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Abstract

Avoiding the broader output losses to their economy is likely to be the key reason why governments avoid debt crises. Despite this, there has been little work that seeks to quantify output losses associated with such crises. This paper seeks to fill this gap. We find that debt crisis episodes last for long — on average by about ten years — and are associated with large output losses (of at least 5% per year). Sovereign crises rarely occur in isolation — more often than not they are associated with currency crises or banking crises or both. It is the occurrence of a potent cocktail of 'twin' or 'triple' crises that is strongly associated with output losses rather than sovereign crisis *per se*.

Key words: Sovereign debt, output losses, banking crises, currency crises.

JEL classification: F33, F34.

Contents

Summary

There have been many financial crises over the past 30 years especially in emerging market economies (EMEs). Crises have either hit the banking sector, the currency, the government or all three. This has spawned a large volume of empirical studies that have attempted to predict these types of crises. In recent years, there have also been a number of studies that have quantified the costs associated with banking and currency crises but there have been very few on the costs of sovereign debt crises. This is surprising especially given that some debt crises have had a broader impact on the global financial system such as the Latin American debt crisis in the early 1980s and the more recent Russian sovereign debt crisis ten years ago which culminated in the bail out of LTCM. This paper seeks to help fill this gap by assessing the impact on output of 40 sovereign debt crises since the 1970s.

In order to calculate the impact on output during periods of debt crises an estimate of what output would have been in the absence of crisis is needed. Two methods are adopted to measure this output counterfactual. The first method uses a relatively simple (Hodrick-Prescott) time trend of the country's GDP growth before the crisis. The second method involves estimating a model that, aside from the debt crisis itself, explains output growth (per head) by the ratio of investment to GDP, the ratio of government consumption to GDP, inflation, the degree of trade openness and a measure of political stability. This procedure should give a more precise measure of the counterfactual growth rate, since it controls for other factors that may affect output growth during the period of the sovereign crisis. As a check on the robustness of the results, the path of output during these sovereign crisis periods was compared to that for similar countries that at the time did not have sovereign crises. Nonetheless, given the difficulty in distinguishing between the loss in output due to the sovereign crisis itself – the cost of sovereign crisis – from the loss caused by the economic event that triggered the crisis in the first place, perhaps more weight should be attached to the relative costs of different types of crises.

The results suggest that, on all methods, debt crisis periods are associated with large output losses – falls in output relative to the counterfactual – of at least 5% per annum – and last a long time – on average for about ten years. Sovereign crises also rarely occur in isolation. More often than not they are associated with banking and/or currency crises. Moreover, it is the potent cocktail of triple crises that are found to have the biggest output losses.

Given that governments in EMEs, unlike in developed countries, have in the past often defaulted at relatively low levels of external debt these results emphasise the importance for EMEs of adopting sound macroeconomic policies and structural reforms to avoid unsustainable debt positions in the first place. In fact, since the new millennium, many EMEs have improved their policy frameworks and made progress in reducing the amount of government debt owed to foreigners while also lengthening the maturity of their debts. But total government debt, including that owed to domestic residents, remains high in a number of EMEs. Governments are also often reliant for debt financing on their domestic banks. This makes some EME banks vulnerable to sovereign weakness and potentially *vice versa* if governments bail out weak banking systems. Moreover, improvements in debt positions over the past decade were helped by the unusually benign external conditions including strong world GDP growth, low inflation and interest rates. The external environment is now significantly less favourable and so it is important that EMEs do not allow their fiscal positions to deteriorate markedly.

Once in a crisis, annual output losses are found to increase the longer that countries stay in arrears or take to restructure their debts. There is also some evidence that countries that restructure their debts face lower output losses than those that do not. This is consistent with the recent policy emphasis on the importance of market-based policy initiatives aimed at improving the speed and efficiency of debtor-creditor restructuring.

1   Introduction

The literature on sovereign debt has long-posed the question of 'why do sovereigns pay their debts?' The question arises because sovereigns, unlike companies, cannot be liquidated. In the absence of gunboat diplomacy, there is no national or international body that can enforce the payment of contracts to sovereign creditors. Indeed, in the 19th century the lack of enforcement of sovereign debts in foreign courts was seen as an inalienable part of sovereign immunity. In a classic dismissal of a case brought against the Portuguese government for alleged misappropriation of money in 1852, the British Lord Chancellor pronounced:

'To cite a foreign potentate in a municipal court…is contrary to the law of nations and an insult which he is entitled to resent'.[1]

It was not until the 1970s that the distinction between a sovereign's commercial activities and its acts of sovereign power became enshrined in major creditors' laws. In particular, the United States and the United Kingdom enacted the Foreign Sovereigns Immunity and State Immunity Acts in 1976 and 1978 respectively. Since their enactment it has become common practice for most countries to include a sovereign immunity waiver in their foreign loans and bond contracts which gives commercial creditors the legal right to seek repayment of their loans in the event of default through seizure of the sovereign's assets (eg, Rogoff and Zettelmeyer (2002)).

From a practical perspective, however, the security that creditors have from sovereign immunity waivers is limited. This is because they largely apply to assets held by the defaulting sovereign for commercial activity in the country where the loan or bond contract was issued,[2] which are usually insufficient to cover the amounts due. In addition, a country can attempt to remove its assets from the relevant foreign jurisdiction before it defaults. It is commonly accepted in the literature, therefore, that the threat of seizure of its foreign assets guaranteed by sovereign immunity waivers cannot explain why sovereigns repay their foreign debts. Two main other reasons therefore have been put forward that might explain why sovereigns specifically avoid defaulting.

The first reason of being wary of defaulting is that international commercial creditors may be able to credibly threaten to prevent a defaulted sovereign from future access to international

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[1] De Haber v. Queen of Portugal (1851), quoted in Kaletsky (1985, page 22).
[2] Usually in the United States or in the United Kingdom.

capital markets in the event of a default. However, the theoretical evidence is mixed on how a sovereign contemplating default might balance the potential loss of access to international capital markets against its ability to use the breathing space afforded by default to support domestic expenditure. In a seminal paper, Eaton and Gersovitz (1981) argue that, if the expected reduction in future consumption from losing market access is at least as large as any increase in current consumption from default, sovereigns should prefer to honour their debt repayments.[3] In contrast, Bulow and Rogoff (1989) suggest that, if the government can invest borrowed funds in international markets, this cushion could be used to support current consumption should the sovereign be cut off from international borrowing following a voluntary default.

A loss of trade finance may also result in defaulters facing a reduction in international trade. This was one of the main concerns voiced during the Less-Developed Countries' crisis in the early 1980s. The concern, however, may be overstated. Trade finance need not be provided by the same creditors that hold the defaulted debt. For example, during the 1980s a few major international banks held most of the defaulted Latin American debt. But this did not prevent other banks, with fewer exposures, stepping in to provide trade finance.[4]

Overall, the empirical evidence suggests that sovereign default is not necessarily associated with any loss of market access, so fears about any such loss may not in themselves be a major deterrent to default. Lindert and Morton (1989) argue that in the 1930s, and again in the early 1980s, during periods when a number of countries defaulted, external credit was no more inaccessible to sovereign defaulters than to non-defaulters. Jorgensen and Sachs (1989) find that, in the two decades following the 1930s sovereign debt crisis, access to international capital markets for Latin American countries was severely restricted for previous non-defaulters as well as for defaulters. And once capital markets opened up in the 1960s, defaulters found it as easy to access capital as non-defaulters. More recently, assessing defaults since 1980, Medeiros *et al* (2005) find that the probability of regaining market access after default depends partly on a country's external situation at the time of default and partly on its domestic macroeconomic performance.[5] More generally, Gelos *et al* (2004) find that it only took past defaulters 3½

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[3] That said, myopic governments might attach a high weight to current rather than future consumption, and therefore a low weight to the risk of future default through increasing current borrowing. Cole and Kehoe (1995, 1998) show that the ability to support debt repayment depends on the international relationships of the country and the alternatives that are open to it. More generally, Cole, Dow and English (1995) provide a model of sovereign debt where creditors do not know whether the sovereign is myopic or not. In their model, less myopic governments signal their type by making a repayment. If the repayment is sufficient they can regain access to markets.

[4] Also, during the 1930s debt crisis, when similar to the 1990s most emerging market debt was held by bondholders rather than commercial banks, banks made it clear at the time that they would not associate themselves with any attempt to deny export credit to a defaulting country (Eichengreen and Portes (1989)).

[5] As measured by GDP growth, inflation, the current account balance and foreign currency reserves.

months, on average, to regain market access after defaulting during the 1990s compared with more than 4½ years during the 1980s. And Tomz (1998) finds that, during the interwar period, defaulting countries that were expected to default, given their poor fundamentals, could regain access to capital markets twice as quickly as countries that defaulted unexpectedly, given their better fundamentals.

Although the empirical evidence does not suggest that default necessarily closes off market access, it does point to an adverse effect on the government's *cost* of future market access. Ozler (1993) finds that, during the tranquil period of the 1970s, lenders charged up to 50 basis points more for loans to previous (post-1930) defaulters. And more recently, Reinhart *et al* (2003) find that EMEs with a history of defaulting on their external debts – especially 'serial defaulters' – received a lower credit rating over the 1979-2000 period than non-defaulters that displayed similar financial strength.[6]

Also on trade, Rose (2002) has found that countries with debts rescheduled by the Paris Club have suffered a statistically significant reduction in trade with their creditors.[7] The author acknowledges, however, that their trade may have well been diverted to non-creditor countries. The second reason for being wary of defaulting is that governments may want to avoid broader losses to the domestic economy associated with default, beyond those caused by a tightening in the terms and conditions on borrowing imposed by foreign creditors and a loss of trade. Dooley (2000) shows that output losses, assumed to be due to domestic residents being unable to borrow from *domestic* as well as foreign creditors in the aftermath of crises, may be the most important incentive for debt repayment. And more recently, Alfaro and Kanczuk (2005) use a dynamic equilibrium model of sovereign debt and find on their calibrations that the threat of higher borrowing costs alone is insufficient to discourage debtors from defaulting. It is only when default also results in 'additional output costs' over and above those caused by higher interest rates that equilibria are derived that are consistent with the stylised facts on the frequency of sovereign defaults.

But through which mechanisms are these 'additional output costs' incurred? One mechanism by which a sovereign default – or more generally an actual or perceived unsustainable government debt position – may reduce output is through its impact on the domestic financial system. In many EMEs, domestic banks are major creditors of the government and so may be severely

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[6] Measured by the ratios of external debt to both GDP and exports. De Paoli *et al* (2006) find a similar result analysing more recent data.
[7] By about 8% a year for around 18 years.

weakened, if not made insolvent, when the government defaults on, or restructures, its debt (including that owed to the domestic sector). In this case, banks may stop playing their intermediation role of providing liquidity and credit to the economy.[8] Banking problems, in turn, may end up as a liability for the government.[9]

Foreign and domestic investors might also react to an actual or prospective sovereign default on its external debt by questioning whether the government has sufficient foreign currency to defend the exchange rate. For net foreign currency borrowers, a sharp currency depreciation would, in turn, increase – when valued in domestic currency terms – the net foreign currency debts and debt service costs of the government, banks and the non-bank private sector.[10] A tightening in monetary policy might limit the extent of exchange rate depreciation but at the expense, in the short run at least, of reducing domestic demand and liquidity in the financial system. Therefore, a triple – sovereign, banking and currency – crisis may ensue, involving a run on both the domestic currency and the banking system. But since depreciation tends to increase trade competitiveness there would, after a time lag, be a potentially offsetting gain in net exports and output depending, *inter alia*, on the size of the traded goods sector (see Frankel (2005)) and whether exporters have access to trade finance.

An important point to note about these broader costs associated with sovereign crises is that they could occur potentially for any sovereign with an actual or prospective unsustainable debt position whether it actually defaults or not. Moreover, once a government's debts become unsustainable an alternative policy of reducing its debts voluntarily through a very sharp tightening in fiscal policy may itself cause a sharp contraction in domestic demand and output.

Despite research pointing to the importance of output losses as a reason why sovereigns would want to avoid a debt crisis, there have been few empirical studies that have sought to quantify directly the losses following sovereign crises nor on the costs and benefits of different types of crisis resolution.[11] This gap in the literature is even more surprising given that similar studies have now been carried out extensively for banking and currency crises and their combination – so-called 'twin crises' – but not for sovereign debt, banking and currency crises – which we can dub 'triple crises' (see for example Kaminsky and Reinhart (1999), Aziz *et al* (2000), Bordo *et al* (2001), Hoggarth *et al* (2002) and Cerra and Saxena (2005)). The purpose of this paper is to fill this gap.

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[8] This happened, for example, in Russia after the government suddenly defaulted on its domestic debt in Autumn 1998.

[9] See Hoggarth *et al* (2004) for evidence of the government's role in past systemic banking crises.

[10] For the balance sheet channel of currency depreciation see, *inter alia*, Cespedes *et al* (2004).

[11] An exception is the recent case studies of pre and post-default restructurers by Finger and Mecagni (2007).

The results suggest that sovereigns that have debt crises face deep recessions. The median output loss in our sample is at least 5% <u>a year</u> of pre-crisis annual output and significantly higher on some definitions of crisis and measures of losses. This is very large and bigger than the estimates reported in papers that estimate output losses of banking and currency crises. Moreover, a debt crisis commonly coincides with banking or currency ones and that when it coincides with both it tends to be considerably more costly. Financial crises rarely occur in isolation – (like buses) they more often than not come in triplets – and when they do the output losses are found to be very large. Moreover, debt restructuring is associated with lower output losses for the defaulting sovereign than staying in arrears. This seems to be consistent with the view that debt restructuring facilitates subsequent market access to international and potentially domestic creditors.

The rest of the paper is organised as follows. In Section 2, definitions are provided of what constitute episodes of sovereign debt, currency and banking crises. Section 3 provides descriptive statistics on the frequency of crises in our sample. Section 4 sets out the two methods we use to measure output losses. Section 5 presents the results. Section 6 offers some concluding remarks. All tables can be found in the appendix.

2   Defining debt crises

A number of authors have attempted to define a sovereign debt crisis episode. This exercise is far from trivial. A review of the various approaches employed in the literature leading to the precise description of our crisis identification procedure and the data can be found in the annex.

In summary, we identify a crisis episode when there is either an actual default defined as when the arrears on principal on external obligations towards private creditors reach at least 15% of total commercial debt outstanding or the arrears on interest on external obligations towards private creditors reach at least 5% of total commercial debt outstanding and/or there is a rescheduling with private creditors as listed in the World Bank's *Global Development Finance*.[12] Following this identification procedure, our final sample consists of 35 countries and 39 sovereign crisis episodes over the 1970-2000 period.

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[12] A broader definition of sovereign crisis would include countries with unsustainable debts that instead resolve them voluntarily through a marked fiscal contraction. We have not opted for such a definition here mainly because of the identification issues involved in measuring unsustainable debts.

In the subsequent sections, we will be explicit about the nature of the debt crisis identification criteria because there is a conceptual difference between rescheduling and arrears. The former might reflect a country's attempt to continue servicing its debts when it is unable to pay the whole amount due whereas the latter clearly does not. Our basic source on arrears and reschedulings is the World Bank's *Global Development Finance* (GDF) CD-ROM. The CD-ROM has comprehensive data on arrears since 1970 and on reschedulings from 1989 onwards. We complement this with data on rescheduling from hard copies of the World Debt Tables from 1970-89 and information from Beim and Calomiris (2001) and Cline (1995).

We identify a currency crisis using Frankel and Rose's (1996) procedure. In particular, we say that a sovereign crisis coincides with a currency crisis when there has been a 25% annual nominal depreciation of a country's domestic exchange rate against the US dollar and a 10% increase in the rate of depreciation in any year of the debt crisis or one year before the onset of the debt crisis. We say that a debt crisis has coincided with a banking crisis if a systemic banking crisis is recorded in Caprio and Klingebiel (2003).[13]

3 Descriptive statistics: sovereign debt, currency and banking crises

Do episodes of sovereign crises coincide with other financial crises? In order to illustrate how often debt crises occur simultaneously with other crises, we follow the method introduced by Reinhart (2002). The approach consists of computing the conditional probability of experiencing a currency or banking crisis given that a sovereign crisis has occurred.

Table 2 shows that in three quarters of our sample sovereign debt crises overlap with currency crises and in most of these the currency crisis starts after, or in the same year, as the sovereign crisis.[14] In two thirds of the sample, sovereign crises overlap with banking crises with again most of the banking crises starting after the sovereign crises. In fact, in almost half the sample sovereign crises overlap with both currency and banking crises and they usually precede or start in the same year as the banking and currency crises. These data show that in the vast majority of our sample, sovereign crises do not occur in isolation. Moreover, given that usually sovereign

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[13] They define a systemic banking crisis, as an episode during which 'all or almost all' of the banking system's capital has been wiped out.

[14] By 'overlap' we mean that the currency or banking crisis may have occurred either before or during the sovereign debt crisis episode, but in the former case it continues during the debt crisis episode as well. See Reinhart (2002) for a detailed description of the method used. Note that the sample includes only the debt crisis countries listed in Table 4. This influences the frequency (or unconditional probabilities) of the different episodes.

debt crises lead banking and currency crises these results are suggestive – but do not prove – that sovereign debt crises often cause broader types of crises.

4   Measurement issues

In order to calculate output losses during debt crisis periods we need to obtain a measure of what output would have been in the absence of the crisis. We adopt two methods for estimating this counterfactual.

The first method follows an approach already taken in the banking and currency crisis literature, which involves estimating a simple growth rate counterfactual by applying a Hodrick-Prescott (HP) filter on a country's GDP series up to the year prior to the onset of the sovereign crisis (eg, Hoggarth *et al* (2002)). Our counterfactual growth rate is then given by the average of the past two years growth rates implied by the HP trend. Chart 1 compares the average growth rates obtained in this way across the episodes of sovereign crisis with the average annual growth rates ten, five and three years prior to default crises.

A stylised fact that emerges from Chart 1 is that, on average, GDP growth three years prior to the onset of sovereign crises drops a little from its longer-term trend rate – represented here by the HP trend, but as it turns out, equivalently by the five-year average annual growth rate prior to the crisis.

Chart 1: Average annual GDP growth rates before the onset of sovereign crisis
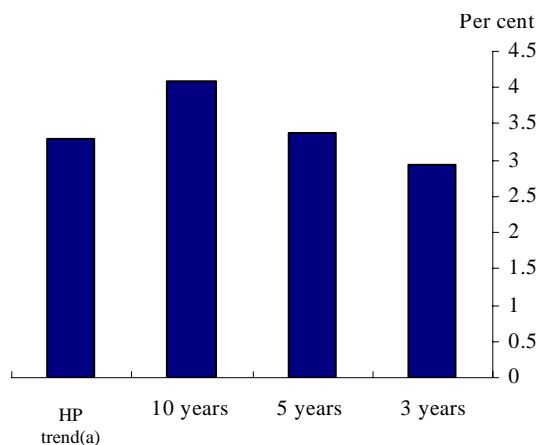
Source: Global Development Finance Indicators and authors' calculations.

(a) The average growth rate in Hodrick-Prescott trend on a country's annual GDP series prior to the onset of a sovereign crisis episode.

Equally, on average, sovereign crisis countries have experienced unusually high GDP growth in the ten years prior to the start of the crisis. To the extent that these relatively high previous growth rates (financed in part with the accumulation of external debt) can be regarded as unsustainable and the growth rates three year prior to crisis are viewed as signalling the economy's descent into crisis, it seems reasonable to measure potential output growth rate using a growth rate somewhere in between (which is in line with our HP trend statistic).

The method described above could, however, overstate what output growth would have been in the absence of a sovereign crisis. This would be the case if sovereign crises are, in fact, caused by recessions or if slower GDP growth and sovereign crises are both caused by some third factor. As shown in Chart 1, GDP growth does slow down prior to sovereign crises. That said, on average in our sample, GDP growth only turns negative once sovereign crises have started. The latter, however, is only suggestive that sovereign crises actually cause the output losses. In the costs of banking crises literature Bordo *et al* (2001) attempt to tackle this problem by identifying the factors that cause recessions, in addition, to banking crises *per se*. Similarly, we adopt a method that seeks to explain the factors that determine GDP growth for the countries in our sample other than caused by the impact of sovereign crises. Potential output growth is estimated using a panel regression with 32 (sovereign crisis) countries over the 1970-2000 period.[15] We condition the four-year average of output per capita growth on the ratio of investment to GDP, the ratio of government consumption to GDP, inflation, the degree of openness, a measure of political instability and, finally, a sovereign crisis dummy that assumes the value of one throughout the crisis episode.[16] The selection of control variables was made on the basis of the vastly documented growth literature.[17] [18] Moreover, the final choice of specification was based on stability tests on the coefficients, the quality of the regression fit and the consistency of the signs of the coefficients.

We employed fixed-effect estimation with the purpose of factoring out country idiosyncrasies. In addition, we estimated the panel using a two-stage least square procedure whereby country-specific lagged values of the explanatory variables served as instruments in the first stage. This procedure was taken in order to address the concern regarding the endogeneity of some of these variables and the potential correlations between the conditioning variables and the error terms. The results, reported in Table 3, are consistent with standard growth theory. In particular, sovereign crises significantly affect growth, reducing the four year growth average rates by 1.7%.[19] The regression output presented in Table 3 indicates a strong negative impact of

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[15] For three countries in our sample of crises (Panama, Georgia and Grenada) long enough time series for the explanatory variables were not available.
[16] Following the panel growth regression literature, all the variables are four-year averages. The GDP per capita, investment/GDP, government/GDP and inflation rate variables are constructed using the *World Development Indicators* (World Bank, 2003). The degree of openness measure is taken from Sachs and Warner (1995). Finally, the data source for the political instability index is Banks (2002) and it is constructed using an average of 'annual number of assassinations' and 'annual number of revolutions'.
[17] Barro and Sala-i-Martin (1995) gives a good description of the growth regression methodology and the reasoning behind the choice of control variables.
[18] A more recent literature seeks to explore the factors that determine periods of sustained GDP growth in low-income countries and EMEs. Berg, Ostry and Zettelmeyer (2008) find that these strong growth spells occur when countries have a higher export orientation, income equality and democratisation.
[19] Sturzenegger (2003) finds that countries that have debt crises grow on average 0.6% per annum less than countries that do not. Cohen (1992) finds that a debt crisis explains a productivity slowdown of around 0.9% per annum.

debt crises on output growth and anticipates the paper's finding of large output costs of sovereign crises.

Finally, the potential output growth rate is the measure predicted by the econometric model with the sovereign crisis dummy assuming a value of zero and all other variables assuming their actual values. This procedure should deliver a more precise measure of the counterfactual growth rate, since it controls for other factors affecting output movements during the sovereign crisis period.

Once we have established the two methods for potential growth rate g_{it}^* for each episode in our sample,[20] i, then we calculate the measures for cumulative output losses during the period of a sovereign crisis $t = 0$ and $t = T$ as:

$$\sum_{t=0}^{T} \frac{Y_{ti} - Y_{0i}(1 + g_{it}^*)^t}{Y_{-1i}} \qquad \textbf{(1)}$$

where Y_{ti} is the annual GDP of a country i in year t, taken from the World Bank's *Global Development Indicators*. In the rest of the paper, we refer to the output losses calculated using the first method as 'Measure 1' and those calculated using the second method 'Measure 2'.

5   Results

Table 4 shows output losses for 39 episodes of sovereign crises on Measure 1 and 32 episodes for Measure 2. Table 5 shows the sample averages. The estimated average *cumulative* output loss of the sample increases with the length of crisis given that actual output remains below its counterfactual during most if not all of the crisis period.[21] Output losses are therefore shown on a per annum basis. Overall, the evidence suggests that sovereign crises episodes last for long – on average for over ten years – and are associated with deep recessions.[22] Median output losses per year are 5¼% of annual pre-crisis GDP on Measure 1 and 10½% on Measure 2. The difference in estimated losses though partially reflects the different sample sizes. On the same reduced sample of 32 countries used in Measure 2, the estimated median losses on Measure 1

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[20] The measure for g_{it}^* obtained from the panel regression is a four-year average and, therefore, is used as the potential output growth for the corresponding four consecutive years, implying that for sovereign crises episodes lasting more than four years the counterfactual growth rate will be time-varying. Unlike with measure 2, the counterfactual growth rates under measure 1 are not time-varying.

[21] In fact, actual output remains below the level suggested by its pre-crisis trend throughout the whole crisis period in over half of the sample.

[22] However, these measures do not capture the potential long-run impact once the crisis has ended in either permanently increasing or reducing the GDP growth rate.

are almost 8%. The variability of sovereign crisis costs across countries is also significant especially on Measure 1.[23]

Table 6 lists output losses conditional on a country in a debt crisis experiencing no other financial crisis; experiencing a banking crisis; experiencing a currency crisis; and experiencing both currency and banking crises. Since the end of a high arrears (ie default) crisis period is somewhat subjective alternative end-point definitions were experimented with. But for all variations of the assumed end point, crises were found, on average, to result in large (per year) output losses and to be long-lasting. The standard measure assumes a sovereign crisis ends only once arrears fall below 5% on principal or below 1½% on interest payments. The alternative shown in Table 6 (Measure 3) shows the end of crisis as soon as arrears on principal fall below 15% or arrears on interest payments below 5%. Other things equal, Measure 3 will clearly imply a shorter crisis period than measure 1 (8½ rather than 11 years). The results confirm that output losses in the wake of sovereign crises appear to be large – between 4½%-10½% a year on the median[24] measure – as well as long-lasting (8 years or more on average).[25] This is the case even on Measure 2 which seeks to estimate explicitly what output growth would have been in the absence of a crisis. As a check on the results for a subset of our sample we also compared output losses during these sovereign crises periods for similar countries that did not have sovereign crises at the time.[26] The output losses for the sovereign crisis countries were found to be, on average, a lot bigger than for their country pairs – 7½% a year on the median measure.[27]

Nevertheless, none of these techniques can categorically separate the output loss due to sovereign crisis *per se* (the cost of sovereign crisis) from the loss caused by the economic shock that triggered the crisis. Therefore, more weight should be attached to the relative costs from different types of crises than to the absolute estimates.

Second, sovereign crises rarely occur in isolation, but when they do, output losses tend to be much smaller than when accompanied by a currency and/or banking crisis. As alluded to earlier,

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[23] Consequently, the average output loss per year is higher on Measure 1 (13%) than on Measure 2 (12%).

[24] Because of some outlier episodes, the median, rather than the average, is a more meaningful summary statistic.

[25] These median output losses per year are about twice as large as the estimates of banking crises losses reported in Hoggarth *et al* (2002).

[26] The criteria used for defining a 'similar' country were i/ close regional proximity, ii/ a similar level of GNP per capita and iii/ a similar structure of output. Given the subjectivity of this measure the precise results should be treated with a large degree of caution. Further detailed case study work is warranted of the impact of alternative policy choices, for example, between a forced restructuring, on the one hand, and a decision to voluntarily reduce debts through a sharp fiscal tightening.

[27] A good example is in Latin America in the early 1980s when many countries defaulted and/or restructured their sovereign debt (seven in our sample). The level of GDP fell subsequently in all these countries by a maximum of between 2%-12%. In contrast, Colombia did not restructure its debt or default according to our definition despite having at the time a similar external debt/GDP ratio to Mexico and Paraguay. GDP in Colombia continued growing throughout the period.

usually a debt crisis coincides with a banking and/or a currency crisis. In fact, around one half of the sample consists of triple (sovereign, banking and currency) crises. In these cases, output losses appear to be particularly high since here the interactions between the different sectors of the economy accentuate the decline in GDP.

Third, there is mixed evidence of whether twin crises are bigger when a debt crisis is accompanied by a banking or a currency crisis – on Measure 1 output losses are larger when there is a twin sovereign/banking crisis rather than a twin sovereign/currency crisis while the reverse is true on Measure 2. Banking crises often result in a sharp and prolonged reduction in the intermediation of credit to the private sector, with significant costs to economic efficiency. A currency crisis stimulates exports assuming that exporters have access to trade finance (especially if the government puts in place an alternative credible nominal anchor).[28] In fact, in two thirds of the sample the share of domestic demand in total final expenditure falls during the crisis period (ie the share of exports increases). However, given that in the past all – or nearly all – external debt of EMEs has been denominated in foreign currency, a sharp fall in the exchange rate has often resulted in a marked deterioration in the balance sheet of the government and/or private sector.

A sovereign crisis country that reaches agreement with its creditors to reschedule its debts could face lower output losses than a country that stays in arrears. First, a country that succeeds in rescheduling its debts will avoid the stigma of staying in default and is less likely to lose access to international capital markets than a country that stops making payments to creditors. And second, creditors would only be expected to agree to a rescheduling if, in the first place, they thought that the country's output growth (conditional on the rescheduling) would be sufficiently high to sustain future repayments. On the other hand, once they have defaulted and incurred the extra stigma costs, debtors are in a stronger position to negotiate with creditors over the terms of the rescheduling than crisis countries that pre-emptively restructure their debts. Table 7 suggests that sovereign crisis countries that stay in arrears face deeper recessions than those that reschedule their debts notwithstanding the fact that they had lower ratios of external debt to GDP, on average, at the outset of the crisis than restructurers.[29] This suggests that countries that

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[28] For example, Asian economies experienced a sharp fall in output followed by an equally marked recovery after an interval of one or two years following the 1997-98 currency crises. Eichengreen and Rose (2002) show that, rather than reflecting Asia's crisis or its economies, this V-shaped pattern is prototypical of the response in output following a successful attack on a currency peg.

[29] Running a cross-sectional regression of output losses on a constant and a dummy that takes the value of one if the default episode involved a debt rescheduling and 0 if it involved arrears, we find a negative (0.26) and statistically significant (at the 10% level) coefficient on the dummy. This is consistent with the results on rescheduling shown in Table 7. A similar regression of output losses on a dummy that takes the value of one if the IMF package is large and zero otherwise results in a close to zero and insignificant coefficient for the dummy – again, consistent with Table 7.

reschedule their debts – and thus start afresh with creditors – face a lower subsequent cost of finance and/or quicker renewed access to external finance. It might also indicate that an active policy of rescheduling has a less debilitating impact on the domestic financial system than a passive policy of remaining in arrears and not restructuring. Moreover, using the model-based estimate of the output counterfactual, and bearing in mind the limited available sample of countries, pre-arrears restructuring is associated with a smaller fall in output – both cumulatively and on an annual basis – than post-arrears restructuring.[30] Finger and Mecagni (2007) also find in recent restructurings that post-defaulters had bigger recessions than pre-defaulters. That said, they also find that post-defaulters have managed to negotiate a much bigger debt reduction than pre-default restructurers. Table 7 also reports estimates of output losses conditional on whether the debtor country was a recipient of a large or small package from the International Monetary Fund and on whether it rescheduled its debts. We define a large package as one that exceeds 6% of GDP in the first year of crisis. This threshold is the IMF lending median over the 39 episodes. It is difficult to posit *a priori* whether output losses should be higher or lower for debt crises involving larger IMF packages. If IMF lending helps a country to repay its debts via the injection of liquidity and through implementing growth-enhancing policy reforms, via conditionality, one would expect larger packages to be associated with lower output losses. If, on the other hand, IMF lending adds to an unsustainable debt stock and diverts the debtor from exerting sufficient policy adjustment effort (debtor moral hazard) we would expect the reverse relationship.[31] In addition, the size of IMF lending may increase with the size of the output losses a country is facing as the Fund may be lending large amounts to avoid a socially unacceptable high damage to a nation's prosperity. Table 7 presents some empirical evidence that, from the countries which went into arrears, the ones that received larger IMF packages suffered longer and slightly bigger output losses.

Output losses *per year* also tend to increase with the length of crisis.[32] This suggests that the longer that it takes to reduce arrears or complete a restructuring, the more output falls (relative to its trend or potential).

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[30] The reduction in output loss averages 10% a year and is significant at the 5% confidence level. Nonetheless, the results from these simple regressions should be treated with caution. There may be other systematic factors (such as different levels of indebtedness) that explain why pre-default restructurers face smaller output losses than post-default restructurers. Also, no difference in output losses associated with pre and post-arrears restructurings is found when the trend-based estimate of the output counterfactual is used.

[31] In the short term, however, exerting the optimal amount of policy effort may involve a decline in GDP growth (for example as a country reduces government spending to generate a larger primary surplus) and therefore manifest itself as a negative output gap. Given that most crisis episodes in our sample are long, this effect, however, is likely to be small.

[32] A simple regression shows that the length of crisis has a positive and statistically significant effect at the 5% level on output losses per year using either the trend or the model-based estimate of the GDP counterfactual.

6 Conclusion

Avoiding the broader costs to a country's economy caused by sovereign crisis is likely to be the key reason why a sovereign debt market exists in practice. Whether this argument is correct depends on the actual magnitude of the output losses from sovereign crises – large losses would support this argument, small losses would not. The estimates here suggest that episodes of sovereign crises are indeed associated with large output losses. Episodes of sovereign crises last long – on average around 8-11 years – and are associated with deep recessions (independent of measure). Across a sample of up to 39 crisis episodes median output losses amount to at least 5% per year of pre-crisis annual GDP and significantly more on some definitions of crisis episodes and measures of losses. This is significantly larger than estimates of the output losses of currency crises or banking crises using similar techniques.

Also, in practice, most sovereign crises over the past 25 years have been associated with a banking and/or a currency crisis rather than occurring in isolation. Sovereign crises appear to have the biggest impact on domestic output particularly when there is a triple (sovereign, banking and currency) crisis.

Sound macroeconomic policies and structural reform should help to reduce the likelihood of these high costs of crises (as well as raise sustainable output growth). These results also emphasise the need for countries themselves to self insure against the possibility of crises. Many EMEs have done this in recent years through building up foreign exchange reserves and reducing and lengthening the maturity of their external (foreign currency) debt. This has reduced the likelihood and cost of currency crises in particular. But total (ie external plus domestic) government debt remains high relative to GDP in many EMEs and is often still significantly financed by the domestic banking system.[33] This makes the latter vulnerable to sovereign weakness and potentially *vice versa* if governments bail out weak banking systems. Moreover, Reinhart and Rogoff (2008) suggest that high domestic debt may explain why many EME governments have often defaulted to foreigners in the past at relatively low levels of external debt.

Once in crisis, annual output losses seem to increase the longer that countries stay in arrears or take to restructure their debts. There is also some evidence that lower output losses are

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[33] See IMF (2006) and Felices *et al* (2008).

associated with defaulting countries that restructure their debts than with those that do not.[34] [35] This is consistent with the recent policy emphasis on the importance of market-based policy initiatives aimed at improving the speed and efficiency of debtor-creditor restructuring.[36]

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[34] These results though are provisional given the small subsamples and the possibility that broader macroeconomic conditions may have been better, and thus debt more sustainable, for sovereigns that restructured their debts, especially pre-default, than those which stayed in arrears.

[35] One area not explicitly examined that is worthy of future research is case study evidence that compares countries with unsustainable debts that decide to reduce them voluntarily through a very sharp fiscal tightening with those that restructure their debts with creditors or remain in default.

[36] See Bedford *et al* (2005).

Appendix: Tables

Table 1: Distribution of private creditors' arrears

		Total arrears/external debt (private creditors)	Interest arrears/external debt (private creditors)	Principal arrears/external debt (private creditors)
Mean		10.88	3.03	7.85
Standard deviation		19.10	6.04	13.85
Median		0.00	0.00	0.00
Deciles	1 to 5	0.00	0.00	0.00
	6	0.04	0.00	0.02
	6.5	0.32	0.02	0.18
	7	1.29	0.15	0.96
	7.5	3.25	0.58	2.14
	8	6.66	1.42	4.80
	8.5	17.33	4.14	10.61
	9	37.35	9.83	26.50
	9.5	67.65	18.77	52.67
	10	203.87	118.80	98.86

Table 2: Conditional probability of other types of crises given that a sovereign crisis has occurred

	Number	**Probability**
Currency crisis also occurs	30	0.77
Currency crisis starts in same year or after the start of the sovereign crisis	26	0.66
Banking crisis also occurs	25	0.64
Banking crisis starts in same year or after the start of the sovereign crisis	18	0.46
Currency and banking crises both also occur	19	0.49
Currency and banking crises start in either the same year or after the start of the sovereign crisis	16	0.41

Table 3: Growth regression

Dependent variable:	GDP per capita growth rate			
Estimation method:	Fixed effects and two-stage least squares			
Total system (unbalanced) observations:	222			
	Coefficient	Standard error	t-statistic	p value
Log (initial GDP)	-6.22	0.93	-6.72	0.00
Sovereign crisis dummy	-1.73	0.47	-3.71	0.00
Government consumption/GDP	-0.17	0.07	-2.53	0.01
Inflation	-1.18	0.54	-2.20	0.03
Investment/GDP	0.22	0.04	5.56	0.00
Openness (SACW)	1.36	0.52	2.63	0.01
Political instability (lagged)	-0.77	0.83	-0.92	0.36
Instruments (country specific):				
Lagged values of:				
Government consumption/GDP				
Inflation				
Investment/GDP				
Openness (SACW)				
Political instability				
Proxy R-squared[a]**:** 0.58				

(a) Given that the use of two-stage least squares affects the fit statistic, a proxy R-squared was obtained from an estimation without the use of instruments.

Table 4: Output losses [a]

Country	Type of episode	Starting year	Duration	Measure 1 (loss per year)[c]	Measure 2 (loss per year)[c]	BC[d]	CC[e]
Albania	Arrears	1991	10	19.1	na	Yes	Yes
Algeria	Rescheduling	1994	5	-2.2	-2.4	No	Yes
Argentina	Arrears[b]	1983	13	-2.6	8.2	Yes	Yes
Bolivia	Arrears	1982	17	21.8	17.8	Yes	Yes
Brazil	Arrears[b]	1983	16	18.6	7.4	Yes	Yes
Bulgaria	Arrears	1991	5	21.6	7.8	Yes	Yes
Cameroon	Arrears	1983	18	85.0	23.1	Yes	Yes
Chile	Rescheduling	1983	8	-9.1	4.4	Yes	Yes
Congo	Arrears	1970	9	-20.3	na	No	No
Congo	Arrears	1985	16	112.4	12.5	Yes	No
Costa Rica	Arrears	1981	2	13.0	12.5	No	Yes
Costa Rica	Arrears[b]	1986	8	-17.1	7.6	Yes	Yes
Cote d'Ivoire	Arrears[b]	1987	14	-10.1	11.1	Yes	Yes
Dominican Rep.	Arrears	1984	16	-0.3	32.3	No	Yes
Ecuador	Arrears[b]	1987	14	5.2	16.1	Yes	Yes
Georgia	Arrears[b]	1994	4	3.0	na	Yes	No
Grenada	Arrears	1987	4	-9.0	na	No	No
Guatemala	Arrears	1985	16	-14.2	16.2	No	Yes
Guyana	Arrears	1979	22	26.1	na	No	Yes
Haiti	Arrears	1983	12	22.8	3.0	No	Yes
Indonesia	Arrears	1998	3	24.0	13.0	Yes	Yes
Jordan	Arrears[b]	1989	12	18.0	36.6	No	Yes
Mexico	Rescheduling	1982	9	34.2	-2.6	Yes	Yes
Morocco	Rescheduling	1983	10	0.7	5.2	Yes	No
Nicaragua	Arrears	1978	2	27.0	16.0	No	Yes
Nicaragua	Arrears	1985	16	-4.6	na	Yes	Yes
Nigeria	Arrears[b]	1987	14	-32.6	4.6	Yes	Yes
Panama	Arrears[b]	1987	10	11.1	na	Yes	No
Paraguay	Arrears	1983	18	73.6	26.3	Yes	Yes
Peru	Arrears	1983	14	26.9	18.0	Yes	Yes
Philippines	Rescheduling	1984	10	26.0	15.8	Yes	Yes
Russia	Arrears	1990	11	46.7	30.7	Yes	Yes
Sri Lanka	Arrears	1990	11	-15.5	-8.2	Yes	No
Syrian Arab Republic	Arrears	1986	15	-2.4	19.1	No	Yes
Togo	Arrears	1978	7	1.6	5.3	No	Yes
Togo	Arrears	1991	7	10.1	10.0	Yes	No
Trinidad and Tobago	Rescheduling	1989	4	-0.5	2.5	No	No
Venezuela	Arrears[b]	1984	2	-1.0	-1.0	No	Yes
Zambia	Arrears	1981	20	-1.0	7.2	Yes	Yes

(a) High arrears crisis assumed to end when arrears on principal fall below 5% or arrears on interest payments fall below 1½%.

(b) Arrears followed by rescheduling.

(c) A positive sign implies a loss (ie output is lower than potential).

(d) A systemic banking crisis occurred during the period of the sovereign crisis episode or one year before.

(e) A currency crisis occurred during the period of the sovereign crisis episode or one year before.

Table 5: Summary statistics of Table 4

	Number of crises	Duration (mean)	Mean loss per year (mean)[a]	Median loss per year [a]
Measure 1	39	10.9	13.0 (15.0) [b]	5.2 (7.7) [b]
Measure 2	32	10.9	11.8	10.6

(a) A positive sign implies a loss (ie output lower than potential).
(b) Figures in brackets are the losses in the same sample of 32 countries as for Measure 2.

Table 6: Output losses per year conditional on different types of financial crisis

Measure 1					
Type of crisis	Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)	Median duration
Sovereign crisis only	3	5.7	-9.9	-9	4.0
Sovereign and banking crises[a]	6	9.7	20.3	6.6	10.0
Sovereign and currency crises[a]	11	10.1	8	1.6	12.0
Triple crises	19	12.5	17.1	19.1	14.0
ALL	**39**	**10.9**	**13.0**	**5.2**	**11.0**

Measure 2					
Type of crisis	Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)	Median duration
Sovereign crisis only	1	4.0	2.5	2.5	4.0
Sovereign and banking crises[a]	4	11.0	4.9	7.6	10.5
Sovereign and currency crises[a]	10	8.9	13.7	14.3	9.5
Triple crises	17	12.5	12.7	11.1	14.0
ALL	**32**	**10.9**	**11.8**	**10.6**	**11.5**

Measure 3[b]					
Type of crisis	Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)	Median duration
Sovereign crisis only	5	3.2	0.5	-3.0	4.0
Sovereign and banking crises[a]	7	8.7	14.8	0.7	9.0
Sovereign and currency crises[a]	14	8.1	6.2	2.3	6.0
Triple crises	17	10.5	19.4	18.7	10.0
ALL	**43**	**8.6**	**12.2**	**4.4**	**8.0**

(a) Excludes triple crisis.
(b) Potential output, as on Measure 1, is based on the country's pre-crisis HP (filter) trend. High arrears crisis ends when arrears on principal fall below 15% or arrears on interest payments fall below 5%.

Table 7: Conditioning output losses on IMF/lending and rescheduling

Measure 1		Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)	External debt/ GDP (%), year before start of crisis [d]
Arrears		23	11.8	20.2	19.1	52.8
Rescheduling[a]		16	9.6	2.6	0.1	70.2

Measure 2		Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)	External debt/ GDP (%), year before start of crisis [d]
Arrears		18	11.7	14.6	14.5	49.6
Rescheduling[a]		14	9.9	8.1	6.3	70.4

Measure 3		Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)	External debt/ GDP (%), year before start of crisis [d]
Arrears		28	9.5	16.1	11.5	57.9
Rescheduling[a]		15	6.9	4.8	0.7	70.8

Measure 1		Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)
Arrears	(+) IMF lending > median[b]	16	12.3	13.4	18.0
	(+) IMF lending < median[b]	17	10.6	14.3	10.6
Rescheduling[c]	(+) IMF lending > median[b]	4	8.3	3.9	-0.8
	(+) IMF lending < median[b]	2	6.5	16.9	16.9

Measure 2		Number of crises	Average duration (years)	Average loss (per year)	Median loss (per year)
Arrears	(+) IMF lending > median[b]		12.4	18.4	17.0
	(+) IMF lending < median[b]	15	11.1	11.6	12.5
Rescheduling[c]	(+) IMF lending > median[b]	4	8.3	5.7	4.8
	(+) IMF lending < median[b]	2	6.5	0.0	0.0

(a) Includes both pre and post-arrears restructurings.

(b) Median is 5.8%

(c) Pre-arrears restructurings.

(d) Data on external debt are unavailable for Congo and for crises that started before 1980.

Annex: Definitional issues

Previous literature

There is no agreed off-the-shelf definition of a sovereign crisis. It could be narrowly confined to debt that has gone into arrears or also include debt that has been explicitly restructured. 'Crisis' could be defined more broadly still. Manasse and Roubini (2005), for example, also include episodes of incipient defaults which they believe were averted through large-scale international bail-outs, such as occurred in Mexico in 1995, Turkey in 2000 and Brazil in 2001. And Sy (2004) defines a sovereign debt crisis to occur when sovereign spreads over US Treasuries rise to 1,000 basis points (10%) or more.[37] The definition of debtor and creditor is also not unambiguous. 'Sovereign' debtor could be defined narrowly as the government or public sector alone or more broadly to include the domestic private sector. And creditors could be confined to the commercial sector or also include the official sector.

Nonetheless, a number of authors have attempted to define what constitutes an episode of sovereign crisis before. Peter (2002) gives a useful review of the definitions employed in the previous literature. Using data that were not previously publicly available at the time from the World Bank, McFadden *et al* (1985) and Hajivassiliou (1989, 1994) count as a crisis event when either of the following conditions is met:

1. there is sovereign rescheduling with either its private or official sector creditors;
2. an IMF upper tranche agreement has been agreed (ie, usually, when the sovereign has drawn more than 125% of its quota);
3. arrears on interest exceed 0.1% of total external debt;
4. arrears on principal exceed 1% of external debt.

Hajivassiliou (1987) and Li (1992) define a crisis event if either of conditions (1) and (2) above are met. Aylward and Thorne (1998) define a crisis when a country is in arrears to its creditors irrespective of the amount. The focus of all these papers is in identifying default to any element of the creditor community: official or bilateral. More recently, Detragiache and Spilimbergo (2001) focus their definition on default to non-resident commercial creditors, as their aim is to find evidence of co-ordination problems amongst private sector lenders leading to liquidity-driven defaults. They count a crisis when either of the two following conditions is met:

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[37] Note this latter definition could include countries that decide to reduce their debts voluntarily.

1. there are arrears of principal or interest on external obligations towards commercial creditors of more than 5% of total commercial debt outstanding;
2. there is a rescheduling on external debt with commercial creditors as listed in the World Bank's *Global Development Finance* (GDF).

Although this definition has the merit of simplicity, Detragiache and Spilimbergo do not discuss how they have arrived at their chosen thresholds.

Reinhart (2002) has combined information on crises sovereigns from Detragiache and Spilimbergo, World Bank reports and two other secondary sources. It is not clear, however, whether one or a mixture of definitions is used in her work. In Reinhart *et al* (2003) the definition used is the default or restructuring of a country's total (sovereign plus private) external debt with private creditors.

Peter (2002) notes that most of the sovereign default definitions are based on the stock of arrears. This risks including as an episode of default periods where the sovereign has repaid a significant share of its arrears but the stock of arrears is still above the (arbitrary) cut-off threshold used in the definition. To get around this problem, Peter counts as a year of default any year where either of the following two conditions is met:

1. the increase in the stock of total arrears towards private or official sector creditors exceeds 2% of total external debt;
2. the total amount of the stock of long-term debt rescheduled exceeds 2.5% of total external debt and there has not been a decrease in the stock of arrears in excess of the amount rescheduled.

A drawback of this definition is that we could well be counting as episodes of sovereign debt default crises, periods where, for some reason or another, the country missed payments on a small part while continuing to service the vast majority of its debt.

Rose (2002) defines a sovereign crisis when the Paris Club reaches agreement on a restructuring. He argues that arrears are not themselves a good measure of a sovereign crisis as debt service often exceeds arrears and the Paris Club often implicitly or explicitly approves a country going into technical arrears on some part of its debt. Paris Club agreements, however,

relate to the renegotiation of a country's debts by a group of official bilateral creditors often subject to the agreement of an IMF programme. As we are focusing on the impact of crisis when debt is outstanding to commercial creditors and there are no data on London and New York clubs (committees of banks and bondholders respectively) agreements this definition is not appropriate for us. In addition both problems noted by Rose can be addressed by using a high threshold for the arrears to debt ratio before we count an observation as a crisis.

Finally, the rating agencies define default as a missed payment of principal or interest or any debt exchange where the debtor offers creditors a contract that amounts to a diminished obligation.

Identifying episodes of sovereign crises

What lessons can we learn from these various definitions of sovereign crisis episodes? First, it appears that the best available data source on arrears and reschedulings is the World Bank's *Global Development Finance* (GDF) CD-ROM. The CD-ROM has comprehensive data on arrears since 1970 and on reschedulings from 1989 onwards. Some characteristics of the data set are listed below:

1. debt data are recorded on original (rather than residual) basis;
2. long-term data (obtained from the debtor) is reliable and is broken down by creditor whereas short-term data is a lower-bound relatively unreliable estimate;
3. data on public and public-guaranteed debt are more reliable than data on private sector unguaranteed debt (latter estimate collected from creditors (OECD export credits, BIS banking statistics and bilateral loans from official sector creditors to private sector)).

Public (ie, sovereign) debt also includes rescheduled debt previously owed by the private sector which the government has accepted responsibility for. We therefore focus on arrears and rescheduling on long-term debt (any debt with greater than one-year maturity on a residual basis). We complemented the data on rescheduling by using hard copies of the World Debt Tables from 1970 to 1989. However the rescheduling data are only available since 1985. Therefore we complemented these data with information from Beim and Calomiris (2001) and Cline (1995) (especially regarding the rescheduling in Latin America during the 1980s).

Second, given our interest in measuring output losses of a sovereign crisis when debt is outstanding with private sector creditors we define default based on arrears and rescheduling to the private sector, rather than using some of the alternative definitions set out above. The average ratio of private creditors' debt to total debt of the 41 countries in the World Bank's *Global Development Finance* was 26% in 2003. We decided to eliminate countries whose private sector debt comprises less than 10% of total external debt on average over the sample period.[38]

Following the previous literature, we opt for choosing a threshold that the stock of arrears to (private sector) debt ratio needs to exceed before we classify it as default. Rather than picking an arbitrary number we looked at the distribution of arrears for all debtors in our sample over our sample period (1970-2000) and identified thresholds that occur with low probability. Table 1 shows descriptive statistics of arrears to external debt ratios for the sample of 29 countries with private sector debt greater or equal to 20% of total external debt both for total arrears and also separately for arrears on interest and principal.

On the basis of these descriptive statistics, we opted for the following identification criteria:

1. A crisis episode is identified when either: (a) the arrears on principal on external obligations towards private creditors reach at least 15% of total commercial debt outstanding; (b) the arrears on interest on external obligations towards private creditors reach at least 5% of total commercial debt outstanding or (c) there is a rescheduling with private creditors as listed in the GDF.

The chosen thresholds, for both arrears on principal and interest, are between the 80th and 90th percentile of the empirical distribution of principal and interest arrears (see Table 1).

It is clear from the data that a country often starts being in arrears by a small amount. After reaching a peak, arrears also fall gradually. Therefore, after we identify a crisis episode on the above criteria, we identify the beginning and end of the crisis as follows:

2. The start is defined as the first year when either (a) the arrears on principal on external obligations towards private creditors exceeds 5% of total commercial debt outstanding;

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[38] Not all the countries with private sector exceeding 10% of total external debt are included in our sample because of some data availability restrictions. The full list of countries in the sample is listed in Table 4.

(b) the arrears on interest on external obligations towards private creditors exceeds 1.5% of total commercial debt outstanding or (c) there is a rescheduling with private creditors as listed in the GDF.

The chosen thresholds, for both arrears of principal and interest are between the 70th and 80th percentile of the empirical distribution of principal and interest arrears (see Table 1).

The end of the period is defined as the last year when either (a) the arrears on principal on external obligations towards private creditors is at least 5% of total commercial debt outstanding; (b) the arrears on interest on external obligations towards private creditors is at least 1.5% of total commercial debt outstanding or (c) there is a rescheduling with private creditors as listed in the GDF. We also tested the sensitivity of the results to the end of crisis definition by assuming instead that a high arrears crisis ends as soon as arrears on principal and interest fall below 15% and 5% of outstanding debt respectively. As shown in Table 6 this makes little difference to the results.

Table 7 lists the default and rescheduling episodes and their length using both definitions of end crisis and our baseline definition for the start of the crisis. We have also compared these episodes with the list of sovereign debt crises in Beim and Calomiris (2001) and Cline (1995) and there is significant overlap.

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