%. The twin crises initiation year becomes a positive and significant predictor of a growth collapse in this period. For example a twin crisis in the previous year increase the probability of a growth collapse by 0.32%[18].

Interestingly, while approximately half of the twin crises episodes occurred during the Gold Standard years, the regression results suggest that the aftermath was not as damaging. The twin crises might have been reducing the probability of a growth take-

[16]See Barro (1991) and Tavares and Wacziarg (2006) review of the existing literature on the link between growth and the size of the government sector.

[17] The choice of time period is motivated by the focus on the effect of the financial crises on growth collapses. The twin crises were very rare between 1946 and 1980, whereas no banking crises occur during that period.

[18] Currency crises and/or banking crises are excluded from the regression (Table 6 (a-b) column 5 and column 6) due to large standard errors of their estimated coefficients. The instability of the coefficients is likely due to the fact that no currency or banking crises have preceded growth collapses during the period 1980-2003 (at 2 lags) and no banking crises have occurred before the growth collapses (at 3 lags) during this period.

off, but were not increasing the probability of a growth collapse, unlike the twin crises after 1980s. This long-run result is once again, consistent with the findings of Bordo et al (2001) on the depth and duration of the twin crises in different eras. This might have been due, once again, to the difference in the monetary systems, the "rules of the game" described by McKinnon (1988). The resumption rule of the Gold Standard era would have mitigated the effect of the banking crisis occurring simultaneously with the currency crisis, restoring the capital flows and minimizing the crippling effect of the currency mismatch on the banking system.

Conclusion.

The paper provides additional insights into the effect of financial crises on long-term growth. One of the main results of the paper is that the various types of financial crises affect long-term growth differently. While currency crises may help pave the way to a growth spur in the future, the twin crises episodes are likely to significantly dampen the economic activity for many years to come.

In previous studies the focus was mainly on the output costs associated with various types of crises. The result that crises can help predict growth take-offs is in line with more recent theoretical models and empirical findings, where crises are seen as a by-product of financial liberalization. The financial openness helps ease the credit constraint and promotes long-run growth, while weak institutions in the initial periods of liberalization result in the higher incidence of financial crises. Thus, countries which experience occasional crises grow faster in the long run. My paper, however, cautions that different types of financial crises are not likely to have the same effect on growth. The combination of banking and balance of payments problems in a financially liberalized economy can be potentially damaging even in the long run.

Another result of the paper is that the long-run effects of crises were different in the different historical eras of financial development. For example, during the Gold Standard era currency crises were strong negative predictors of take-offs, while the opposite was true for the Bretton Woods period and the post oil shock period of 1975-2003.

One of the possible reasons could be the existence of the resumption rule during the Gold Standard era, whereby the countries implicitly committed to restoring in the long-run the original parity of their currency with gold. While the existence of the resumption rule could have restored the capital flows more readily and mitigated the possible effects of currency mismatches, the same rule may have contributed to a longer duration and bigger damage from the stand-alone currency crises.

Since the World War II, however, countries no longer committed to the long-run parity to the anchor currency or to gold, which allowed the exchange rate and interest rates to align more closely with the fundamentals and set in motion the automatic stabilizer effects of investment and trade.

The paper presents some evidence in support of the hypothesis outlined above. In particular, I find that during the Gold Standard period, export and import growth did not significantly deviate from their historical mean following a currency crisis. During the Bretton Woods and post-Bretton Woods periods, however, export growth was nearly 5.6% above its historical mean in the years following the currency crisis, as well as significantly above the average export growth in tranquil times.

One of the results of the paper is that the twin crises in the modern period were significant predictors of growth collapse episodes. This was not true of the Gold Standard era. The evidence is in line with other empirical findings in the literature, which indicate that twin crises were shorter, and less severe during the Gold Standard years. The result might be due to the differences in the monetary system rules during these historical periods. The lack of long-run parity commitment would have hindered the return of capital flows and made currency mismatch problems more onerous for the countries' banking systems.

Data Appendix

I. Sources and Definitions of Variables:

Sources:

1) All GDP per capita data comes from Angus Maddison Historical Statistics for the World Economy 1-2003 AD available at http://www.ggdc.net/maddison/
2) B.R. Mitchell International Historical Statistics Europe 1750-1993
   and B.R. Mitchell International Historical Statistics Africa, Asia & Oceania 1750-1993 – source for European and Asian countries data on:
   GDP at current prices data until 1948-50
   Gross capital formation until 1948-50
   Total Central Government Expenditure until 1948-50
   Exports, Imports until 1948 -50
   Infant mortality rate until 1993
3) B.R. Mitchell International Historical Statistics the Americas 1750-1993 – source for the US (until 1948) and Brazil (until 1900) data on:

GDP at current prices; Gross capital formation, Total Central Government expenditure, Exports, Imports, Wholesale price index.

Infant mortality rate - US, Latin American countries until 1993

4) Oxford Latin American Economic History Database - source for Latin American countries data 1900-2000 on:
   GDP at current prices; Gross Domestic Fixed Investment; Central Government Expenditure; Exports; Imports; Implicit GDP deflator.
   Data available at: http://oxlad.qeh.ox.ac.uk/index.php
5) International Financial Statistics (IFS) - all countries after 1948-1950 data on:

GDP at current prices; Gross fixed capital formation, Government Expenditure, Exports, Imports, GDP deflator

6) World Development Indicators (WDI) – all countries data on Infant mortality rates after 1993 (and for earlier dates if missing from Mitchell)
7) OECD (2004), HEALTH DATA 2004, 1st edition (www.oecd.org/health/healthdata). - Supplementary data source for OECD countries Infant mortality rates from 1960 (if missing from Mitchell).
8) Other supplementary data sources for select countries:

Netherlands: National Accounts of the Netherlands 1800-1913 available at http://nationalaccounts.niwi.knaw.nl/start.htm

- source for 1820-1913 data on:

  GDP at current prices, Investment, Imports, Exports, Public Expenditure, GDP deflator.

Norway: Norges Bank Historic Data available at http://www.norgesbank.no/stat/historiske_data/en/hms/c6_txt.html
Source for 1830-2001 data on GDP at current prices, Gross Investment, Imports, Exports, Government Consumption, GDP deflator.

Spain: Prados de la Escosura, L. (2003). *El progreso económico de España, 1850-2000*. Madrid: Fundación BBVA – source for 1850-1959 data on GDP at current prices, Investment, Imports, Exports, Government Expenditure, GDP deflator.

Portugal: Nunes, Mata and Valerio "Portuguese Economic Growth 1833-1985" (1989) Journal or European Economic History

- source for 1833-1950 data on Exports, Imports, GDP at current prices, GDP deflator, Public Expenditure.

9) Sources of data on currency, banking and debt crises:
   Eichengreen and Bordo (2002) Crises Now and Then: What Lessons from the Last Era of Financial Globalization? NBER Working Paper #8716

   Bordo, Financial Crises Database available at http://sites.google.com/site/michaelbordo/home3

10) Marshall and Jaggers Polity IV Project: Political Regime Characteristics and Transitions, 1800-2002 available at http://www.cidcm.umd.edu/inscr/polity/

- source of political regime change data and democracy (polity) indicators. All countries 1820-2001

II. Definitions

1. Polity: An index variable (Polity IV dataset) defined as the level of country's democracy score (index from 0 to +10) minus the country's autocracy score (index from 0 to +10). The resulting polity scale ranges from –10 (strongly autocratic) to +10 (strongly autocratic).
2. GDP per capita: real GDP per capita expressed in 1990 international dollars.
3. TGE/GDP: Total Central Government Expenditure (or Public Expenditure) at current prices divided by GDP at current prices.
4. VOT/GDP: Volume of Trade (defined as Exports plus Imports) at current prices divided by GDP at current prices
5. Investment/GDP: Gross Fixed Capital Formation (or Private Investment) at current prices divided by GDP at current prices
6. Infant mortality rate: number of death of infants less than 1 year old per 1000 live births.
7. Crisis – a binary variable that take value 1 in the year that marks the onset of currency, banking or twin crises.

III. Data coverage

There are overall 61 countries in the dataset. Since some European countries leave the sample as others enter, there are at most 54 countries in the sample in any given year.

Western/Northern Europe: United Kingdom, Ireland, Netherlands, Belgium, France, Switzerland, Spain, Portugal, Prussia, Germany, Austria, Italy, Finland, Sweden, Norway, Denmark.

Eastern Europe/Central Asia: Poland, Hungary, Czechoslovakia, Czech Republic, Slovakia, Albania, Macedonia, Croatia, Yugoslavia, Serbia-Montenegro, Bosnia, Slovenia, Greece, Bulgaria, Moldova, Romania, USSR, Russia, Estonia, Latvia, Lithuania, Ukraine, Belarus, Armenia, Georgia, Azerbaijan, Turkey.

Asia/Oceania: Japan, Thailand, Malaysia, Singapore, Philippines, Indonesia, Australia, New Zealand.
The Americas: United States, Canada, Mexico, Colombia, Venezuela, Peru, Brazil, Chile, Argentina, Uruguay.

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Table 1. Growth Takeoffs.

	Western Europe	Eastern Europe	Americas	Asia and Oceania	Total number	Share of the total episodes
Share of the country- year observations	45.6%	19.3%	22.5%	12.5%		
1820-1914	27	---	8	3	38	24.7%
1915-1938	20	3	16	4	43	27.9%
1939- 1971	22	10	4	5	51	33.1%
1972-2003	9	3	6	4	22	14.3%
Total number	78	16	44	16	154 total episodes	
Share of the total episodes	50.6%	10.4%	28.6%	10.3%		

Table 2 Growth Collapses

	Western Europe	Eastern Europe	Americas	Asia and Oceania	Total	Share of the total episodes
Share of the country-year observations	45.6%	19.3%	22.5%	12.5%		
1820-1914	18	---	5	2	25	32.9%
1915-1938	9	3	9	2	23	30.3%
1939- 1971	3	2	2	2	9	11.8%
1972-2003	0	10	8	1	19	25%
Total number	30	15	24	7	76 total episodes	
Share of the total episodes	39.5%	19.7%	31.6%	9.2%		

Table 3 ***Rapid growth episodes: Historic Definition***

* growth episode occurred within 3 years after a currency crisis
** growth episode occurred within 3 year after a banking crisis
*** growth episode occurred within 3 years after a twin crisis

The Americas	year	average 8-year growth rate
US	1877	0.0402
	1896	0.0380
	1922	0.0249
	1938	0.1178
	1961*	**0.0396**
Canada	1877	0.0446
	1896	0.0567
	1921	0.0576
	1937	0.0894
	1949	0.0252
	1962	0.0365
	1996	0.0279
Mexico	1936	0.0229
Colombia	1923	0.0315
	1933	0.0325
	1943	0.0259
	1967	0.0390
Venezuela	1907	0.0369
	1922	0.1633
	1932	0.0775
	1942	0.1384
Peru	1922	0.0473
	1931	0.0483
	1948	0.0378
	1959	0.0448
Brazil	1905	0.0162
	1916**	**0.0406**
	1931*	**0.0379**
	1945	0.0312
	1955	0.0442
	1967*	**0.0715**
Chile	1922	0.0337
	1974	0.0403
	1990*	**0.0663**
Argentina	1921	0.0264
	1942	0.0323
	1964*	**0.0328**
	1990*, ***	**0.0400**

The Americas	year	average 8-year growth rate
Uruguay	1881	0.0385
	1905	0.0488
	1923	0.0423
	1943	0.0469
	1973	0.0388
	1988*	**0.0258**
	1990	0.0400

Europe West	year	average 8-year growth rate
UK	1842	0.0348
	1893**	**0.0241**
	1910	0.0256
	1922	0.0238
	1936	0.0413
	1950*	**0.0228**
	1982	0.0359
Ireland	1946	0.0308
	1958	0.0401
	1994	0.0840
Netherlands	**1845****	**0.0136**
	1860	0.0187
	1879	0.0259
	1896	0.0114
	1921	0.0382
	1944	0.1357
	1984	0.0236
Belgium	1918	0.0674
	1943	0.0488
	1959	0.0423
France	1853	0.0262
	1887	0.0225
	1906	0.0239
	1918	0.0801
	1932**	**0.0222**
	1944	0.1291
Switzerland	1883	0.0325
	1892	0.0275
	1918	0.0486
	1943	0.0650

Europe West	year	average 8-year growth rate
Portugal	1880	0.0236
	1894* **	**0.0271**
	1918	0.0381
	1942	0.0273
	1959	0.0597
	1984*	**0.0524**
Germany	1923	0.0524
	1932* **	**0.0700**
	1951*	**0.0711**
Austria	**1922** **	**0.0406**
	1934	0.0657
	1950	0.0664
Italy	1881	0.0157
	1902	0.0432
	1911	0.0540
	1933 **	**0.0303**
	1945	0.0965
Spain	1870	0.0365
	1896	0.0251
	1920	0.0230
	1950	0.0454
	1960*	**0.0812**
	1984	0.0405
	1996*	**0.0388**

Europe East/South	year	average 8-year growth rate
Poland	1992	0.0558
Hungary	1948	0.0446
	1956	0.0495
	1996	0.0455
Czechoslovakia	1934	0.0587
	1953	0.0543
Yugoslavia	1932	0.0335
	1943	0.0591
	1957	0.0563

Europe East/South	year	average 8-year growth rate
Greece	1931	0.0319
	1963	0.0680
Bulgaria	1945	0.0924
	1956	0.0707
Romania	1960	0.0597
USSR	1942	0.1128
Albania	1996	0.0577

Europe North	year	average 8-year growth rate
Finland	1868	0.0231
	1892	0.0386
	1918*	**0.0712**
	1931*	0.0541
	1948	0.0381
	1958	0.0478
	1967	0.0561
	1993* **	**0.0416**
Sweden	1842	0.0143
	1853	0.0264
	1867	0.0450
	1891	0.0246
	1923	0.0395
	1932* **	**0.0479**
	1958	0.0446
	1996	0.0284
Norway	1909	0.0317
	1926	0.0293
	1944	0.0661
	1991	0.0375
Denmark	1842	0.0214
	1921	0.0255
	1941	0.0447
	1958	0.0421
	1958	0.0421

Asia/Oceania	year	average 8-year growth rate	Asia/Oceania	year	average 8-year growth rate
Japan	1888	0.0304	Indonesia	1967	0.0766
	1914	0.0433		**1988***	**0.0606**
	1934*	**0.0545**			
	1951	0.0629	Australia	**1918***	**0.0277**
	1960	0.0839		1931	0.0451
Thailand	1961	0.0520	New Zealand	1899	0.0316
	1986**	**0.0885**		1932	0.0668
Malaysia	1972	0.0564			
	1987**	**0.0689**			
Singapore	1966	0.1118			

Table 4 ***Growth collapses***

*** growth collapse episode occurred within 3 years after a currency crisis**
**** growth collapse episode occurred within 3 year after a banking crisis**
***** growth collapse episode occurred within 3 years after a twin crisis**

The Americas	year	average 8-year growth rate
US	1927	-0.0517
Canada	**1916***	**-0.0368**
	1927	-0.0600
Mexico	1926	-0.0464
	1981	-0.0206
Venezuela	1978	-0.0416
	1996***	**-0.0302**
Peru	**1978***	**-0.0213**
	1986***	**-0.0507**
Brazil	1887	-0.0354
	1926**	**-0.0030**
Chile	**1908****	**-0.0164**
	1916**	**-0.0175**
	1926**	**-0.0592**
	1970	-0.0321
Argentina	**1910***	**-0.0449**
	1927	-0.0251
	1978*	**-0.0213**
	1996***	**-0.0231**
Uruguay	1894	-0.0296
	1910	-0.0362
	1927	-0.0427
	1956	-0.0165
	1996	-0.0240

Europe West	year	average 8-year growth rate
UK	**1915***	**-0.0296**
Netherlands	1854	-0.0046
	1889	-0.0077
	1911	-0.0180
	1928	-0.0268
	1938*	**-0.1023**
Belgium	1912	-0.0434
	1937***	**-0.0372**
France	1912	-0.0422
	1938*	**-0.0953**
Switzerland	1861	0.0002
	1911	-0.0197
Spain	1863	-0.0116
	1890	-0.0058
	1932***	**-0.0575**
Portugal	1901	-0.0058
	1912	-0.0119
Germany	1912	-0.0381
	1941	-0.1375
Austria	1912	-0.0570
	1928	-0.0434
	1940	-0.1180

Europe North	year	average 8-year growth rate
Finland	1874	-0.0126
	1912	-0.0494
Sweden	1912	-0.0292
Norway	1937	-0.0234
Denmark	1911	-0.0133
	1936	-0.0295

Europe East/ South	year	average 8-year growth rate
East Germany	1983	0.0059
Poland	1976	-0.0176
	1986	-0.0296
Hungary	1940	-0.0679
	1987	-0.0384
Czechoslovakia	1928	-0.0355
	1985	-0.0197

Europe East/South	year	average 8-year growth rate
East Germany	1983	0.0059
Poland	1976	-0.0176
	1986	-0.0296
Hungary	1940	-0.0679
	1987	-0.0384
Czechoslovakia	1928	-0.0355
	1985	-0.0197

Asia/Oceania	year	average 8-year growth rate
Turkey	1938	-0.0580
Japan	1888	0.0304
Pilippines	1980	-0.0314
Indonesia	1960	-0.0147
Australia	1912	-0.0149
	1925	-0.0366
New Zealand	1877	-0.0170
	1926	-0.0160

Table 5a. Base Model Results (Coefficients)

Crises and Takeoffs

Dependent variable: rapid growth episode 0-1	All years 1870-2003		1870-1933 Gold Standard[19]		1946-1971 Bretton Woods		1975-2003 Post-Oil Shock years	
	1	2	3	4	5	6	7	8
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)	**0.206†**	**0.248***	**-1.163***	-0.534	**0.994*****	**0.710****	**0.441†**	**0.6877****
Banking crisis (lag)	0.077	0.248	-0.141	0.172			0.583	**0.7585†**
Twin crisis (lag)	-0.259	**-0.313†**	**-0.840***	**-0.653†**			-0.012	-0.3592
War Dummy	0.052	0.050	0.369	0.197				
Great Depression dummy	0.072	0.055	-0.197	-0.395				
Volume of Trade(t-1)	**1.364***	**1.413***	-0.166	-0.424	2.757	2.584	**4.915*****	**5.330*****
Volume of Trade(t-2)	-0.950	-0.986	1.348	1.574	-1.423	-1.317	**-4.667****	**-5.030****
Investment(t-1)	**-7.547*****	**-7.622*****	-4.836	-3.512	**-11.831****	**-12.383****	**-14.042****	**-15.343****
Investment(t-2)	**3.682***	**3.613***	-0.030	-1.323	**9.956***	**10.318***	5.592	6.575
TGE 3year av.(t-1)	**-1.417****	**-1.457****	**-3.770***	**-3.956***	-2.066	-1.900	-0.691	-0.943
log gdp(t-1)	**-2.994*****	**-3.021*****	**-3.969****	**-4.148****	**-9.749*****	**-9.683*****	-1.206	-2.150
log gdp 4year av.(t-2)	**2.625*****	**2.656*****	**2.865***	**3.057***	**8.930*****	**8.931*****	0.736	1.685
Polity (t-1)	**0.019***	**0.019***	**0.066*****	**0.063*****	0.000042	-0.004	**0.074***	**0.074***
log gdp_t (t-1)	-0.616	-0.682	2.437	1.852	0.683	0.775	**-5.594†**	**-6.585***
VOT_t (t-1)	**-1.364***	**-1.318***	1.279	0.214	-1.827	-0.882	**-5.870***	**-5.909***
Investment_t (t-1)	-0.030	0.170	-9.320	-6.130	**-24.698†**	**-27.663†**	20.700	23.289
Polity_t (t-1)	0.051	0.048	-0.085	-0.088	**0.729****	**0.693****	0.139	0.132
Infant mortality_t(t-1)	**-10.880*****	**-11.428*****	-15.278	-18.849	**-58.288****	**-56.923****	-123.637	-139.822
TGE_t (t-1)	0.953	0.984	**9.002†**	7.434	**-17.845†**	**-20.393†**	**22.249†**	**23.649†**
Constant	**8.620***	**9.129****	-9.014	-3.851	10.166	9.684	48.412	**56.710†**
N	2969	2969	687	687	966	966	1161	1161

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[19] Excluding years 1914-1918

Table 5b. Base Model Results Marginal Effects[20]

Crises and Takeoffs

Dependent variable: rapid growth episode 0-1	All years 1870-2003		1870-1933 Gold Standard[21]		1946-1971 Bretton Woods		1975-2003 Post-Oil Shock years		1946-2003 Post World War II years	
	1	2	3	4	5	6	7	7	9	10
	2 lags of crisis, %	3 lags of crisis, %	2 lags of crisis, %	3 lags of crisis, %	2 lags of crisis, %	3 lags of crisis, %	2 lags of crisis, %	3 lags of crisis, %	2 lags of crisis, %	3 lags of crisis, %
Currency crisis (lag)	**3.166†**	**3.878***	**-8.038***	-6.875	**19.653*****	**12.351****	**0.620†**	**1.127****	**2.993****	**4.006****
Banking crisis (lag)	1.345	4.082	-2.140	3.097			1.100	**1.410†**	4.049	**7.199†**
Twin crisis (lag)	-2.403	**-2.745†**	**-7.320***	**-7.485†**			0.035	0.123	-0.792	-0.492
War Dummy	0.893	0.916	4.145	0.927						
Great Depression years dummy	1.211	1.037	-2.903	-5.075						
Volume of Trade(t-1)	**10.308***	**10.739***	-0.566	-1.431	19.083	17.650	**34.710*****	**32.689*****	**11.448***	**14.337***
Volume of Trade(t-2)	-3.680	-3.740	5.972	7.457	-3.452	-3.394	**-0.266****	**-0.202****	**-1.509***	**-2.340†**
Investment(t-1)	**-4.687*****	**-4.666*****	-3.350	-2.689	**-4.369****	**-4.603****	**-0.248****	**-0.188****	**-1.387*****	**-2.147*****
Investment(t-2)	**4.210****	**4.084****	-0.025	-1.094	**11.025***	**11.857***	0.412	0.332	**1.324†**	**1.840†**
TGE 3year av.(t-1)	**-2.127****	**-2.158****	**-3.180***	**-3.438***	-2.178	-2.099	-0.065	-0.055	-0.436	-0.635
log gdp(t-1)	**-6.798*****	**-6.720*****	**-7.410****	**-7.781****	**-5.274*****	**-5.466*****	-0.251	-0.199	**-1.731*****	**-2.776*****
log gdp 4year av.(t-2)	**65.525*****	**66.235*****	**43.645***	**48.191***	**94.725*****	**94.533*****	0.844	1.698	**57.303****	**63.465****
Polity (t-1)	**1.933****	**1.897****	**7.784*****	**7.698*****	0.003	-0.297	**0.796***	**0.692***	**0.823†**	**1.125†**
log gdp_t (t-1)	-3.356	-3.580	6.427	4.773	1.634	1.931	**-0.201†**	**-0.166***	**-1.552****	**-2.459†**
VOT_t (t-1)	**-2.535***	**-2.440***	0.644	0.109	-1.140	-0.595	**-0.247***	**-0.190***	**-1.579*****	**-2.474*****
Investment_t (t-1)	-0.018	0.102	-2.891	-2.105	**-3.635†**	**-4.000†**	0.312	0.258	0.542	0.693
Polity_t (t-1)	1.503	1.419	-1.703	-1.825	**5.223****	**5.021****	0.357	0.199	**1.702†**	**2.132†**
Infant mortality_t(t-1)	**-4.811*****	**-4.893****	-3.993	-4.807	**-4.423****	**-4.529****	-0.250	-0.195	**-1.689*****	**-2.696*****
TGE_t (t-1)	**0.913***	**0.936***	**4.076†**	3.383	**-2.349†**	**-2.681†**	**0.528†**	**0.417**	0.131	0.172
N	2969	2969	687	687	750	750	1161	1161	2028	2028

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[20]The marginal effect of 1 standard deviation change from the estimation sample mean (for continuous variables) or a 1 point change from the sample mean for the Polity variables, and the change from 0 to 1 for dummy variables.

[21] Excluding years 1914-1918

Table 6. Base Model Results (Coefficients) Crises and Growth Collapses

Dependent variable: growth collapse episode 0-1	All years after 1870		1870-1933 Gold Standard[22]		1980-2003		All years after 1870	
	1	2	3	4	5	6	5	6
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)	-0.041	-0.033	0.126	0.182		**-1.281***	-0.180	-0.108
Banking crisis (lag)	-0.380	0.114	-0.270	0.288			-0.442	0.059
Twin crisis (lag)	0.266	0.235	-0.384	-0.694	**0.843***	0.430	0.210	0.210
War Dummy	**1.095*****	**1.104*****	**0.761***	**0.760***			**1.289*****	**1.288*****
Great Depression dummy	**0.983*****	**0.964*****	0.669	0.581			**1.260*****	**1.227*****
Volume of Trade(t-1)	0.413	0.460	1.041	1.460	0.062	0.336	0.408	0.503
Volume of Trade(t-2)	-1.132	-1.215	-1.107	-1.503	-2.550	-3.271	-1.174	-1.303
Investment(t-1)	**3.899†**	**3.675†**	-1.208	-1.296	6.777	5.653	**3.945†**	**3.781†**
Investment(t-2)	-2.612	-2.307	-0.952	-1.147	-4.094	-4.272	-2.474	-2.205
TGE 3year av.(t-1)	**0.947†**	**0.975†**	-3.025	-3.351	**2.057†**	1.877	**0.873†**	**0.923†**
log gdp(t-1)	0.053	0.154	1.042	1.307	**4.166†**	**4.929†**	-0.318	-0.167
log gdp 4year av.(t-2)	0.043	-0.069	-0.577	-0.846	**-4.522†**	**-5.308***	0.484	0.320
Polity (t-1)	**-0.023***	**-0.021***	-0.018	-0.014	**-0.055***	**-0.068***	**-0.023***	**-0.021***
log gdp_t (t-1)	**1.780***	**1.637†**	2.767	2.570	-7.907	-8.724	**1.992***	**1.857†**
VOT_t (t-1)	1.001	1.212	-2.420	-2.935	7.409	8.260	**2.776***	**2.940***
Investment_t (t-1)	2.831	3.372	-6.726	-6.445	**-68.658****	**-62.838****	-0.107	0.441
Polity_t (t-1)	-0.048	-0.057	-0.170	-0.195	-0.626	-0.504	-0.104	**-0.111†**
Infant mortality_t(t-1)	**20.414*****	**20.112*****	-19.243	-21.879	50.034	115.673	**16.959****	**16.932****
TGE_t (t-1)	-1.597	-1.120	**-25.753****	**-25.211****	18.107	28.139	-5.124	-4.618
US/UK Interest rate (t-1)							1.782	1.796
US/UK Growth rate (t-1)							**4.173****	**4.110****
Constant	**-20.004****	**-18.995****	-18.864	-16.772	79.734	81.168	**-21.651****	**-20.721****
N	2969	2969	687	687	966	966	2562	2562

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[22] Excluding years 1914-1918

Table 6. Base Model Results, , Marginal Effects[23]

Crises and Growth Collapses

Dependent variable: growth collapse episode 0-1	All years after 1870		1870-1933 Gold Standard[24]		1980-2003		All years after 1870	
	1	2	3	4	5	6	7	8
	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis	2 lags of crisis	3 lags of crisis
Currency crisis (lag)	0.891	0.952	2.695	2.949		**-0.008***	0.481	2.302
Banking crisis (lag)	-0.259	1.743	0.310	3.909			-0.284	3.625
Twin crisis (lag)	2.819	2.574	-0.115	-0.775	**0.321***	0.027	2.599	5.202
War Dummy	**12.309*****	**12.365*****	**8.547***	**8.010***			**16.666*****	**16.423*****
Great Depression dummy	**12.043*****	**11.581*****	7.230	5.840			**18.796*****	**25.660*****
Volume of Trade(t-1)	1.014	1.134	2.405	3.478	0.003	0.009	0.776	1.666
Volume of Trade(t-2)	-1.500	-1.534	-1.552	-1.776	-0.023	-0.005	-1.903	-3.355
Investment(t-1)	**1.934†**	**1.769†**	-0.495	-0.491	0.065	0.020	**1.738†**	**2.506†**
Investment(t-2)	-0.816	-0.725	-0.391	-0.433	-0.014	-0.003	-1.097	-1.664
TGE 3year av.(t-1)	**0.741†**	**0.755†**	-1.315	-1.320	**0.038†**	0.014	**0.409†**	**0.709†**
log gdp(t-1)	0.233	0.731	6.346	8.435	**27.224†**	**35.770†**	-1.368	-1.503
log gdp 4year av.(t-2)	0.184	-0.267	-1.614	-1.925	**-0.023†**	**-0.005***	2.748	2.281
Polity (t-1)	**-0.726***	**-0.660***	-0.714	-0.532	**-0.017***	**-0.004***	**-1.051***	**-1.607****
log gdp_t (t-1)	**12.131***	**10.351†**	4.088	3.474	-0.020	-0.005	**14.874***	**17.988†**
VOT_t (t-1)	1.048	1.295	-0.549	-0.608	0.471	0.280	**3.784***	**6.148***
Investment_t (t-1)	0.780	0.938	-1.067	-0.956	**-0.022****	**-0.005****	-0.313	-0.281
Polity_t (t-1)	-0.476	-0.551	-1.497	-1.532	-0.023	-0.005	-1.241	**-2.123†**
Infant mortality_t(t-1)	**14.793*****	**14.245*****	-2.156	-2.138	0.034	0.059	**10.537*****	**14.709****
TGE_t (t-1)	-0.521	-0.371	**-2.641****	**-2.413****	0.038	0.032	-1.648	-2.572
UK/US Interest rate(t-1)							0.225	0.358
US/UK growth rate (t-1)							**1.087****	**1.645****
N	2969	2969	687	687	966	966	2562	2562

† p<0.1 * p<0.05, ** p<0.01, *** p<0.001

[23]The marginal effect of 1 standard deviation change from the estimation sample mean (for continuous variables) or a 1 point change from the sample mean for the Polity variables, and the change from 0 to 1 for dummy variables.

[24] Excluding years 1914-1918

Table 7: Exports and Imports growth –deviation from the historical mean[25]

		Post-currency crisis		**Post-Banking crisis**		**Post-Twin crisis**		**Tranquil times**	
		Imports	Exports	Imports	Exports	Imports	Exports	Imports	Exports
I	All time periods[26]	**.02916***** (.007806) [27]	**.043046***** (.00782)	**-.02501**** (.01017)	-.00406 (.00946)	**-.02435†** (.01546)	.00737 (.00947)	.000747 (.001756)	**.00367**** (.00160)
II	Before 1933[28]	-.01672 (.01631)	-0.0055 (.01565)	**-.02805**** (.01251)	-.00253 (.01235)	.00311 (.014453)	**.022968†** (.01417)	**-.01838***** (.00260)	**-.01506***** (.00230)
III	After 1946	**.042095***** (.00796)	**.05554***** (.00803)	-.01868 (.01963)	-.00429 (.01585)	**-.03485†** (.02214)	.00181 (.012704)	**.01313***** (.00237)	**.01717***** (.00218)
IV	Difference: After - Before	**.05881***** (.01815)	**.061008***** (.01759)	.009367 (.02327)	-.001758 (.02009)	**-.03798†** (.02644)	-.021155 (.019032)	**.03152***** (.00352)	**.03223***** (.00317)
V	Difference: Crises- Tranquil (Before 1933)	.02075 (.02453)	.01972 (.01877)	-.00966 (.01278)	.01253 (.01256)	**.02150†** (.014686)	**.03803**** (.014357)		
VI	Difference: Crises- Tranquil (After 1946)	**.02896***** (.00831)	**.04240***** (.00837)	**-.03182†** (.019772)	-.02146 (.016001)	**-.0479**** (.022275)	-.01536 (.01289)		

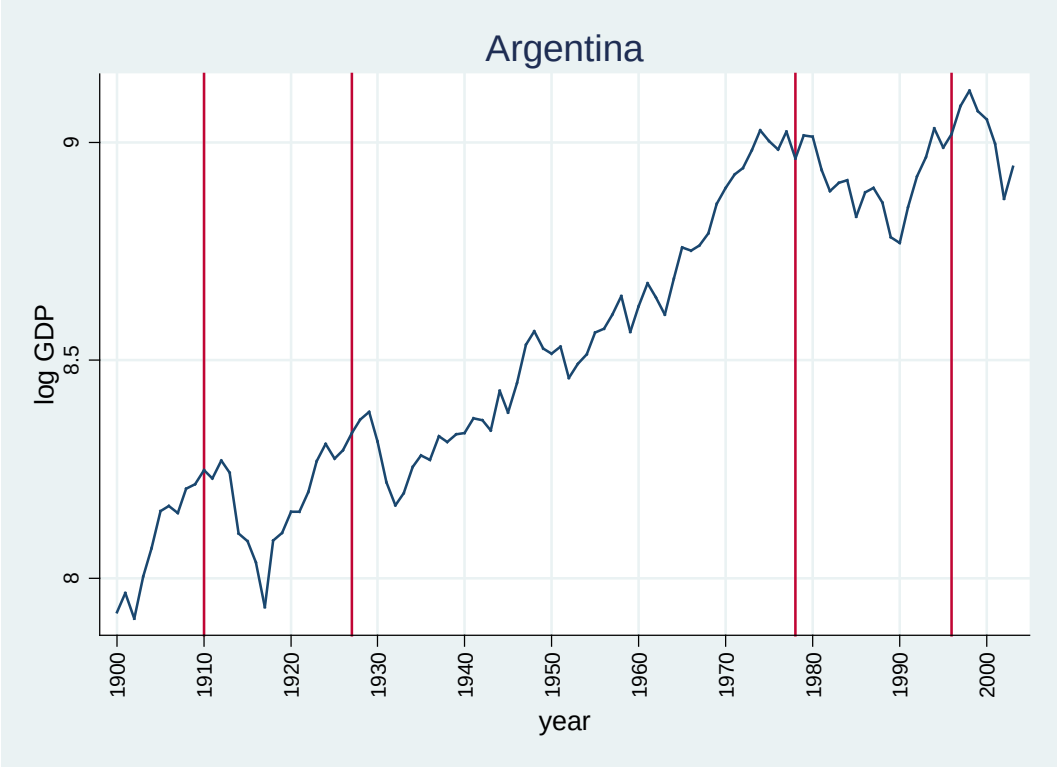
[25] Difference between a 5 year forward-looking (time t to t+4) average growth rate of exports(imports), and their historical growth mean, conditional on a financial crisis occurring at time t-1. The historical mean is calculated as the average export(import) growth rate from time t=0 to time t, excluding the crises years.

[26] Excluding the WWI years, and the Great Depression years.

[27] Standard errors in parentheses. *** denotes significance on at least 1% level; ** significance on 5% level, * significance on 10% level, † denotes significance of a one-tailed test on at least 10% level.

[28] Excluding 1914-1918 and 1929-1933 (World War I and the Great Depression years) for all countries.

Figure 1. a-b Output Collapses



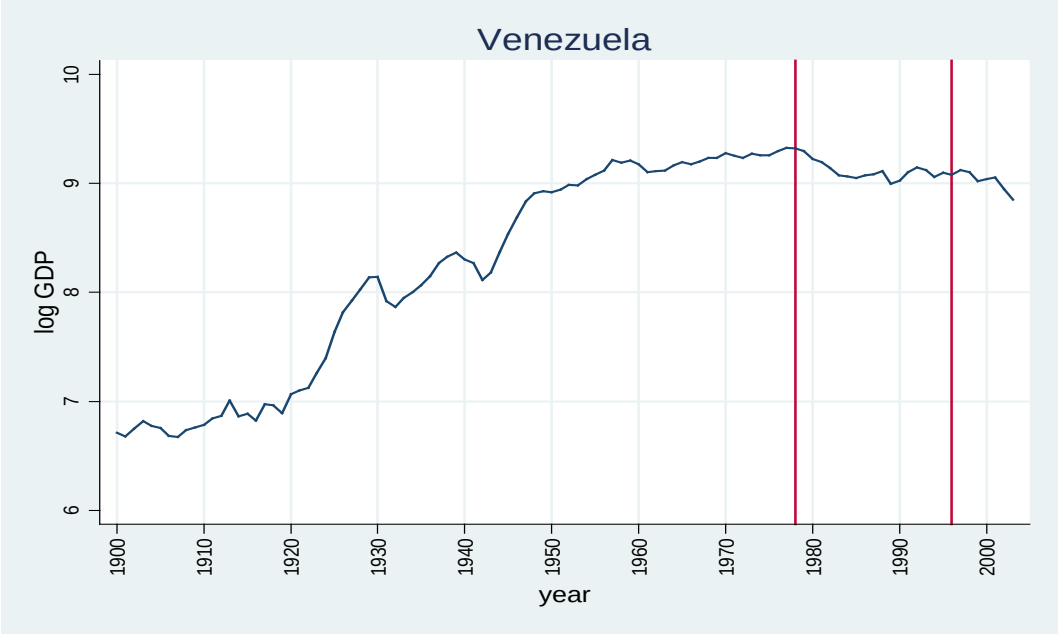
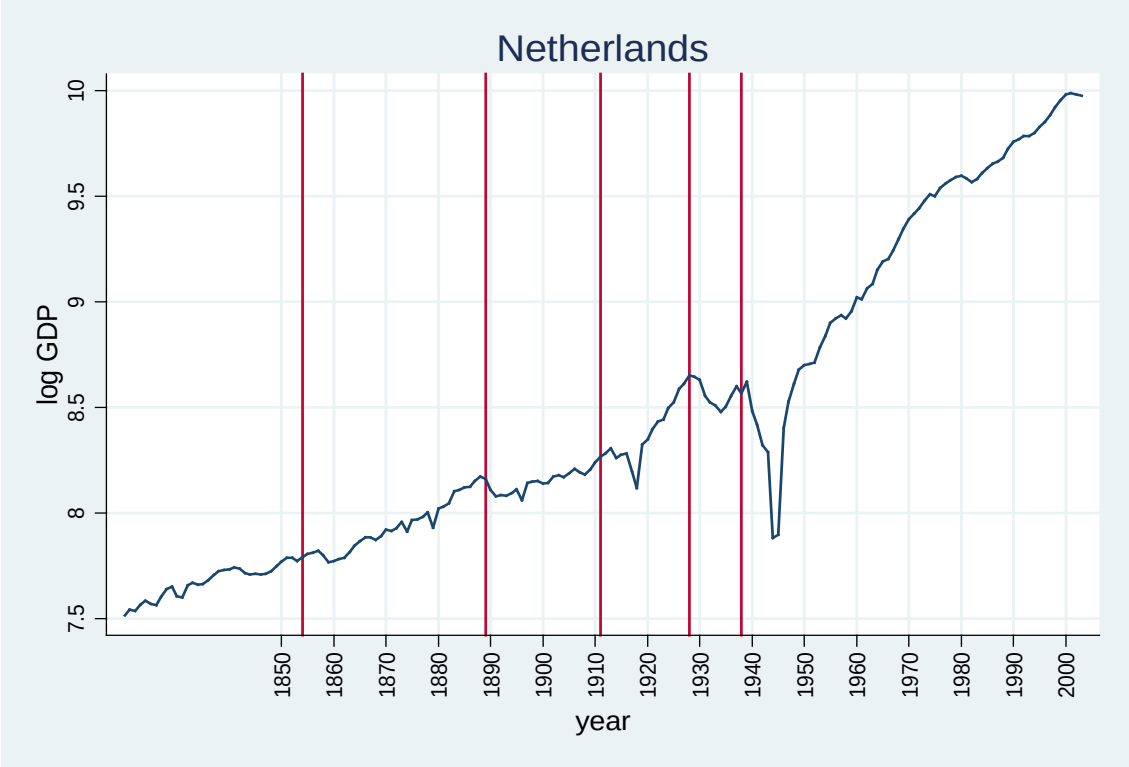


Figure 1. c-d Output Collapses



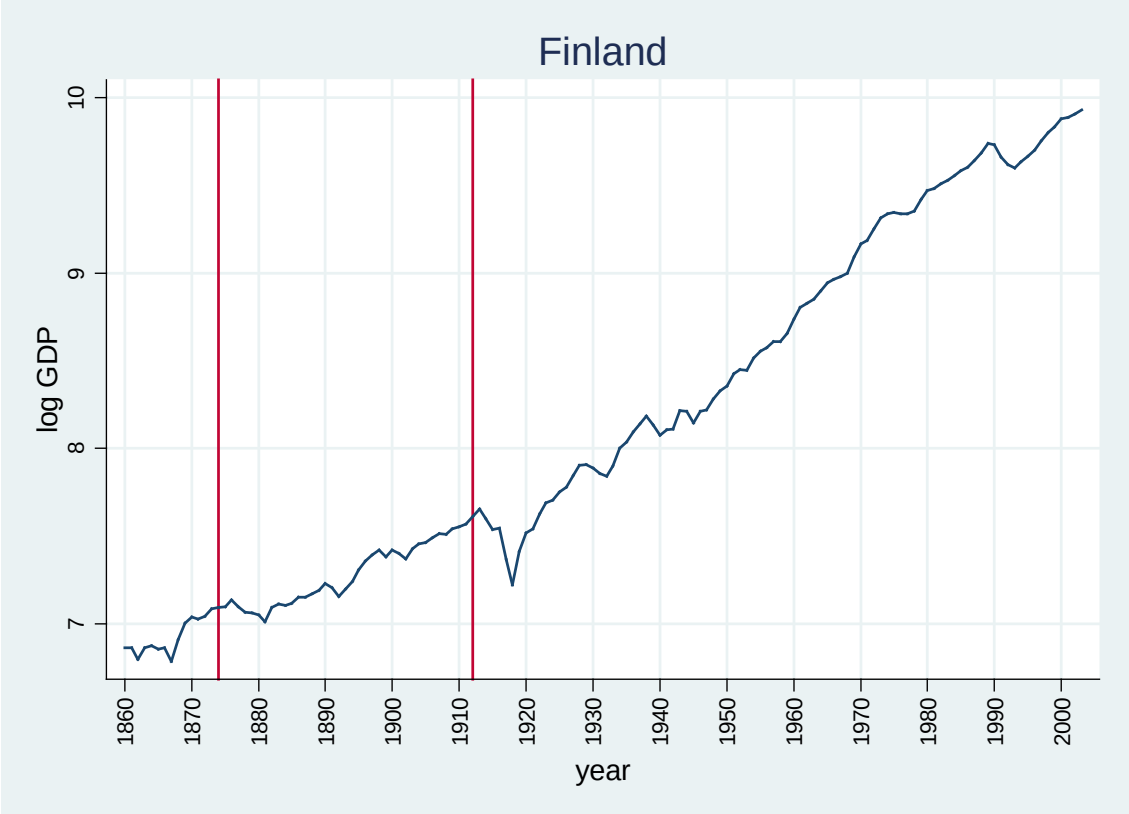
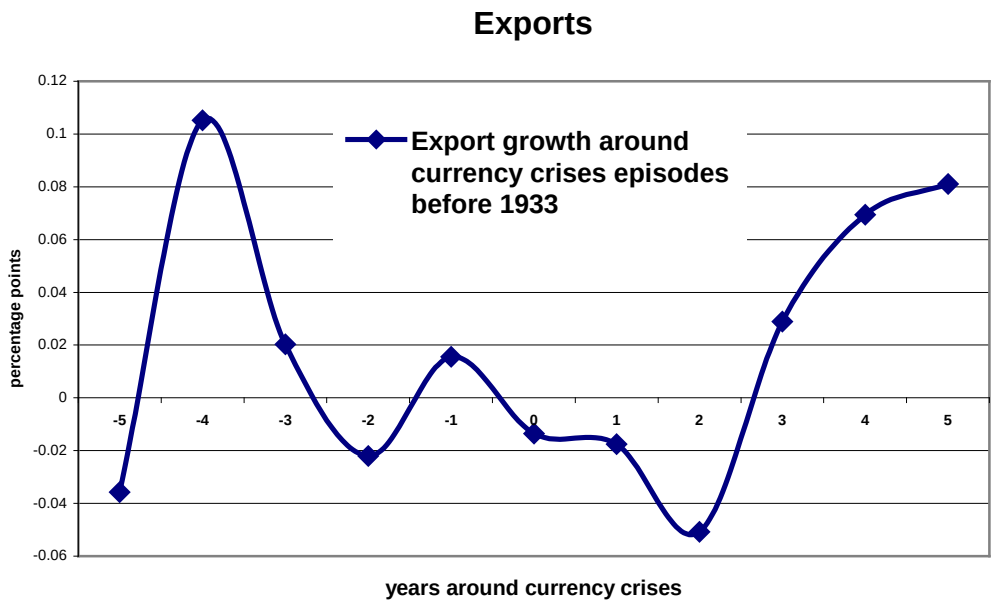


Figure 2 a-b
Export growth (deviation from historical mean) around currency crises episodes.



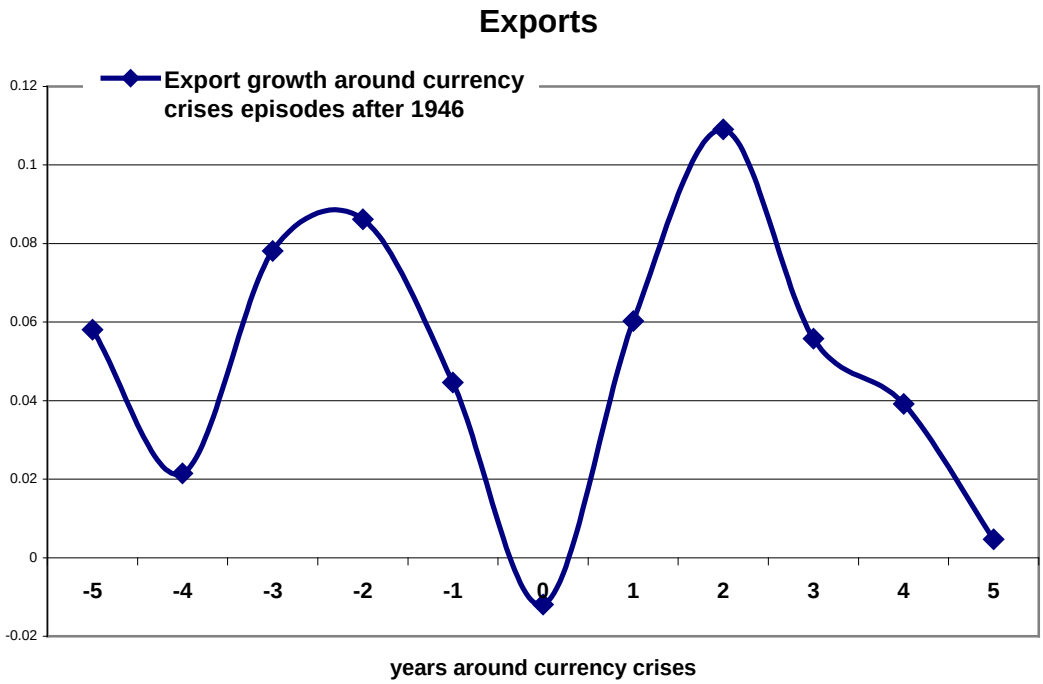


Figure 2 c-d
Import growth (deviation from historical mean) around currency crises episodes