Sovereign Defaults: The Price of Haircuts[1]

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Abstract

A main puzzle in the sovereign debt literature is that defaults have only minor effects on subsequent borrowing costs and access to credit. This paper questions this stylized fact by refining the proxy for country credit history used in the received literature. We construct the first complete set of investor loss ("haircut") estimates in all debt restructurings between governments and foreign banks and bondholders since 1970, covering 202 cases in 68 countries. We then show that restructurings involving higher haircuts (lower recovery rates) are associated with significantly higher subsequent spreads (borrowing cost) and longer periods of capital market exclusion. The results give new support to reputational theories of sovereign borrowing and indicate punishment effects within credit markets.

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1. Introduction

A central feature of theory papers in international finance is that debtor governments have strong incentives to repay in order to maintain a good reputation and to avoid punishment in capital markets (see Eaton and Gersovitz 1981 or, more recently, Arellano 2008, D'Erasmo 2010, Kletzer and Wright 2000, Yue 2010, Wright 2002). Yet the empirical support for this proposition is weak at best, as shown by more than 30 years of research (see the surveys by Panizza, Sturzenegger and Zettelmeyer 2009, Eaton and Fernandez 1995). In this paper we present a novel dataset of investor losses in all sovereign debt restructurings from 1970 until 2007, the only complete set of estimates so far. Using the recovery values therein, we provide new evidence on the costs of defaults within credit markets that is consistent with reputational theories of sovereign debt.

Our innovation tackles a measurement error problem. Papers attempting to gauge the effects of defaults on subsequent market access have used a binary default indicator, capturing *any* missed payment, as explanatory variable for past credit history. But theory papers predict punishments that are proportional to the loss inflicted on investors. Using binary default instead of actual losses ignores the large variation in restructuring outcomes and can thereby introduce measurement error, which makes OLS estimators inconsistent and attenuated towards zero. This bias may be one reason why past research concluded that punishment effects in sovereign credit markets are negligible, at least in the medium run.[2] A typical finding is that defaults in the 1990s and 2000s affected risk spreads only in the first and second year after the resolution of crisis (Borenzstein and Panizza 2008). Moreover, Gelos et al. (2004) show that most defaulters regain access to borrowing within one year after a restructuring. These recent findings have only confirmed those of earlier studies[3] and have lead many to conclude that banks and bondholders have very short memories. As Bulow and Rogoff (1989, p. 49) put it, "debts which are forgiven will be forgotten."

Our key hypothesis is that higher haircuts will result in (i) higher post-restructuring spreads and (ii) longer duration of exclusion from capital markets. These testable predictions can be derived from two recent theoretical models that build on the classical reputational framework by Eaton and Gersovitz (1981). Yue (2010) shows that the duration of exclusion depends on the renegotiation outcome. The lower the recovery value on the defaulted debt (the higher the haircut), the longer the financial exclusion after default. Asonuma (2010) extends the contribution by Yue and explicitly models the link between haircut size and subsequent yield spreads. He shows that a defaulting country negotiates

[2] Only recently have researchers started to work on models that take into account default characteristics such as the duration of negotiations or restructuring outcomes. Benjamin and Wright (2009), for example, develop a model that generates a positive correlation between delays in debt renegotiation and the size of the haircut. In a recent empirical paper Benczur and Ilut (2009) use the scale of arrears as a continuous measure for repayment history.

[3] See Eichengreen (1989), Jorgensen and Sachs (1989), Lindert and Morton (1989), and Ozler (1993).

with creditors not only on the size of the haircut, but also on the level of subsequent risk premia. The debtor faces a trade-off: A high haircut implies a large degree of debt reduction now, but is punished by markets with higher borrowing costs in the future. To our knowledge this paper is the first to test these theoretical priors jointly and based on a full sample of restructurings.

We present haircut (recovery value) estimates implied in all 202 sovereign restructurings with foreign banks and bondholders between 1970 and 2007, covering 68 countries. Surprisingly, there is no single standardized source providing a satisfactory overview on the dates, terms and haircut sizes of sovereign debt restructurings in the last decades. We gathered and synchronized data from 29 different lists on restructuring terms and more than 100 further sources, including articles from the financial press and from the IMF archives. We also develop a novel approach to estimate market discount rates prevailing at the exit of each default, taking into account both the global price of credit risk as well as debtor country conditions at each point in time. We find a large variation in haircut size: one half of the haircuts are lower than 23% or higher than 53% – while the 5th and 95th percentiles thereof are 0.11 and 0.71 respectively. The average haircut is 36% and has been increasing since the 1990s, mainly because of a wave of restructurings with very high haircuts (above 90%) in highly indebted poor countries. However, we do not find that the subsample of sovereign bond exchanges since 1998 had, on average, higher haircuts than the negotiated Brady deals, which put an end to the debt crisis of the 1980s.

Building on these data, we find strong indications that credit market penalties for non-payment are more substantial and longer-lived than previously found. First, we find that the size of the haircut is a main predictor for post-restructuring bond spreads. A one standard deviation increase in haircut (20 percentage points) is associated with post-restructuring bond spreads that are 170 basis points higher as compared to the baseline and after controlling for fundamentals and country and time fixed effects. The effect decreases over time but is still significant in years four and five after the restructuring, implying 50 basis points higher spreads.

Second, we find that haircut size is highly correlated with the duration of capital market exclusion. Ceteris paribus, a one standard deviation increase in haircuts is associated with a 60% lower likelihood of re-accessing international capital markets in any year after the restructuring. This strong result puts the finding of Gelos et al. (2004), that defaults do not significantly reduce the probability of tapping markets, into a new perspective. More generally, the findings in this paper lend new support to reputational theories of sovereign debt and default. Given the new wave of papers building on the Eaton and Gersovitz (1981) framework[4], the results can thus be seen as bridging theory and empirics.

[4] E.g. Aguiar and Gopinath (2007), Amador (2010), Arellano (2008), D'Erasmo (2010), Tomz and Wright (2007), Yue (2010). See also Tomz (2007).

The rest of the paper is organized as follows. The methodology to compute haircuts and the dataset are summarized in sections 2 and 3. Section 4 estimates the effects of haircuts on subsequent borrowing costs, while section 5 focuses on capital market exclusion. The last section concludes. The appendix comprehensively describes the dataset construction methodology and the resulting new data.

2. Estimating Creditor Losses: Methodology and Data

Sturzenegger and Zettelmeyer (2006, 2007 and 2008) provide the most rigorous haircut estimates so far, covering 22 bond restructurings in nine countries over the period 1998 to 2005. They calculate bond-by-bond investor losses by comparing the present value of new debt with both the par value and the present value of the old debt at the exit from default. Jorgensen and Sachs (1989) were the first to compute creditor losses in sovereign restructurings covering the cases of Bolivia, Chile, Colombia, and Peru during the 1930s and 1940s.[5] Benjamin and Wright (2009) provide haircut estimates for a much larger sample of 90 cases since 1990, which are not computed in present value terms but rather based on aggregate face value reduction and interest forgiven. Further haircut estimates for several other recent cases are provided by Cline (1995), Bedford et al. (2005), Díaz-Cassou et al. (2008a and 2008b), Finger and Mecagni (2007) and Rieffel (2003). Despite these contributions, we are the first to cover the complete set of 202 sovereign restructurings with foreign banks and bondholders between 1970 and 2007. This section describes the methodology and data used to calculate these haircuts.

We provide two main sets of haircut estimates, one following the baseline approach used by most market participants ("market haircut"), and another using the more refined approach by Sturzenegger and Zettelmeyer (2006, 2007, 2008) ("SZ haircut"). Mainly for comparison with the work of other researchers, we also provide a set of "naïve" haircut estimates (as in Finger and Mecagni 2007), which is just like the market haircut but using a uniform 10% discount rate, and we also calculate the size of nominal debt reduction, i.e. the scope of face value write-offs in percent of all debt restructured (similar to Benjamin and Wright 2009) These latter measures will only be used to assess the robustness of our estimation results and are not discussed in detail.

Section 2.1 defines the two main haircut measures, while section 2.2 describes how we compute debt service streams and presents our discounting approach. Finally, section 2.3 discusses case selection and the data sources used.

[5] Other authors computed the internal rates of return on sovereign bonds over longer periods of time, but without computing recovery values for specific restructurings: e.g. Eichengreen and Portes (1986, 1989), Lindert and Morton (1989), and Klingen et al. (2004). More recently, Esteves (2007) computed pre- and post-default rates of return of 58 bonds issued by ten countries from 1890 until 1917.

2.1. Defining Investor Losses

Debt restructuring typically involves swapping old debt in default for a new debt contract. For a country i that exits default at time t and issues new debt maturing τ years later in exchange for the old debt, and which faces an interest rate of $r^i_{t,t+\tau}$ at the exit from default, the market approach to calculate haircuts (H_M) is

$$H_{M}{}^i_t = 1 - \frac{\text{Present Value of } New \text{ Debt } (r^i_{t,t+\tau})}{\text{Face Value of } Old \text{ Debt}} \qquad (1)$$

This approach thus compares the present value (PV) of the new debt instruments (plus possible cash repayments) with the full face value amount of the old outstanding debt (including past due interest on the old debt but no penalties). This simple formula is widely used by financial market participants and does not require detailed knowledge of the old debt's characteristics. An important rationale for using it as a benchmark is that debt payments are typically accelerated at a default event. Acceleration clauses are a standard feature in sovereign debt contracts and entitle creditors to immediate and full repayment in case the debtor defaults on interest or principal payments (see Buchheit and Gultai, 2002). However, 107 of the 202 events in our sample correspond to cases in which all debt had already fallen due, so that using the face value of mature debt is not due to acceleration.

For the remaining 95 cases in the sample in which the old debt had not all fallen due, Sturzenegger and Zettelmeyer (2007 and 2008, SZ hereafter) propose using

$$H_{SZ}{}^i_t = 1 - \frac{\text{PV of } New \text{ Debt } (r^i_{t,t+\tau})}{\text{PV of } Old \text{ Debt } (r^i_{t,t+\tau})} \qquad (2)$$

The key difference between equations (1) and (2) is that the old debt instruments are not taken at face value but (i) computed in present value terms and (ii) discounted at the same rate as the new debt instruments. SZ use the secondary market yield implicit in the price of the new debt instruments at the first trading day after the debt exchange. Since we cover a sample that spans countries and periods in which voluntary secondary market yields are unavailable, we design a procedure to estimate these rates for our 202 restructuring events. The procedure is described in section 2.2.

In essence, equation (2) compares the value of the new and the old instruments in a hypothetical scenario in which the sovereign kept servicing old bonds that are not exchanged on a pari passu basis with the new bonds being issued (Sturzenegger and Zettelmeyer 2008, p. 783). The common discount rate for new and old instruments reflects the increased servicing capacity resulting from the exchange itself. Following this intuition, H_{SZ} effectively measures the loss realized in the exchange by the participating creditors. More generally, SZ interpret their measure as capturing the degree of pressure that must have been exerted on creditors to accept a given exchange offer, so as to overcome the associated free rider problem. They conclude that equation (2) provides haircuts that better describe the "toughness" of a successful exchange than equation (1). They also argue that acceleration clauses might not always be a valid justification for taking the old debt at face value. In fact, some of the recent debt exchanges were pre-emptive, that is, implemented prior to a formal default that could have triggered acceleration.

Equation (2) will often, but not always, yield a lower haircut estimate than equation (1). The difference between these two measures arises from the comparison between the face value and the present value of the old debt. When $r^i_{t,t+\tau}$ is larger than the interest/coupon rate on the old debt, then $H_M > H_{SZ}$. This discrepancy will tend to increase, the longer the remaining maturity of the old debt. When $r^i_{t,t+\tau}$ is smaller than the interest/coupon rate on the old debt, then the present value of the old debt is greater than par, and $H_M < H_{SZ}$.

Another advantage of H_{SZ} is that it provides a better measure, compared to H_M, of the cumulative losses afforded by investors in a sequence of exchanges of the same debt. For example, if a country restructures old debt at time t but the new debt is renegotiated again soon after, say at time $t+N$, then the product $\frac{PV\ New_t}{FV\ Old_t}\frac{PV\ New_{t+N}}{FV\ Old_{t+N}}$ will tend to overestimate the cumulative loss of investors since in general $\frac{PV\ New_t}{FV\ Old_{t+N}}<1$, especially when the debt is long term. For H_{SZ} , this latter ratio would be $\frac{PV\ New_t}{PV\ Old_{t+N}}$ which under normal conditions will be much closer to 1. This distinction is empirically relevant, as many of the countries that entered the Brady plan restructured the same debt two or three times during the 1980s.

2.2. Discounting Payment Streams

This section presents a summary review of our methodology to compute present values of both the new and the old debt, so as to derive the two components of the haircut formula: numerator and denominator:[6]

Numerator: We start by computing the contractual cash flows in US dollars of the old and the new debt for each year from restructuring to maturity τ: in particular the amounts, maturity, repayment schedule, contractual interest/coupon rate and any further debt characteristics that might influence an instrument's present value. For example, the latter include payments that are collateralized by guarantees from a third party (i.e. as in Brady bonds).

[6] The old debt is only discounted for the H_{SZ} measure, while it is taken at face value for the calculation of H_M.

Two particularly important assumptions relate to timing and the calculation of future interest payments. We use the month of the enactment of a restructuring as a baseline date for the cash flow calculations and to identify discount rates applied. From there, all cash-flow calculations are broken down on an annual basis. Within-year payments starting one month after the restructuring are summed up annually and discounted at the prevailing rate for the end of each year. Moreover, during the 1980s and 1990s, interest payments were typically linked to the US Libor (London Interbank Offered Rate) plus a spread. In these cases, we construct Libor forward rates using the settlement price of Eurodollar contracts traded at the Chicago Mercantile Exchange at the end of each month.[7] These future rates would have been the fixed rate of an interest rate swap if the debt holder wanted to trade his right for variable coupons for a fixed rate on the restructuring month. The Appendix gives a more detailed overview of how we compute cash flows streams, including all assumptions made and the data source for each restructuring.

For consistency, we use the same US dollar reference amounts to derive payment streams of the new and the old debt, except for cases with face value reduction or debt forgiveness. In case the detailed characteristics of old instruments are not available, we assume a linear repayment pattern over the consolidation period[8] and discount only those principal amounts coming due after the restructuring date. Portions of debt that have been previously restructured are treated in the same way as other old instruments, by using the terms of the previous restructuring to calculate *PV Old*. H_{SZ} from equation (2) can thus be easily applied to deals that include previously restructured debt (PRD).

Denominator: We next discount these cash flow streams to assess their present values. In the spirit of SZ we use a discount rate at the time of exit from each restructuring. SZ use secondary market bond yields but such data are only available for countries with a liquid secondary market and can thus be applied to a small set of recent restructurings.[9] For periods further back in time there is no consistent and readily available source of information on voluntary market rates for the countries in the sample. This has pushed other researchers to use a constant discount rate across restructurings (see also Kozack 2005). A popular rule of thumb is to use a flat 10% rate, as done, for example, by the Global Development Finance team of the World Bank (Dikhanov 2004), by IMF staff (see Finger and Mecagni 2007) and by researchers such as Andritzky (2006). Others have used

[7] This should go in the data section: The price data were obtained from the Futures Industry Institute and from Bloomberg.

[8] The consolidation period of a restructuring is the time window in which the debt being exchanged would have originally fallen due. For example, a restructuring deal in July 1987 might have a consolidation period of January 1985 to December 1989, so that all principal due in this period is subject to the exchange, plus the unpaid part of the interest that fell due between January 1985 and July 1987.

[9] Edwards (1986, Figure 1) and Folkerts-Landau (1985, Table 8) use secondary market bonds yields for Mexico and Brazil from the International Herald Tribune. Such yields are available only for a few Latin countries and just from 1980 until 1986. Moreover, at times, countries default in large parts of their debt while they are able to keep performing status on a relatively small issue of bonds, mainly used by residents (e.g. in Argentina this happened with the External Bonds in the 1980s and with the Central Bank Bills in 2001). Hence, the secondary market yield on these bonds does not reflect the discount rate that would have been applied to a creditor who wanted to sell his defaulted claim –which is our object of interest.

risk free reference rates such as U.S. Treasury bond yields or Libor (Clark 1990, Claessens et al. 1992, Lee 1991).

While the approaches previously used in the literature are straightforward, they neglect two important determinants of the cost of capital facing holders of defaulted debt: a) the specific country situation and b) the variation in credit risk premia over the business cycle. During the sample, countries restructured their debts in very different creditworthiness conditions, as assessed by international bankers. For example, when Nicaragua restructured in 1995, its credit rating was 9.6 points on the Institutional Investor scale (which goes from 0 to 100 where larger numbers imply more creditworthiness), while when South Africa restructured in 1993 its credit rating was 38.2. Hence, it is unlikely that the default-exit yield would be the same for these two debtors. On the second point, it is well known that the credit risk premium also changes over time above and beyond the change in country conditions. For example, when Russia restructured in August 2000, the secondary market spread on Moody's index of speculative grade US corporate bonds was 547 basis points (total yield of 11.43%), while it was only 412 basis points (total yield of 8.14%) when Argentina restructured. Our procedure takes into account both of these factors and gives different yields for these four cases: 10.13 for South Africa, 10.36 for Argentina, 12.62 for Russia and 17.66 for Nicaragua. In summary, we think that the discount rates used in the literature can heavily distort investors' outcomes from restructuring.

To be more specific, we estimate a set of voluntary market rates for each country-month from 1980 until 2007. To our knowledge, no set of discount rate estimates spans such a large sample of countries and years. The interquartile range of our discount rates is bounded by 13 and 24%. We next summarize the procedure briefly.

In order to incorporate the global credit risk premium, we start by using the secondary market yield to maturity on low-grade medium-term US corporate bonds for each credit rating category.[10] Since 1990, these are readily available from Moody's, but before then, we only have aggregate market indices (the Lehman Brothers US corporate high-yield index for 1986-1990 and the figures in Altman (1987) for 1980-1985). Using the relation between yields on the aggregate market and those of bonds in individual rating categories in 1991-1997, we impute corporate yields by rating category back to 1980. These imputed yields closely correspond to actual yields by category directly computed off market data by Altman (1989) for the few years and categories for which the latter are available.

Next we need to convert these corporate yields into discount rates on sovereign debt. For each credit rating category we compute the median spread between US corporate and JP Morgan's Emerging Market Bond Index (EMBI) sovereign yields since 1991 when the latter became available. We then add this spread to the corporate yields from the previous

[10] We used all speculative grade categories: Ba1, Ba2, Ba3, B1, B2, B3 and Caa.

step and obtain an implicit time series of sovereign secondary market yields for each credit rating category for 1980-2007. Having obtained a sovereign discount rate for each rating grade the procedure would be completed, if a credit rating for each country were available since 1980. Unfortunately, only a handful of countries in the sample were rated by Moody's, Standard and Poor's or Fitch at the time of their restructurings. Therefore, we use the Institutional Investor country credit ratings which cover 187 of the 202 restructuring events to impute estimated agency ratings.[11] Specifically, we start by estimating a linear relationship between Institutional Investor ratings and agency ratings building on the subset of country-semesters for which agency ratings are available. We then use this relationship to impute agency ratings for each country-semester. The last step then links these agency credit ratings with the imputed sovereign bond return in each month of the semester, providing a rating- and country-specific discount rate over time. These monthly discount rates reflect both global financial market conditions (credit spreads) and the specific country situation (sovereign credit rating).

The unbiasedness and the timeliness of credit ratings have been subject of much debate in recent years. While some authors argue that agencies add fundamental value above and beyond market prices (e.g. Cavallo, Powell and Rigobon 2008, Sy 2004), others have criticized them for reacting to public information with delay (see Kaminsky and Schmukler 2002, among others). Despite this, we think that the Institutional Investor ratings are the most reliable and useful source of information on sovereign risk across countries and time for our purposes: First, they arise directly from the credit analysis teams of large internationally active banks who were the players in the sovereign debt market, hence the agents who would potentially trade these assets in primary or secondary markets. Second, they span a much larger number of countries and cover a wider time period than any alternative source of data on sovereign risk (including bond or loan spreads). Furthermore, we use semester data, which will be less prone to agency rating delays and bias compared to rating data on a daily or weekly basis.

Section A5 in the Appendix describes the procedure in detail while section 3 shows the estimated discount rates for a subsample of recent restructurings.

[11] Institutional Investor (II) is a trade magazine that has been publishing country credit ratings twice a year since 1979. Most leading international banks have credit analysis teams whose job is to appraise the probability of default of the bank's borrowers. II surveys 75 to 100 of these banks asking them to rate the creditworthiness of each government. Respondents can not rate the country where the head office of their institution is domiciled. Recently, II began adding sovereign risk analysts at global money management and securities firms. The individual responses are weighted in proportion to the worldwide exposure and the sophistication of the country analysis system of each bank, but only the weighted-average response for each country is reported. II went from covering 93 countries in the first survey to almost 180 countries at the end of our sample. In the 15 cases in which the country was unrated by Institutional Investor at the time of the restructuring, we used the discount rate of a neighboring country (e.g. for Niger's restructuring in March 1984, we used Sudan's contemporaneous discount rate, etc.).

2.3. Sample and Data Sources

Our sample covers the entire universe of public and publicly guaranteed debt restructurings with foreign commercial creditors (banks/bondholders) in the period 1970 to 2007. We include sovereign debt restructurings with foreign private creditors only, thus excluding debt restructurings that predominantly affected domestic creditors and restructurings with official creditors, e.g. those negotiated under the chairmanship of the Paris Club. We include only distressed debt exchanges, defined as restructurings of bonds and bank loans at less favorable terms than the original bond or loan. We thereby follow the definition and data provided by Standard and Poor's (2007). We also restrict the sample to restructurings of medium and long-term debt thus disregarding deals involving short-term debt only, such as the maintenance of short-term credit lines or 90-day debt rollovers. Similarly, we exclude agreements that only imply short-term maturity extension of less than a year. Note, finally, that restructurings of private-to-private debt are not taken into account, even in cases such as Korea 1997 or Indonesia 1998, where large-scale workouts of private sector debt were coordinated by the respective governments.

Based on these selection criteria, we identify 202 sovereign debt restructurings in 68 countries. We were able to gather sufficient data to compute haircuts on all of these cases, except for the cases of Togo 1980 and 1983. Beyond these, we decided to drop 18 agreements that were never implemented, e.g. because of failed IMF programs or for political reasons, as well as four minor restructurings.[12] The rationale for dropping these 22 cases is that they are not comparable to the other cases on the sample. We thus base all summary statistics on a final sample of 178 implemented restructurings in 68 countries.

There is no single standardized source providing the degree of detail, reliability and completeness necessary to set up a satisfactory database of restructuring terms since the 1970s from which to estimate haircuts. We therefore gathered data from all publicly available lists on restructuring terms and many further sources, including articles in the financial press and from the IMF archives. Overall, our information set is based on 29 documents containing systematic lists with debt restructuring terms, as well as more than 100 additional sources such as books, academic articles, policy reports, offering memoranda, and press articles. Table A1 in the Appendix provides a condensed overview, while the exact sources collected for each of the cases are documented in detail in Appendix B (section B3). Despite compiling (and comparing) as many sources

[12] The four minor deals include Mexico's side-deal with Spanish banks (May 1990), two deals that only implemented minor interest rate adjustments (Chile April 1988, Romania Oct 1987) as well as the case of Turkey in August 1981.The Appendix gives a more detailed description on these cases and why they are excluded.

as possible on each case, we generally relied on only one primary source and, sometimes, up to two additional sources for the final calculations. [13]

We adopt several strategies to minimize errors and omissions in the haircut calculations. First, we merge the information contained in all of our sources into one unified overview table. This exercise enabled us to fill most data gaps and correct many minor inaccuracies contained in the individual sources. The comparison also revealed notable differences in the scope and data quality of the available sources (see the discussion in section A4 in the Appendix). In case of remaining inconsistencies or missing data, we search for further sources in the press and elsewhere, with exact sources provided. To be as transparent as possible with regard to the quality of our calculations, we also compute an index (ranging from 0 to 5) that captures the scope and quality of information available for each case (see subsection A4.2).

3. Haircut Estimates: Results and Stylized Facts

The dataset and estimates of the 178 deals in our final sample provide a series of new facts on restructurings and sovereign debt as an asset class. A first insight is the high frequency of restructurings, both within and across countries. On average, defaulting countries restructured their debt two and a half times since 1970. Figure A7 in the Appendix plots the timing of restructuring events for each of the countries. Especially the 1980s saw a large number of successive restructurings, which were often linked to each other. The country with the most completed debt exchanges was Poland with eight deals, followed by Mexico, Congo (Dem. Rep.), Jamaica and Nigeria with seven deals each and by Argentina, Brazil and Mexico with six deals each. These figures reconfirm the notion of "serial defaults" highlighted by Reinhart and Rogoff (2009). Interestingly, however, not all historical serial defaulters feature a high number of restructurings. Peru, for example, was in on-and-off negotiations for as long as 14 years before it finally exited default via its 1997 Brady deal restructuring.

<Figure 1 about here>

A second stylized fact is the large variability in haircut size across space and time. The simple scatter plot (Figure 1) is based on our estimates for H_{SZ} (eq. 2) and illustrates the large dispersion in haircut size, which has increased since the 1970s. Recent years have seen a particularly large variation, with some deals involving haircuts over 90% and others involving haircuts as low as 5%.

The figure also plots the relative size of each restructuring in nominal US dollars, reflected by the size of the circles. One can see that there have been a series of very

[13] For the 1980s and 1990s, the most important sources where a series of reports by the IMF and a detailed restructuring survey collected by the Institute of International Finance (see Appendix). For the more recent period, the most important source was Sturzenegger and Zettelmeyer (2006, 2007, 2008), who kindly shared their database of bond-by-bond haircut calculations.

sizable deals from the mid 1980s on. Particularly the Brady deals restructured large volumes of debt. The cases of Mexico 1990 ($54 bn) and of Brazil 1994 ($43 bn) involved debt volumes in the range of Argentina restructuring of 2005 ($44 bn). Interestingly, there have been several deals in the last decade with both very large volumes of debt affected and exceptionally high haircuts. In particular, we find that the three largest restructurings of recent years (Argentina 2005, Russia 2000 or Iraq 2006) all implied haircuts of more than 50%.

<Table 1 about here>

Table 1 provides summary statistics. We find that across all restructurings between 1970 and 2007, H_{SZ} is estimated at 36%, which means that investors were able to preserve almost two-thirds of their asset value in each exchange. The volume-weighted average haircut is even lower, amounting to about 31%. The table also shows notable differences in haircut estimates depending on the formula applied. As predicted, the market haircut at 39% tends to be larger than the SZ haircut, although the differences are surprisingly small, amounting to only 3 percentage points on average. We find larger differences when comparing the H_{SZ} estimates to the set of naïve haircut estimates, which were computed using a uniform 10% discount rate (hence neglecting country and global credit market conditions) and no forward interest rates. The average naïve haircut is a mere 20%, or nearly half the average H_{SZ} haircut. When using the face value reduction type of haircuts the average is lowest (16%). These large discrepancies with H_{SZ} suggest that these two latter measures will miss the actual creditor value loss implied in restructurings.

Overall, creditor losses turn out to be surprisingly small, at least compared to corporate restructurings. The most comprehensive dataset on US corporate bond and banking debt restructurings for the period 1982-2005 by Moody's (2006) estimates the average value weighted market haircut to be 64%.[14] According to these figures, US corporate debt restructurings implied haircuts that were twice as high as those we find for sovereign debt restructurings, during a roughly corresponding sample period.

Looking at different decades, we find that average haircuts were significantly lower in the 1970s and 1980s as compared to recent years (25% on average). Haircuts of restructurings in the early and mid 1990s and those implemented after 1998 were nearly twice as high on average (of 52% and 48% respectively). However, we do not find an increase in haircuts when comparing the subsample of 16 Brady deals (between 1990 and 1997) with the subsample of 13 sovereign bond restructurings since 1998. On the contrary, Brady deals implied an average haircut of 52%, which is higher than that of recent bond debt exchanges (of 49%).

[14] Haircuts of senior secured corporate debt were 47% while those on senior secured banking debt were 36% --very similar to those on sovereign. Altman and Kishore (1996) find similar results.

<Figure 2 about here>

Figure 2 plots the distribution of haircuts with and without some degree of face value reduction. It is evident that the 1990s and 2000s feature many more restructurings with outright debt reduction. These cases also tend to imply higher creditor losses than debt reschedulings that only involve a lengthening of maturities (with haircuts of 65% vs. 24% respectively).

The type of debtor also matters. In particular, we find exceptionally high haircuts in restructurings of highly indebted poor countries (HIPCs). To show this, we categorize a subsample of restructurings as donor supported, i.e. deals that were largely financed by the World Bank's Debt Reduction Facility that grants funds to governments to buy back their debts to external commercial creditors at a deep discount (see World Bank 2007). The average haircut in the 23 donor supported restructurings since the early 1990s is estimated at 87%. This is more than three times as large as for restructurings in middle income countries, but is in the range of debt relief accepted by official creditors in these same countries (see World Bank 2010).

<Table 2 about here>

To compare our haircut estimates to those of others, we summarize results of 16 recent restructurings in Table 2. For the overlapping sample, our estimates are very similar to those of SZ. When comparing their average haircut (reported in SZ 2006) to our preferred haircut of (eq. 2) there is a mean absolute deviation of 6 percentage points. Only two estimates differ significantly (by more than 10 percentage points), namely Pakistan 1999 and Ukraine 2000, and this is mostly because our methodology yields significantly lower discount rates for these two cases. We also find our results to be roughly in line with the net present value estimates by Bank of Spain and Bank of England staff (Bedford et al. 2005 and Diaz-Cassou et al. 2008a, 2008b), with an average deviation of 8.6 and 9.1 percentage points, respectively. Our results differ more markedly from Finger and Mecagni (2007), who often apply a 10% discount rate, and from those reported by Benjamin and Wright (2009), who do not calculate haircuts in present value terms but base their estimates on World Bank data on debt stock reduction and interest and principal forgiven (including buy backs).

4. Theory and Identification

This section briefly discusses the theoretical framework, the key hypotheses and our empirical strategy to test them. Our main aim is to assess the link between restructuring outcomes (haircuts) and subsequent borrowing conditions. More specifically, we focus on the government's post-restructuring access to finance by analyzing (i) monthly secondary market bond spreads and (ii) different yearly measures of exclusion from capital markets.

Theoretically, we build on Asonuma (2010) and Yue (2010) who provide clear predictions of how haircut size will affect country access to foreign credit. Yue's (2010) dynamic stochastic general equilibrium model generates endogenous exclusion from financial markets after default, where the duration of exclusion increases with the amount of debt reduced. A bad credit record due to high arrears and/or a low recovery rate of the defaulted debt implies longer exclusion. Asonuma (2010) extends Yue's model by incorporating the rate of return offered on newly-issued debt after default. In his model, forward-looking creditors and debtors bargain not only over the size of the recovery rate, but also on the risk premium paid on debt issues after re-entry into capital markets. His quantitative analysis reveals that the yield spread on new debt will be higher, the lower the implied recovery rate of the restructuring, i.e. the higher the haircut. From these models, we can derive two testable hypotheses: Hypothesis 1: The larger the size of H, the higher the yield spreads after restructurings; and hypothesis 2: The larger H, the longer the period of exclusion from capital markets.

In both Yue (2010) and Asonuma (2010) the implicit mechanism is the classic reputational one suggested by Eaton and Gersovitz (1981): A good repayment record assures access to credit in the future. However, there could be other channels through which haircut size affects market access conditions. First, high haircuts could be seen as a signal of bad fundamentals and government unwillingness to pay, with adverse consequences for country spreads and capital access (in analogy with Sandleris, 2008). Second, investors could assess whether the size of H is "excusable", i.e. justified by bad macroeconomic conditions. This channel is linked to Grossmann and van Huyck (1988) who suggest a model in which debt-servicing obligations are implicitly contingent on the realized state of the world. Adverse reputational effects would then only occur in case of excessive or "inexcusable" haircuts. Third, there is the countervailing effect of debt relief. Sovereigns imposing high haircuts will reduce their indebtedness more significantly, which makes them more solvent thereafter, at least in the short run. In an atomistic bond market without tacit creditor collusion a la Wright (2002), new lenders may ultimately reward the resulting lower debt to GDP ratio. Higher haircuts would then imply lower post-restructuring spreads and quicker reaccess.

Empirically, it is challenging to test how much each of these potential channels matters. Our key contribution is to use our new dataset to document the relationship between H and the terms of subsequent capital market access. However, one extension of our analysis dissects the size of H into its “expected” and “abnormal” or “inexcusable” components resulting from a rather parsimonious model. We then use these two variables in our estimations on bond spread determinants. Of course, this is but a first step. Future versions of the paper will attempt to disentangle the mechanisms at play in more detail.

We should mention an important challenge to identifying the impact of past haircuts on subsequent borrowing. Intuitively, it can be that countries imposing higher haircuts are also in a worse shape at the time of the restructuring and in the periods thereafter. However, if time and country characteristics are correlated with the lagged values of H, the estimation may be biased and the relationships documented below may not be causal. To address this concern, we include country and time fixed effects and control for a set of observable fundamentals suggested by theory and the previous international finance and asset pricing literature. This mitigates, but not necessarily completely eliminates, the possibility that our coefficients are picking up the correlation between H and an omitted variable that represents the ultimate cause at stake. In this version of the paper, we are replicating the models used in a literature that claims that defaults do not imply substantial increases of future financial costs. Our refinement allows identifying a higher cost of defaults under the maintained hypothesis that the received empirical models are an adequate testing tool. Future versions of this paper will address this identification concern in more depth.

5. Haircuts and Post-Restructuring Spreads: Data and Results

In order to identify post-crisis episodes, we focus on “final” restructurings only, which we define as those that were not followed by another restructuring (vis à vis private creditors) within the subsequent four years.[15] We interpret these as being the restructurings that successfully resolved a debt crisis. We therefore disregard intermediate restructurings, including most deals of the early and mid 1980s that only implied short term debt relief. This definition yields a sample of 66 final restructurings in 62 countries during the period 1980-2006.[16]

5.1. Dependent Variable: EMBIG Spreads

To assess the role of haircut size for post-restructuring borrowing costs, we use monthly data on secondary market bond spreads from J.P. Morgan’s EMBI Global (EMBIG) in the period 1993 to 2006. EMBIG spreads have been used extensively in the academic literature to proxy country borrowing costs in international financial markets. A main advantage of using EMBIG data is that it allows constructing a monthly panel dataset for a large number

[15] In the analysis, we also exclude years with ongoing defaults (including selective default) on bank and bond debt using Standard & Poor’s (2007) data.

[16] An overview of “final” deals is provided in Table 8 below. Note that there are only four countries in the sample with more than one final deal. The cases are Argentina (1993 and 2005), Dominican Republic (1994 and 2005), Ecuador (1995 and 2000) and Uruguay (1991 and 2003).

of emerging market countries whose bonds satisfy certain minimum liquidity and global visibility benchmark, so that one would expect informationally efficient pricing. The EMBIG is composed of U.S.-dollar denominated sovereign or quasi-sovereign Eurobonds and Brady Bonds that are actively traded in secondary markets, as well as a small number of traded loans.[17] While the EMBIG was only introduced in January 1998, historical data for major emerging market countries is available back to 1993. Table 3 lists the 36 countries included in our pricing analysis. Of these 36 countries, 24 countries restructured sovereign debt with private creditors at some point since 1990, while 12 never restructured, at least not since the mid 1980s.

<Table 3 about here>

5.2. Preliminary Data Analysis

We begin with a preliminary analysis of bond spreads. Figure 3 plots monthly average spreads during post-restructuring years measured in event time. The plot reveals a notable difference in average spreads following deals involving haircuts larger and smaller than 30%, which is roughly the sample mean for these 24 defaulters. The deviation is small in year one and two after the restructuring, but increases from year three onward, with differences surpassing 200 basis points (bp) on average. Given the defaulter average spread level of about 600 bp in the overall sample, these are very sizable differences. The figure also shows that the unconditional sample mean spread for the 12 non-defaulters in the sample was 223 bp, a lower bound that is never pierced by any of the defaulter groups in the 100 months after restructurings.

<Figure 3 about here>

5.2. Estimated Model on Post-Restructuring Spreads

Since asset markets are forward looking, understanding bond yields at a given point in time requires controlling for current and expected future conditions affecting both the prevailing price of credit risk and expected collection. To assess the role of credit history for sovereign borrowing costs and to facilitate comparison with the received literature, we take a bond spread equation in the vein of those in Dell'Arriccia et al. (2006), Panizza et al. (2009) or Eichengreen and Mody (2000). Our innovation is that we use a continuous measure of investor outcomes instead of a default dummy variable. The empirical model is:

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[17] The spread is simply the difference between the weighted average yield to maturity of a given country's bonds included in the index and the yield of a U.S. Treasury bond of similar maturity. In line with most other researchers, we use stripped spreads which focus on the non collateralized portion of the emerging country bonds (see J.P. Morgan 2004 for details).

$$S_{it} = \{\phi_1 I_1(i,t) + \phi_2 I_2(i,t) + \phi_3 I_3(i,t) + \phi_{4-5} I_{4-5}(i,t) + \phi_{6-7} I_{6-7}(i,t)\}\ H_i\ + \beta' X_{i,t-1} + \omega_i + \eta_t + u_{it} \qquad i = 1,...,N \quad t = 1,...,T \tag{3}$$

where $I_\tau(i,t)$ is an indicator variable that equals 1 when month t belongs to year τ after country i finalized its last restructuring (τ =1,2,3,4-5,6-7) and zero otherwise, H_i is the haircut arising from that restructuring, $X_{i,t\text{-}1}$ is a vector of macroeconomic control variables known during month t, ω_i is a country fixed effect, η_t is a time fixed effect and u_{it} is an error term. The key parameters of interest are ϕ_τ which measure the partial effect of haircuts on spreads τ years into the future controlling for other simultaneous determinants of spreads.

Specifically, we control for the debtor country's level of total external debt to GDP, the ratio of reserves to imports, the ratio of exports to GDP, the country's annual rate of inflation and (real) GDP growth, the level of the current account to GDP and the budget balance. To capture political risk we include the standard aggregate risk index by ICRG. These control variables are lagged by one year. International credit market conditions are controlled for by including the 10 year US Treasury yield rate and the Lehman Brothers low grade US corporate spread index. Following the received literature we also take into account credit ratings, by including the residual of a regression of S&P and Moody's country credit ratings on the set of other fundamentals and variables in each specification. The definition and sources of all variables are listed in Table 4 below.

<Table 4 about here>

Generically speaking, the previous literature estimates the ϕ coefficients without controlling for the magnitude of haircuts. Following Asonuma (2010) our contribution is to allow for the possibility that the effect of restructuring on spreads could be a function of a continuous measure of investor outcomes, not just of the mere existence of a restructuring. It is natural to think of that specification in light of the wide variation of investor losses documented in section 3.

Moreover, in one of the specifications below, we follow Grossman and van Huyck (1988) in dissecting haircuts into a component that we call excusable (H^{EX}) and another one that we call inexcusable (H^{INEX}) as estimated from a parsimonious auxiliary model. In that specification, the estimating equation is:

$$S_{it} = \{\phi_1 I_1(i,t) + \phi_2 I_2(i,t) + \phi_3 I_3(i,t) + \phi_{4-5} I_{4-5}(i,t) + \phi_{6-7} I_{6-7}(i,t)\}\ H_i^{EX}\ + \{\gamma_1 I_1(i,t) + \gamma_2 I_2(i,t) + \gamma_3 I_3(i,t) + \gamma_{4-5} I_{4-5}(i,t) + \gamma_{6-7} I_{6-7}(i,t)\}\ H_i^{INEX}\ + \beta' X_{i,t-1} + \omega_i + \eta_t + u_{it} \qquad i = 1,...,N \quad t = 1,...,T \tag{4}$$

The idea is that, to the extent that sovereign contracts are implicitly contingent on the realized state of the world, only haircuts that are abnormally high given the exogenous shocks affecting an economy will be subsequently priced in the market. Hence, in equation (4) we expect the γ-coefficients to be positive while the ϕ-coefficients should be zero.

5.3. Results: Haircuts and Subsequent Bond Spreads

Table 5 shows the results, both with and without the set of control variables suggested by Eichengreen and Mody (2000) and Dell'Arriccia et al. (2006). The key result is that the lagged values of H_{SZ} are positive and significant for up to five or even seven years after the restructuring event.[18] This result holds for different model specifications and also when including year fixed effects. The strictest model to test our hypotheses is that in column (6) which includes year effects and controls for the potential endogeneity of the timing of restructuring (e.g. as in countries hurrying to settle with creditors when they anticipate favorable future borrowing conditions). It indicates that a one percentage point increase in haircuts is associated with EMBIG spreads that are about 8.8 bp higher in year one after the restructuring and still about 2.3 bp higher in years four and five. Put differently, a one standard deviation increase in H_{SZ} (about 20 percentage points in this sample of emerging country final deals) is associated with spreads that are 1.7 percentage points higher in year one and almost one half a percentage point higher in years four and five. Alternatively, after controlling for a host of fundamentals affecting bond spreads, a jump in H from the first to the third quartile of its distribution carries an expected increase in spreads of 252 bp in year one and 65 bp in years four and five after the restructuring. With just two exceptions, these coefficients are uniformly lower than those in the specifications of columns (1) through (5) which replicate different specifications from Dell'Arriccia et al. (2006) and Eichengreen and Moody (2000). Therefore the reported coefficients should be taken as a lower bound of the estimated effects. Note also that most of the other variables have the expected sign and are in line with Dell'Arriccia et al. (2006) and others.[19]

<Table 5 about here>

The estimated coefficients are much larger, and longer lived than those presented in previous work on the impact of country credit history for borrowing costs.[20] To make our results directly comparable to the previous literature, we substitute the lagged values of H_{SZ} with lagged values of a simple default dummy and obtain coefficients that are nearly identical to Borenzstein and Panizza (2008) (see column (2) of Table 6). The coefficient

[18] H is measured in percentage points throughout.
[19] We also find that the coefficient of the U.S. Treasury 10-year yield is significant and negative, which is surprising. A likely reason for this is that the U.S. 10-year yield is strongly correlated with the high-yield bond spread (0.75), so that including both variables jointly may bias the estimated coefficient. We therefore exclude the U.S. Treasury 10-year yield in the robustness analysis.
[20] For example, the influential early studies by Lindert and Morton (1989) and Özler (1993) and a new, rigorous paper by Benczur and Ilut (2009) all find that past default leads to an average increase in post-crisis spreads of, at most, 50 basis points.

for past restructurings is in the range of 360 bp in year one after the restructuring, about 250 bp in year two, but much smaller and mostly insignificant thereafter. Thus, with the binary dummy, effects appear strong but very short-lived. This stands in contrast to our key finding, as the size of the haircut seems to matter both in the short and medium run.

To identify the channel behind this main finding we distinguish between “excusable” and “inexcusable” haircuts. In line with Grossmann and van Huyck (1988), adverse reputational effects would ensue only when haircuts are excessive or “inexcusable” given exogenous shocks to the debtor. To our knowledge this refutable proposition has not been taken to the data - so we next do a first attempt at it. We start with a parsimonious first stage model in which H_{SZ} of all restructurings in the sample (see Table 3) are regressed on time effects (1990-1994, 1995-1999 and 2000-2007), regional effects (Europe and Central Asia, Far Asia, Middle-East and Africa, and Latin America and Caribbean), a dummy for Brady deals and the debt to GDP ratio in the year before the restructuring. [21] This regression decomposes actual H_{SZ} into its “predicted“ value and a residual which we interpret as measuring the „inexcusable“ haircut.

Column (7) in Table 5 reports the results of replicating the model in column (6) but dissecting H_{SZ} into these two components as indicated in equation (4) above.[22] The left sub-column at the top reports the estimated coefficients on lagged predicted haircut while the right sub-column shows the coefficients on the lagged inexcusable haircut. The results are interesting: in the short run, markets penalize predicted haircuts. However, predicted haircuts have no long run effects. Long run effects are associated only with inexcusable haircuts and they are both economically and statistically significant. A one standard deviation of inexcusable haircut causes ceteris paribus an increase in spreads of 150 basis points in years four and five after the restructuring and of 207 basis points in years six and seven after the restructuring. We conclude that, on first examination, the data seem consistent with the reputational model of Grossman and van Huyck (1988), in which investors differentiate between types of default.

5.4. Robustness

We next implement several further extensions and robustness checks, based on a parsimonious specification that only includes explanatory variables that are significant across the different models and weakly correlated among each other. We first assess

[21] The first-stage results are not reported but are available from the authors on request. The specification resulted from a “general to specific” modeling approach. Other variables considered, but not included in the final first-stage regression, were natural disasters (share of population killed and affected by natural disasters as moving sum between years t-4 and t-1), bank crisis (1 if there was a bank crisis between t-4 and t-1, 0 otherwise), terms of trade (cumulative percentage increase between t-4 and t-1), GDP growth (cumulative percentage increase between t-4 and t-1) and the debt to exports ratio in year t-1. When the individually significant variables were put alongside each other only debt to GDP remained significant.

[22] This second stage regression has fewer observations than those of the previous columns since it is focused on the sample of defaulting countries (e.g. those in the left-hand side of Table 3). It uses the abnormal pressure exerted on creditors, conditional on a restructuring having taken place, and given conditions that are exogenous to the debtor.

whether the results are sensitive to alternative definitions of haircuts as defined in section 2. Table 6 shows the results with alternative haircut measures. Column (3) shows results when including lagged values of the face value reduction measure, column (4) for lagged values of H_M, and column (5) for lags of the naïve haircut. In addition, column (6) also shows the effects for lagged values of an "effective haircut" measure, which results from multiplying H_{SZ} by the fraction of total foreign debt owed to private international creditors (in *t*-1) involved in the final deal (with data on debt to private creditors taken from the GDF database). This last measure thus takes into account the percentage of debt affected by the haircut. Finally, column (7) shows results when using a "decaying haircut" measure which weights H_{SZ} with linearly decreasing weights (by 0.1 per year). In this specification, I_τ in equation (4) is multiplied by (1-0.1(τ-1)).

<Table 6 about here>

Overall, we find that the results are rather stable across different haircut measures. However, the effects seem to be more pronounced and longer-lived the closer the variables measure the "true" loss suffered by creditors. To see this compare the results using the face value reduction measure in column (3) with those relying on effective haircut in column (6), which accounts for the volume of debt affected. The latter specification shows much larger and significant coefficients in the medium run.

Further robustness checks are implemented in Table 7. In a first step, we restrict the time frame to 1998-2006, thus dropping all Brady-era observations of 1993-1997 (column 1). Next, we focus on the subsample of defaulters, defined here as countries that restructured sovereign debt at least once after 1985 (those in the left column of Table 3). In both cases we find the results for our benchmark equation to be robust. The same is true when excluding two notable outlier countries, Argentina and Russia, which both defaulted unilaterally, in 1998 and 2001 respectively, and imposed exceptionally high haircuts. As can be seen in columns (3) and (4) the results are largely robust to these additional checks. In a last step, we include a dummy variable for ongoing holdout and litigation events using data from Trebesch (2008). We thereby take into account instances like in Argentina post 2005 or Peru post-1997 in which countries did come to a final restructuring but continued in disputes with holdout creditors. As can be seen, the dummy variable for litigation is insignificant and the effects of *H* are largely unchanged.

<Table 7 about here>

6. Haircuts and Duration of Exclusion: Data and Results

To assess the role of haircuts for exclusion duration we construct an annual dataset on access to capital for the period of 1980 to 2006. The decision to use yearly data is in line with related research and driven by data availability, as our duration analysis goes further back in time and spans a larger number of defaulting countries, many of which do not have reliable data at monthly frequency. We again focus on access conditions after “final” restructurings, i.e. those not followed by another restructuring in the next four years. The sample includes all 16 Brady deals and the set of recent sovereign bond restructurings, but excludes the exceptional cases of Yugoslavia and Cuba due to missing data on explanatory variables (Table 8 provides an overview on all 66 cases included).

6.1. Dependent Variable: Years of Exclusion

The dependent variable on exclusion duration is the number of years between a restructuring event and the first year of reaccess to capital markets.[23] In defining market access, we build on Gelos et al. (2004) and Richmond and Dias (2009), the two key empirical contributions on this issue in recent years. Gelos et al. define access as issuance of a public or publicly guaranteed bond or syndicated loan on international markets that leads to an increase in public indebtedness to private external creditors.[24] Richmond and Dias, in contrast, propose a broader definition based on aggregate capital flow data. They define reaccess as the first year after settlement with a net debt transfer from private foreign creditors to the public and/or private sector of the debtor country. Our aim here is not to develop a novel measure of reaccess, nor do we plan to embark into lengthy discussions on the benefits and drawbacks of alternative measures. By contrast, our purpose is to analyze the findings of the received literature through the lenses of a more precise definition of investor losses. As a baseline, we therefore construct a measure that is as general as possible, simply by combining the definitions of Gelos et al. and Richmond and Dias. Later on, we test the robustness of our results to alternative measures, including the original ones proposed by the authors.

The main measure used here captures “partial” reaccess, defined as the first year with primary market issuance and/or positive credit flows to the public sector. The measure takes a value of one in case the government and/or public or publicly guaranteed enterprises (i) places at least one syndicated loan or bond in international markets that results in an increase in indebtedness or (ii) if the public sector receives net transfers from private foreign creditors so that new borrowing minus debt service is positive. The first criterion follows Gelos et al. and is measured using issuance data on individual syndicated

[23] If a country restructures and regains market access in the same year, we consider the duration of market exclusion to be one year.
[24] This second criterion aims to exclude cases in which sovereigns issue debt only to roll over expiring maturities.

loans and bonds provided by Dealogic. More specifically, we aggregate information of 3,688 public and publicly guaranteed bonds in 78 countries and 10,013 syndicated loans that are public or publicly guaranteed from 143 countries between 1980 and mid 2008. In line with Gelos et al. we only regard issuances that lead to an increase in the public sector debt stock. Data on the stock of public sector debt owed to private creditors is taken from the GDF dataset. The second criterion follows Richmond and Dias and is constructed from aggregate data on bank and bond flows. The dummy takes a value of one in case bank or bond transfers from foreign private creditors to the public and publicly guaranteed sector are larger than 0. To check the robustness of our finding we also construct (i) measures of "full reaccess" defined as the first year in which debt flows surpass 1% of GDP, (ii) a measure that focuses on primary market issuance only (the original Gelos et al. definition), and (iii) a measure that takes into account flows to the public *and private* sector of debtor countries (the Richmond and Dias definition).

6.2. Preliminary Data Analysis

Next, we present descriptive findings on haircut size and the duration of exclusion. Table 8 lists restructuring events and the year of reaccess using various definitions. The average duration from restructuring to partial reaccess is 5.5 years, while it takes an average of 8.2 years until full reaccess. We find that the duration of exclusion tends to increase with haircut size. The average duration until partial reaccess is 2.9 years following restructurings with haircuts lower than 30%, but 6.2 years for deals with H_{SZ}>30. Figure 4 plots the relationship between H_{SZ} (in %) and years until partial reaccess for the full sample, further pointing to a positive relationship between the two. The overall picture is similar when using time until full reaccess, i.e. until loan or bond issuance or net inflows surpass 1% of GDP.

<Table 8 about here>

<Figure 4 about here>

Another way to illustrate the patterns of exclusion is to plot an empirical survival function. We apply the non-parametric Kaplan-Meier estimator, which estimates an unconditional survival function and is very popular in the survival analysis literature. This statistic reports the compound probability of not having reaccessed the market for each year after the restructuring. It can be defined as

$$\hat{S}(t) = \prod_{j|t_j \leq t} \left(\frac{n_j - d_j}{n_j} \right) \qquad (5)$$

where $t_j, j = 1, \ldots$, denotes the times at which failure occurs, d_j are the number of failures, or "exits" at time t_j and n_j is the total number at risk of failure at time t_j (see Kalbfleisch and Prentice 2002). Here, the number of failures d_j is simply the sum of countries that successfully reaccess capital markets in a given year, while n_j counts the number of country cases that were excluded at t_{j-1}.

<Figure 5 about here>

Figure 5 shows the result for the estimated survival function for partial reaccess. Unlike previous research, we estimate survival functions depending on haircut size of the restructuring. More specifically, we group cases with H_{SZ}<30%, with H_{SZ}>60% and those in-between. The graph shows that the estimated functions are markedly different for cases with higher haircuts. Only 10% of countries with H_{SZ}>60% regain partial access within two years, compared to 50% for cases with H_{SZ} smaller than 30%. The figure also shows that exceptionally high haircuts are often followed by exceptionally long periods of exclusion. More than 70% of countries imposing $H_{SZ} > 60$ did not regain partial access after 15 years.

6.3. Estimated Model on Exclusion Duration

In a second step, we estimate a semi-parametric Cox proportional hazard model that includes our haircut measure as the key explanatory variable. The advantage of the Cox model is that it allows including time-varying covariates and that it can deal with the problems of censored observations and multiple events. For this model, the hazard rate for the *i*th individual (or *i*th exclusion episode) can be written as

$$h_i(t) = h_0(t)\exp(\beta' z), \qquad (6)$$

where $h_0(t)$ is the baseline hazard function, z a set of covariates and β a vector of regression coefficients.

The key advantage of the Cox model vis-à-vis other duration models such as the parametric Weibull model or the log logistic model, is that it is not necessary to specify a functional form of the baseline hazard rate $h_0(t)$. Instead, the shape of $h_0(t)$ is assumed to be unknown and is left unparameterized. Accordingly, we estimate reduced form models allowing the functional form of the hazard function to be explained by the data. The model is estimated via a partial likelihood function of the following form:

$$L(\beta) = \prod_{i=1}^{n} \left(\frac{\exp(\beta' z_i)}{\sum_{j \in R(t_i)} \exp(\beta' z_j)} \right)^{\delta_i}, \qquad (7)$$

where $R(t_i) = (j : t_j \geq t_i)$ denotes the risk set (i.e. the number of cases that are at risk of failure) at time t_i. The model can be extended in a simple manner once time varying covariates are included (see Lancaster 1990 for a detailed presentation).

In estimating the model we rely on the variance correction method proposed by Lin and Wei (1989).[25] This avoids misleading inference in the case of repeated events and is relevant because some countries in our dataset had multiple restructurings and reaccess episodes since 1980. Thereby potential learning effects are also taken into account.

In the choice of control variables we again build on previous literature, in particular on Dell'Arriccia et al. (2006), Gelos et al. (2004) and Richmond and Dias (2009). One difference compared to the above is that we now use country ratings by Institutional Investor magazine instead of commercial rating agency ratings, simply because we cover a much larger sample of countries and years than in the monthly EMBIG dataset. We also include dummy variables for world regions following the World Bank classification as well as period fixed effects (by decade).[26]

6.4. Estimation Results: Haircuts and the Duration of Market Exclusion

Table 9 shows the results for various specifications of the Cox proportional hazard model. A positively signed coefficient means that higher values of a covariate increase the hazard rate, i.e. the likelihood of failure in a given period. Here, a positive coefficient indicates that higher values of that variable are associated with quicker reaccess relative to the baseline, while negative coefficient indicates longer exclusion duration.

< Table 9 about here >

The main result of Table 9 is that the coefficient of H_{SZ} is positive and robustly significant in all specifications. It also has a sizable quantitative effect. To illustrate this and to allow for a more intuitive interpretation, it is necessary to exponentiate the coefficients shown in the table. The coefficient of 0.0304 in column (7) indicates that a one unit (percentage point) increase in H_{SZ} lowers the likelihood of reaccessing capital markets in a given year by 3%.[27] Accordingly, a 30 percentage point increase in H_{SZ} decreases the likelihood of reaccess by 60% in any given year, and after controlling for country fundamentals.[28] This indicates that restructuring outcomes play a crucial role for the speed of reaccess after settlement.

Regarding the other variables included, we can report only few significant coefficients. In line with Richmond and Dias (2009), we find population size to be positively associated with the speed of reaccess, although this finding is not very robust to specification changes. Higher debt to GNI levels and higher annual inflation have significant negative coefficients, and are thus associated with longer exclusion duration. We also find country

[25] For a survey on variance-correction methods for repeated events in survival analysis see e.g. Kelly and Lim (2000).

[26] Note that the proportional hazard survival models produce biased estimates with country fixed effects (Allison 2002, Andersen et al. 1999).

[27] The calculation is 100*($e^{-.0304}$-1) = -3

[28] The calculation is 100*($e^{[30*-.0304]}$ -1) = -59.9

credit ratings to matter, with more favorable ratings increasing the likelihood of reaccess. All other variables included turn out not to be significant. Like before we therefore strike a balance between parsimony and performance of the model, and settle on a baseline specification with a reduced set of covariates. Other than regional and decade fixed effects this baseline specification includes the high-yield bond spread, debt to GNI, GDP per capita, the growth rate, reserves to imports and the rating residual. Both the log-likelihood statistics and the B.I.C. criterion indicate a superior model fit for this specification.

6.5. Robustness

As an important robustness check, we assess to what extent our main results depend on the definition of market access. Table 10 reports results for three alternative dependent variables. Columns (1) and (2) show results for duration until "full reaccess" defined above as the first year with issuance volumes or net transfers to the public sector exceeding 1% of GDP. The dummy for "full reaccess" uses these same data sources, but imposes a higher threshold. It is coded as one (i) if bond or loan issuances in international markets exceed 1% of GDP or (ii) if net bank and bond transfers to the public sector exceed 1% to GDP. The 1% threshold is chosen in accordance with Richmond and Dias and represents less than one-half of the annual public sector borrowing requirement over the entire sample of years and developing countries.[29]

< Table 10 about here >

Columns (3) and (4) extend the definition of access to include net transfers to the *private* sector as well, following Richmond and Dias (2009). This broader definition translates into significantly shorter periods of exclusion, as illustrated in Table 8.[30] We next follow the original definition of Gelos et al. (2004) in columns (5) and (6). Under this specification, market access is measured by primary market loan or bond issuance only, thus disregarding overall net transfers. When comparing the results for these very different market access definitions, we find our main result to be surprisingly robust. H_{SZ} remains significant with a sizable coefficient of between -0.02 and -0.04. This gives strong support that haircut size may play a crucial role for country access to capital markets post-restructuring.

< Table 11 about here >

[29] GDP data is taken from the World Development Indicator dataset. The annual volume of loan and bond placements is again aggregated from individual issuance data from Dealogic, while net transfers are again taken from the GDF dataset.
[30] Take the example of Chile, which restructured in 1990. According to our baseline definition, which focuses on public sector borrowing only, the country regained partial access in 1994 and full access in 1998. Yet, once debt flows to the private sector are taken into account partial access is gained as early as 1991, i.e. after only one instead of 4 years.

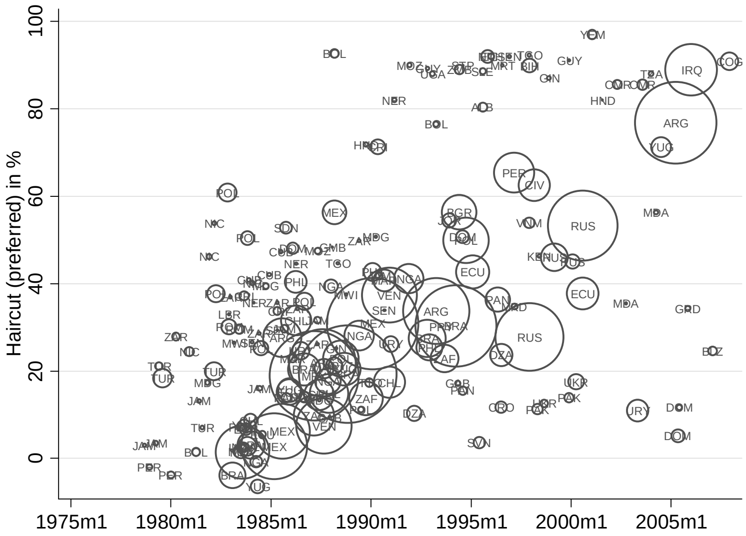
To further assess the validity of our results, we restrict the sample to middle income countries only (see columns 7 and 8 in Table 10). Specifically, we exclude all episodes linked to donor funded debt restructurings, which usually take place in highly indebted poor countries (HIPCs). The reason why this robustness check is important is that donor funded debt restructurings tend to be of a different nature. First, haircuts in donor funded deals tend to be significantly higher compared to all other restructurings. Additionally, most HIPCs have no or only limited access to international capital markets, a fact that may distort the estimated coefficients if these countries are included. As can be seen, however, we find the results to be robust in the subsample of non-HIPC countries. The same is true when restricting the sample to the group of emerging market countries included in our analysis on EMBIG spreads above (results available upon request). Finally, we also show results when using other haircut measures. Table 11 shows that the results are only little affected when using the "market haircut" of eq. (2), a measure for plain face value reduction, the set of "naïve haircuts" using a uniform discount rate, or the "effective haircut" accounting for the share of outstanding debt restructured.

7. Conclusion

This paper computes haircuts implicit in debt restructurings between sovereigns and private international creditors during 1970-2007. We use the variation in haircut size as a novel measure of credit history and investigate the link between haircuts and subsequent borrowing conditions of defaulting countries. Our main finding is that higher haircuts are associated with significantly higher post-restructuring spreads and much longer periods of market exclusion. This indicates punishment effects in credit markets, as predicted by theory. Interestingly, however, the finding stands in contrast to much of the existing literature, which finds only small or short-lived effects of defaults and restructurings on access conditions.

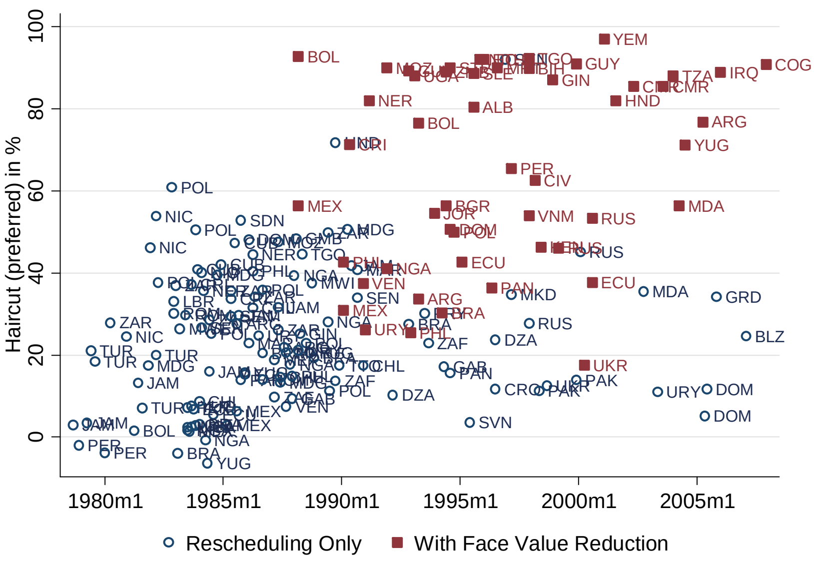
Overall, we regard the analysis in this paper as a first step to reassess post-default borrowing conditions of sovereigns. In particular, we see the need for further analysis on the mechanism behind our finding.

Figure 1: Haircuts and Deal Volume over Time



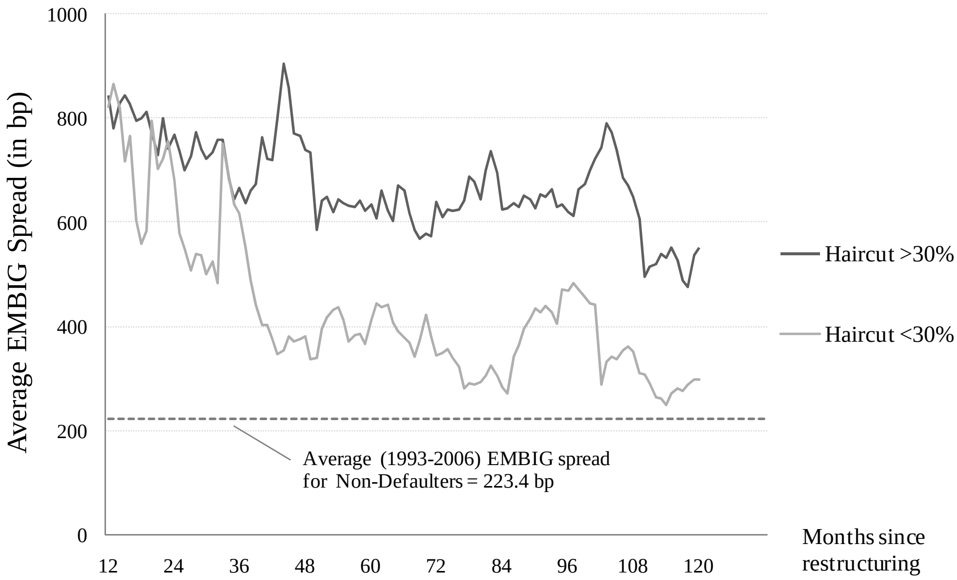
Note: The Figure plots the size of haircuts in % (H_{SZ} from eq. 2) across countries and time. The circle size reflects the volume of debt restructured (in current USD)

Figure 2: Restructurings with and without Debt Reduction



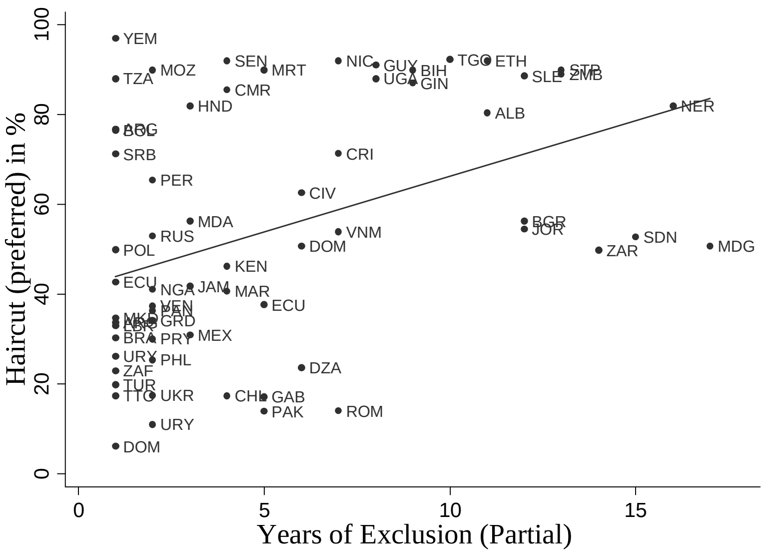
Note: The Figure plots the size of haircuts in % (H_{SZ} from eq. 2) across countries and time.

Figure 3: Post-Restructurings Spreads (average, by haircut size)



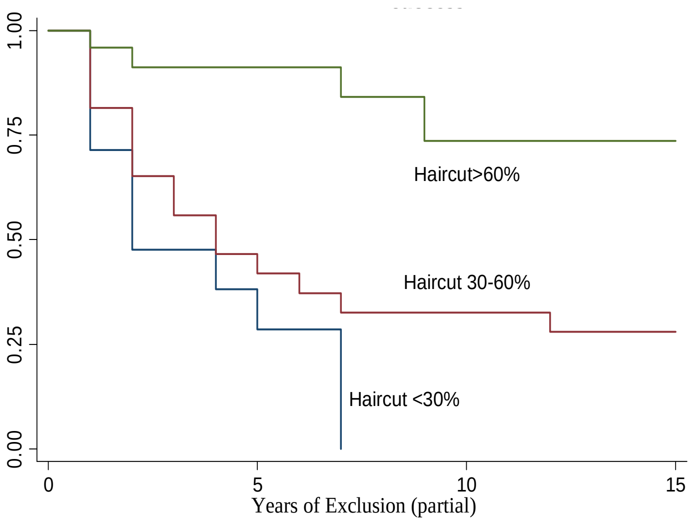
Note: The figure plots average post-restructuring EMBIG spreads across restructuring episodes with $H_{SZ} < 30\%$ and those with $H_{SZ} > 30\%$, respectively. Years with ongoing default as of S&P (e.g. Argentina 2001-2005) are excluded. The country cases with $H_{SZ} < 30\%$ are Algeria, Chile, Dom.Rep.(post-2005), Pakistan, Phillipines, South Africa, Ukraine and Uruguay (post-1991/post-2003). The country cases with $H_{SZ} > 30\%$ are Argentina (post-1993 and post-2005), Brazil, Bulgaria, Cote d'Ivoire, Dom.Rep. (post-1994), Ecuador (post-1995/ post-2000), Mexico, Morocco, Nigeria, Panama, Peru, Poland, Russia,Venezuela,Vietnam,Serbia and Montenegro. The Figure also shows the average EMBIG spread 1993-2006 for countries that did not restructure (non-defaulters).

Figure 4: Duration of Exclusion and Haircut Size



Note: The figure plots the relationship between H_{SZ} and years until reaccess to capital markets after the related restructuring. The time period covered is 1980-2006. Reaccess here is defined as the first of the following two events: (i) issuance of a syndicated loan or bond on international markets OR (ii) a positive net transfer of bond or bank credit to the public sector.

Figure 5: Kaplan-Meier Survival Functions for Duration of Reaccess



Note: The figure plots the survival function for "years until reaccess to capital markets" after restructurings, depending on the size of H_{SZ} (smaller than 30%, larger than 60%, or in between). The y-Axis denotes the Kaplan-Meier survival estimate for each function and represents the proportion of countries that remain excluded from capital markets in any given year.

Table 1: Haircut Estimates by Type of Restructuring and Era

	Obs.	Mean	Std. Dev.	Min	Max
By Type of Estimate					
Market Haircut (eq. 1)	178	39.17	26.99	-8.60	97.00
SZ Haircut ("preferred", eq. 2)	177	36.05	27.22	-8.60	97.00
Naive Haircut (DR 10%)	177	19.61	34.99	-47.70	97.00
Write Off (of Face Value)	180	15.49	29.75	0.00	97.00
By Era					
Pre-Brady (1970-1989)	100	24.69	18.04	-6.40	92.70
Brady Era (1990-1997)	48	52.08	28.24	3.60	92.30
Post-Brady (since 1998)	29	48.68	33.20	-8.60	97.00
By Type of Debtor					
HIPC or Donor-Funded	23	87.02	7.00	62.60	97.00
All Other Restr.	154	28.44	19.92	-8.60	92.70
By Type of Creditor					
Bank Debt Restructuring	163	36.52	27.75	-8.60	97.00
Bond Debt Restructuring	14	30.64	20.09	5.20	76.80
Rescheduling vs. Debt Reduction					
Rescheduling Only	125	23.99	16.83	-6.40	92.00
With Reduction in Face Value	52	65.05	25.59	-8.60	97.00

Note: The Table shows summary statistics for different estimates and subsamples. The "type of estimates" refers to different haircut computation formula (section 3.1.). All other estimates in the table are based on the "preferred" haircuts (H_{SZ} from eq. 2). "HIPC or Donor Funded" restructurings are those implemented in the poorest and highly indebted countries supported by the IDA debt reduction facility (World Bank 2007).

Table 2: Haircuts in Selected Recent Restructurings (1999-2007)

Restructuring Details						**Haircuts: Authors Estimates**					**Prior Estimates**						
Case	**Date of Exchange**	**Anounce-ment**	**Default**	**Debt exchanged (in m USD)**	**Particip ation Rate**	**SZ type Haircut (Preferred)**	**Market Haircut (eq. 1)**	Underlying Discount Rate	**Naïve Haircut (10% DR)**	**Face Value Reduction (in %)**	**SZ average haircut**	SZ Discount Rate	**SZ haircut 10% DR**	**Benjamin & Wright (2009)**	**Finger & Mecagni (2007)**	**Bedford et al. (2005)**	**Diaz-Cassou et al (2008a,b)**
Pakistan (Bank debt)	July 1999	Aug. 1998	preemptive	777	n.a.	11.2	11.2	0.130	6.6	0.0							
Pakistan (External bonds)	Dec. 1999	Aug. 1999	preemptive	610	99%	13.9	13.2	0.142	1.8	0.0	31	0.214	0.3	29	9-27	35	30
Ukraine (External bonds)	April 2000	Dec. 1999	preemptive	420	97%	17.5	16.1	0.140	8.0	0.9	28.9	0.286	2.2	1	5	40	32
Ecuador (External bonds)	Aug. 2000	July 1998	Aug. 1999	6,700	98%	37.7	58.7	0.167	24.4	33.9	28.6	0.222	21	34	25	40	26
Russia (London Club)	Aug. 2000	Sept. 1998	Dec. 1998	31,943	99%	53.3	67.7	0.145	46.3	36.4	52.6	0.164	48.2	32	44	50	48
Moldova (External bonds)	Oct. 2002	June 2002	preemptive	40	100%	35.5	35.5	0.188	7.0	0.0	33.5	0.210		42	0-6		
Uruguay (External bonds)	May 2003	March 2003	preemptive	3,127	90%	11.0	13.6	0.097	11.3	0.0	12.9	0.122	7.8		8-20	15	14
Moldova (Gazprom debt)	April 2004	Sept. 2002	mid 2001	115	n.a.	56.3	56.3	0.101	56.3	56.3					58		
Serbia & Mont-enegro	July 2004	Dec. 2000	since 1990s	2700	n.a.	71.2	73.5	0.098	71.1	59.3				57			62
Dominica (bonds and loans)	Sept. 2004	June 2003	July 2003	144	72%	n.a.	54.9	0.094	57.3	15.0							
Argentina (External bonds)	April 2005	Oct. 2001	Jan. 2002	43,736	76%	76.8	78.8	0.104	76.0	29.4	75	0.082	77.8	63	75	70	73
Dominican Rep. (External bonds)	May 2005	Apr. 2004	preemptive	1,100	94%	5.2	5.2	0.097	5.9	0.0	1.5	0.096	1.6		1	5	1
Dominican Rep. (Bank debt)	Oct. 2005	Apr. 2004	Febr. 2005	180	n.a.	11.7	16.3	0.099	12.3	0.0					2		
Grenada (bonds and loans)	Nov. 2005	Oct. 2004	Dec. 2004	210	91-97%	34.2	41.6	0.098	34.4	0.0							
Iraq (bank/commercial)	Jan. 2006	in 2004	n.a.	17,710	96%	88.9	88.9	0.117	87.4	81.5							
Belize (bonds and loans)	Febr. 2007	Aug. 2006	Sept. 2006	516	97%	24.6	30.5	0.098	25.5	0.0							28

Note: The average haircuts by Sturzenegger and Zettelmeyer (2006, 2007, 2008) and those by the Bank of Spain and Bank of England staff (Benford et al 2005, Diaz-Cassou et al. 2008a,b) are computed in present value terms using country-specific discount rates and can thus be compared to H_{SZ} from equation (2). Finger and Mecagni (2007) mostly use a 10% discount rate, while Benjamin and Wright's (2009) estimates are based on nominal interest and principal forgiven, so that the results are not directly comparable.

Table 3: Countries included in EMBIG Analysis

Countries with Sovereign Restructuring since 1990 (n=24), with agreement dates	Countries without Restructuring since 1990 (n=12)
Algeria (07/1996)	Colombia
Argentina (04/1993, 04/2005)	China
Brazil (04/1994)	Egypt
Bulgaria (06/1994)	El Salvador
Chile (12/1990)	Hungary
Cote d'Ivoire (03/1998)	Indonesia
Croatia (07/1996)	Lebanon
Dominican Rep.(08/1994, 05/2005)	Malaysia
Ecuador (02/1995, 08/2000)	South Korea
Mexico (05/1990)	Thailand
Morocco (09/1990)	Tunisia
Nigeria (12/1991)	Turkey
Pakistan (12/1999)	
Panama (05/1996)	
Peru (03/1997)	
Philippines (12/1992)	
Poland (10/1994)	
Russia (08/2000)	
South Africa (09/1993)	
Ukraine (04/2000)	
Uruguay (05/2003)	
Venezuela (12/1990)	
Vietnam (12/1997)	
Serbia & Montenegro (07/2004)	

Table 4: Description of Data and Variables used in Estimations

Variable	Description	Frequency	Source
Main Dependent Variables			
EMBIG Stripped Spread	Monthly average EMBIG spread	Monthly	JP Morgan/Datastream
Reaccess (partial reaccess)	Dummy capturing the first of the following two events: (i) foreign syndicated loan or bond issuance (public or publicly gurant.), or (ii) net transfer from private foreign creditors to public sector	Yearly	Dealogic (primary market data); GDF (series DT.NTR.PNGB.CD and DT.NTR.PNGC.CD)
Main Haircut Measures			
Haircut (M)	Market haircut (comparing par value of old with present value of new debt, see eq. 1)	Monthly/Yearly	Own Calculations
Haircut (SZ)	Haircuts computed in analogy to Sturzenegger and Zettelmyer (comparing present value of old and new debt, see eq. 2)	Monthly/Yearly	Own Calculations
Control Variables			
High-yield bond spread	Lehman Brothers US Corporate High Yield spread	Monthly/Yearly	Lehman Brothers/Bloomberg
US 10-year Treasury Yield	Yield on 10-year US Treasury bonds	Monthly/Yearly	Datastream
Political Risk (ICRG)	Political Risk Index (lagged)	Monthly/Yearly	ICRG (Political Risk Group)
Rating	Rating average of available ratings or only available rating.	Monthly (S&P, Moody's), Yearly (IIR)	S&P, Moody's (in EMBI analysis), and Institutional Investor Magazine (in yearly analysis / duration)
Credit Rating Residual	Residual from regression of ratings on fundamentals (cf. ratings)	Monthly/Yearly	Own calculations, based on ratings data
External Debt / GNI (in %)	Total external debt to GNI (in %, lagged)	Yearly	WDI
GDP real growth (in %)	GDP real growth (yoy in %, lagged)	Yearly	WDI
Current Account to GDP (in %)	Current account to GDP, four-year moving average (in%, lagged)	Yearly	WDI
Budget Balance to GDP (in %)	Central government Fiscal Balance to GDP (in %, lagged)	Yearly	Economist Intelligence Unit
Reserves to Imports (in %)	Reserves (incl. gold) to Imports (in %, lagged)	Yearly	WDI
Exports to GDP (in %)	Exports to GDP (in%, lagged)	Yearly	WDI
Inflation (in %)	Consumer price inflation (yoy in %, lagged)	Yearly	WDI
GDP per capita (PPP, log)	log of per capita GDP in purchasing power parity	Yearly	WDI
Population (log)	log of population size	Yearly	WDI

Note: GDF stands for Globald Development Finance, WDI stands for the World Development Indicators (both World Bank databases).

Table 5: Baseline Results for Haircuts and Bond Spreads

	Fixed Effects, No Controls	Eichengreen - Mody	Dell'Arriccia et al. spec.	Dell'Arriccia et al. spec.	Dell'Arriccia et al. spec.	With Year Fixed Effects	"Predicted" Haircut	"Inexcusable" Haircut
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
Haircut (SZ),	10.32**	11.90***	10.29***	10.73***	10.76***	8.84***	6.14**	-7.71
1 year lag	(4.45)	(1.85)	(1.75)	(1.93)	(1.78)	(2.78)	(2.49)	(9.50)
Haircut (SZ),	6.93**	9.07***	8.69***	8.86***	8.97***	7.79***	4.96*	0.40
2 year lag	(2.90)	(2.16)	(2.23)	(2.23)	(2.03)	(2.63)	(2.70)	(6.08)
Haircut (SZ),	6.08**	5.95***	5.32**	5.27**	5.14***	4.22*	1.56	9.00
3 year lag	(2.47)	(2.03)	(2.11)	(2.07)	(1.77)	(2.33)	(2.86)	(7.49)
Haircut (SZ),	4.64***	3.99***	3.06**	3.08**	3.05***	2.30*	0.67	9.45*
4 & 5 year lag	(1.66)	(1.11)	(1.28)	(1.22)	(1.07)	(1.37)	(1.94)	(5.60)
Haircut (SZ),	2.55	2.54**	2.23	2.17	2.29*	1.70	1.00	13.05**
6 & 7 year lag	(1.97)	(1.23)	(1.41)	(1.41)	(1.23)	(1.36)	(1.67)	(5.11)
Credit Rating		-74.54***	-99.78***	-97.90***	-82.70***	-74.54***	-106.21***	
(Residual)		(17.90)	(20.57)	(20.23)	(20.35)	(19.50)	(17.12)	
GDP Real Growth		-10.18***	-7.59*	-7.10*	-9.66**	-10.44**	-7.69**	
(in %)		(3.69)	(4.14)	(4.08)	(4.06)	(4.44)	(3.11)	
External Debt to		2.58*	2.70	3.86**	3.05*	2.75	2.53*	
GNI (in %)		(1.33)	(1.94)	(1.87)	(1.60)	(1.73)	(1.43)	
Budget Balance to			-9.22*	-9.25*	-7.07*	-8.67	-10.12	
GDP (in %)			(4.74)	(4.74)	(4.25)	(5.31)	(6.61)	
Current Account to			-11.76**	-10.95**	-5.64	-4.94	-28.31**	
GDP (in %)			(4.93)	(5.21)	(5.82)	(5.81)	(12.09)	
Political Risk				1.25	5.89	4.82	8.43	
(ICRG)				(3.69)	(3.68)	(4.15)	(18.17)	
Exports to GDP					-2.77	-2.36	-4.82	
(in %)					(2.36)	(2.71)	(3.52)	
Reserves to					-5.67***	-5.03***	-7.92***	
Imports (in %)					(1.51)	(1.62)	(2.18)	
Inflation (annual,					0.03	-0.00	-0.04	
in %)					(0.06)	(0.07)	(0.06)	
US 10-year		-58.12***	-51.29***	-58.05***	-70.62***	-74.16***	-44.49**	
Treasury Yield		(18.01)	(16.20)	(15.02)	(15.40)	(17.10)	(22.09)	
High-yield bond		46.70***	44.93***	47.83***	44.69***	61.17***	56.54***	
spread		(9.56)	(9.31)	(9.47)	(8.94)	(10.46)	(19.04)	
Constant	381.43***	91.29	16.67	-124.45	58.32	37.44	410.64**	
	(26.25)	(122.61)	(130.98)	(281.60)	(319.15)	(356.78)	(189.80)	
Country Fixed Eff.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Year Fixed Eff.	No	No	No	No	No	Yes	Yes	
Observations	3,384	2,714	2,557	2,533	2,533	2,533	1,733	
R-squared	0.092	0.361	0.416	0.436	0.468	0.517	0.597	

Note: The table shows coefficients of a fixed effects panel data regression with robust, country-clustered standard errors. The dependent variable is the monthly average country spread to US treasury bonds (EMBIG stripped spread), while the key explanatory variables are lagged values of H_{SZ} up to 7 years after each final restructuring. Column 7 contains residuals of a first-stage regression of H on fundamentals, thus dissecting H_{SZ} into a predicted component and a residual or "inexcusable" part. See equation 4 and section 5.3.

Table 6: Extended Results for Bond Spread Estimation – Other Haircut Measures

	Benchmark	**"Plain" Measures**		**Other Haircut Measures**			
	Preferred Haircut	Restructuring Dummy	Face Value Reduction	Market Haircut	Naive Haircut	Effective Haircut	Decaying Haircut
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1 year lag	8.52***	364.02***	12.83***	6.91***	7.88***	8.56***	8.54***
	(1.61)	(98.62)	(2.45)	(1.17)	(1.36)	(1.64)	(1.59)
2 year lag	6.33***	252.39***	10.21***	5.09***	6.05***	6.96***	7.06***
	(1.75)	(76.60)	(3.90)	(1.48)	(1.80)	(1.95)	(1.92)
3 year lag	3.49**	123.21*	6.39*	3.01**	3.64**	4.13**	4.39**
	(1.62)	(64.60)	(3.62)	(1.28)	(1.76)	(1.83)	(1.99)
4 & 5 year lag	2.76**	77.30	0.05**	2.36**	2.75**	3.45***	4.22**
	(1.09)	(49.33)	(0.02)	(1.01)	(1.08)	(1.06)	(1.65)
6 & 7 year lag	1.97	47.77	0.03	1.54	2.11*	2.69**	4.59*
	(1.21)	(54.67)	(0.02)	(1.09)	(1.20)	(1.27)	(2.69)
Credit Rating (Residual)	-59.27***	-58.52***	-57.92***	-60.56***	-59.56***	-60.75***	-59.25***
	(16.29)	(17.31)	(17.89)	(16.31)	(16.84)	(16.49)	(16.29)
External Debt to GNI (in %)	2.96**	3.09**	3.06**	3.04**	3.03**	2.91**	2.97**
	(1.41)	(1.53)	(1.53)	(1.40)	(1.45)	(1.45)	(1.40)
Reserves to Imports (in %)	-5.92***	-5.74***	-5.70***	-6.01***	-5.92***	-6.02***	-5.90***
	(1.89)	(1.82)	(1.91)	(1.91)	(1.91)	(1.91)	(1.88)
High-yield bond spread	36.33***	37.61***	36.57***	36.53***	36.56***	36.12***	36.32***
	(8.53)	(8.82)	(8.31)	(8.57)	(8.54)	(8.50)	(8.51)
Constant	95.13	72.09	91.94	92.63	93.93	105.81	93.69
	(142.40)	(137.00)	(149.31)	(143.26)	(145.09)	(145.85)	(141.59)
Ctry Fixed Eff.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,658	2,658	2,658	2,658	2,658	2,658	2,658
R-squared	0.381	0.384	0.371	0.378	0.375	0.377	0.382

Note: The table shows coefficients of a fixed effects panel data regression with robust, country-clustered standard errors. The dependent variable is the monthly average country spread to US treasury bonds (EMBIG stripped spread), while the key explanatory variables are lagged values of various haircut measures up to 7 years after each final restructuring.

The "Preferred Haircut" refers to H_{SZ}, the "Market Haircut" refers to H_M, "Naïve Haircut" is the same as H_M, but applies a uniform 10% discount rate and no forward interest rates, "Effective Haircut" takes into account the volume of debt affected by the restructuring and results from multiplying H_{SZ} by the fraction of total foreign debt owed to private international creditors (in t-1) that is involved in the exchange. Column 7 shows results when using a "decaying haircut" measure, which weights H_{SZ} with linearly decreasing weights (by 0.1 per year).

Table 7: Robustness Checks for Bond Spread Estimation

	From 1998 on only	Subsample of Defaulters	Excluding Argentina, Russia	Controlling for Litigation
	(1)	(2)	(3)	(5)
Haircut (SZ),	9.61***	8.09***	9.00***	7.93***
1 year lag	(2.90)	(1.54)	(2.22)	(1.93)
Haircut (SZ),	6.26***	6.19***	6.48***	6.01***
2 year lag	(1.87)	(1.75)	(1.91)	(2.00)
Haircut (SZ),	2.62**	3.32**	3.10*	3.26*
3 year lag	(1.22)	(1.50)	(1.65)	(1.83)
Haircut (SZ),	3.08***	2.66**	2.80***	2.69**
4&5 year lag	(1.00)	(1.17)	(1.06)	(1.11)
Haircut (SZ),	1.21	1.43	1.88	2.00*
6&7 year lag	(1.03)	(1.27)	(1.27)	(1.20)
Credit Rating	-66.88***	-71.99***	-59.32***	-59.57***
(Residual)	(21.95)	(18.67)	(16.83)	(16.36)
External Debt	1.84	3.79**	3.35**	2.99**
to GNI (in %)	(1.52)	(1.90)	(1.48)	(1.43)
Reserves to	-7.18***	-6.87***	-6.14***	-6.02***
Imports (in %)	(1.89)	(1.55)	(2.02)	(1.93)
High-yield bond	34.27***	45.09***	36.76***	36.08***
spread	(8.94)	(10.40)	(8.98)	(8.49)
Litigation				55.59
				(71.29)
Constant	221.67	-2.16	76.74	100.73
	(158.13)	(166.33)	(151.03)	(143.66)
Ctry Fixed Eff.	Yes	Yes	Yes	Yes
Observations	2,203	1,919	2,514	2,658
R -squared	0.412	0.431	0.380	0.384

Note: The table shows coefficients of a fixed effects panel data regression with robust, country-clustered standard errors. The dependent variable is the monthly average country spread to US treasury bonds (EMBIG stripped spread), while the key explanatory variables are lagged values of H_{SZ} up to 7 years after each final restructuring.

Table 8: Overview on Restructuring Cases and Reaccess Years (duration analysis)

Country	Restructuring Date	**Main Definition** (Flows to PUBLIC sector)		**Robustess Check** (Flows to Public OR Private)
		Partial Reaccess (Flows > 0)	Full Reaccess (Flows > 1% of GDP)	Partial (> 0), but incl. flows to private sector
Albania	1995	2006		2004
Algeria	1996	2002		2002
Argentina	1993	1994	1994	1994
Argentina	2005	2006		2006
Bolivia	1993	1994		1994
Bosnia and Herzegovina	1997	2006	2006	2001
Brazil	1994	1995	1995	1995
Bulgaria	1994	2006		1996
Cameroon	2003			
Chile	1990	1994	1998	1991
Congo, Dem. Rep.	1989	2003		2003
Costa Rica	1990	1997	1998	1992
Cote d'Ivoire	1998	2004		2004
Dominica	2004			
Dominican Republic	1994	2000	2001	2000
Dominican Republic	2005	2006		2006
Ecuador	1995	1996	1997	1996
Ecuador	2000	2005	2005	2001
Ethiopia	1996			
Gabon	1994	1999		1999
Gambia, The	1988			
Grenada	2005			
Guinea	1998			
Guyana	1999			
Honduras	2001	2004		2004
Jamaica	1990	1993	1998	1993
Jordan	1993	2005	2005	2005
Kenya	1998	2002	2003	2002
Liberia	1982	1983		1983
Macedonia, FYR	1997	1998	2003	1998
Madagascar	1990			
Malawi	1988			1989
Mauritania	1996	2001		2001
Mexico	1990	1993	1993	1991
Moldova	2004			2005
Morocco	1990	1994	2003	1993
Mozambique	1991	1993		1992
Nicaragua	1995	2002		1999
Niger	1991			
Nigeria	1991	1993		1993
Pakistan	1999	2004	2006	2004
Panama	1996	1998	1998	1997
Paraguay	1993	1995	1999	1994
Peru	1997	1999	1999	1998
Philippines	1992	1994	1996	1993
Poland	1994	1995	1995	1995
Romania	1986	1993	1999	1991
Russian Federation	2000	2002	2002	2002
Sao Tome and Principe	1994			
Senegal	1996	2000		1997
Serbia and Montenegro	2004	2005	2005	2005
Sierra Leone	1995			
South Africa	1993	1994	1994	1994
Sudan	1985	2000		2000
Tanzania, UR	2004	2005		2005
Togo	1997			
Trinidad and Tobago	1989	1990	1992	1990
Turkey	1982	1983	1983	1983
Uganda	1993	2001		2001
Ukraine	2000	2002	2002	2001
Uruguay	1991	1992	1994	1992
Uruguay	2003	2005	2005	2005
Venezuela	1990	1992	1992	1992
Vietnam	1997	2004	2005	2004
Yemen, Rep.	2001	2002		2002
Zambia	1994			

Table 9: Main Results for Haircuts and Years of Exclusion

	Year Fixed Effects	Country Size and Wealth	External Financing Conditions	Country Funda-mentals I	Country Funda-mentals II	With Sovereign Rating	Full Model
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Haircut (SZ, in %)	-0.037***	-0.025***	-0.033***	-0.049***	-0.050***	-0.034***	-0.030***
	(0.007)	(0.007)	(0.006)	(0.012)	(0.010)	(0.009)	(0.011)
Population (log)		0.849**					0.430
		(0.408)					(0.440)
GDP per capita (PPP, log)		0.221					
		(0.171)					
High-yield bond spread			-0.240				-0.150
			(0.160)				(0.147)
US 10-year Treasury Yield			0.397				
			(0.471)				
Current Account to GDP				2.716			
				(3.516)			
Budget Balance to GDP				-0.037			
				(0.061)			
External Debt to GNI				-0.034***			-0.032***
				(0.011)			(0.011)
GDP Real Growth					0.016		-0.030
					(0.047)		(0.065)
Inflation					-0.011***		0.001
					(0.003)		(0.002)
Exports to GDP					-1.320		
					(0.914)		
Reserves to Imports					-0.674		0.870
					(1.027)		(1.117)
Political Risk (ICRG)						0.041	
						(0.032)	
Credit Rating (Residual)						0.071*	0.063**
						(0.036)	(0.032)
Time Fixed Effects (Decades)	Yes (Year Dummies)	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	350	301	350	229	264	242	193
Log-Likelihood	-74.10	-83.12	-85.53	-57.17	-76.69	-63.16	-57.44
B.I.C.	259.499	217.596	223.778	163.238	214.720	170.234	188.560

Note: The table shows coefficients (not hazard rates) of a Cox proportional hazard model. The dependent variable measures years from a restructuring until partial reaccess to capital markets, defined as the first year with (i) issuance of a bond or syndicated loan on international markets and/or (ii) positive net debt flows to the public sector of the debtor country.

Table 10: Robustness Analysis of Exclusion Duration

	Full Access		Richmond-Dias incl. Access by Private Sector		Gelos et al. Primary Market Access only		Partial Acces, Without HIPCs	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
Haircut (in %)	-0.03***	-0.02*	-0.02***	-0.04***	-0.03***	-0.02**	-0.02***	-0.03**
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
High-yield bond spread		-0.22**		-0.17***		-0.17		-0.17
		(0.09)		(0.06)		(0.13)		(0.11)
GDP p.c.		1.05*		-0.79*		0.94*		-0.01
(PPP, log)		(0.58)		(0.44)		(0.54)		(0.07)
GDP Real		-0.06		-0.12**		-0.03		-0.36
Growth		(0.04)		(0.05)		(0.06)		(0.46)
Reserves to		-0.43		1.47*		1.32		0.69
Imports		(1.33)		(0.78)		(0.99)		(0.86)
Credit Rating		0.07		0.15***		0.11***		0.06*
(Residual)		(0.05)		(0.04)		(0.04)		(0.04)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	505	316	285	161	463	279	143	121
Log-Likelihood	-87.40	-68.06	-115.11	-84.51	-83.82	-64.52	-78.24	-65.45
B.I.C.	218.36	205.20	269.79	229.99	210.61	196.62	191.22	188.46

Note: The table shows coefficients (not hazard rates) of a Cox proportional hazard model. The dependent variable measures years from a restructuring until reaccess to capital markets. In columns 1 and 2 "full reaccess" is defined as the first year in which (i) the volume of bond issuances or new syndicated loans on international markets and/or (ii) net debt flows to the public sector of the debtor country, surpass 1% of GDP. The dependent variable in columns 3 and 4 is the same as in the baseline definition of "partial access" but also takes into account capital flows to the private sector. It thus extends the baseline definition (see also Table 9 above) by a third criterion, namely (iii) positive net debt flows to the *private* sector of the debtor country. The dependent variable in columns 5 and 6 focuses only on primary market placements using Dealogic data. It measures years from the restructuring until the first international bond issuance or syndicated loan by the government or a publicly guaranteed entity. Columns 7 and 8 exclude highly indebted and poor countries.

Table 11: Extended Results for Exclusion Duration – Other Haircut Measures

	Market Haircut (eq. 2)	Face Value Reduction	Naive Haircut	Effective Haircut
	(1)	(2)	(3)	(4)
Market Haircut	-0.03***			
	(0.01)			
Face Value Reduction		-0.04***		
		(0.01)		
Naive Haircut			-0.03**	
			(0.01)	
Effective Haircut				-0.03**
				(0.01)
High-yield bond spread	-0.11	-0.11	-0.13	-0.08
	(0.13)	(0.14)	(0.13)	(0.14)
External Debt to GNI	-0.03***	-0.03***	-0.03***	-0.03***
	(0.01)	(0.01)	(0.01)	(0.01)
GDP per capita (PPP, log)	0.48	0.56	0.58	0.73*
	(0.46)	(0.46)	(0.43)	(0.40)
GDP Real Growth	-0.03	-0.04	-0.04	-0.02
	(0.07)	(0.07)	(0.07)	(0.07)
Reserves to Imports	1.02	0.65	0.87	0.88
	(1.09)	(1.17)	(1.20)	(1.18)
Credit Rating (Residual)	0.07**	0.05	0.07**	0.06*
	(0.03)	(0.03)	(0.03)	(0.03)
Time Fixed Effects (Decades)	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	Yes	Yes	Yes
Observations	200	200	200	200
Log-Likelihood	-55.47	-54.20	-55.17	-55.55
B.I.C.	179.81	177.28	179.22	179.97

Note: The table shows coefficients (not hazard rates) of a Cox proportional hazard model. The dependent variable measures years from a restructuring until partial reaccess to capital markets, defined as the first year with (i) issuance of a bond or syndicated loan on international markets and/or (ii) positive net debt flows to the public sector of the debtor country.

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