No 458

JANUARY 2021

CefES

Center for European Studies

PAPER SERIES

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Silvia Marchesi, Tania Masi and Pietro Bomprezzi

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DIPARTIMENTO DI ECONOMIA, METODI QUANTITATIVI E STRATEGIA DI IMPRESA

UNIVERSITÀ DEGLI STUDI DI MILANO BICOCCA

The Price of Haircuts: Private and Official Default

Silvia Marchesi
University of Milano Bicocca, CefES and Centro Studi Luca D'Agliano

Tania Masi
University of Milano Bicocca and CefES

Pietro Bomprezzi
University of Milano Bicocca and CefES

January 2021

Abstract: In this paper we examine the link between sovereign defaults and credit risk, by taking into account the depth of a debt restructuring (haircut) and by distinguishing between commercial and official debt. The focus is on debt restructuring events, which take place at the end of a default, or renegotiation spell. Using dyadic data for the relationship between rated countries and agencies, we find that private credit events are more costly than private ones, when it comes to ratings. Moreover, the rating decline is larger for cases with deeper haircuts. Similar results are found when taking bond yield spreads (EMBIG) as measure of a country's creditworthiness. Results are robust to using the local projection approach (Jordà and Taylor 2016) for the identification of causal effects. Therefore, we find evidence that official and private defaults may have different costs and then induce selective defaults. In the wake of the Covid-19 pandemic, since official lending is likely to increase and official debt sustainability is going to become an important concern, understanding the difference between private and official deals has become even more important.

Keywords: Sovereign defaults, Haircut, Credit Rating Agencies, bond yield spreads, local projection.

JEL Classification: F34, G15, G24, H63.

Acknowledgement: We are grateful to Tamon Asonuma, Nicola Borri, Sergio de Ferra, Julian Donaubauer, Aitor Erce, Kai Gehring, Christoph Moser, Tiziano Razzolini, Christoph Trebesch for very useful comments and suggestions. We would also like to thank participants at the 12th BBQ Workshop (Kiel 2019), Development Economics and Policy Conference, DIW (Berlin.2019), Economics of Global Interactions Conference (Bari 2019), European Public Choice Society Annual meeting (Jerusalem 2019) and 60th SIE Annual meeting (Palermo 2019).

E-mail addresses: silvia.marchesi@unimib.it; tania.masi@unimib.it; p.bomprezzi@campus.unimib.it

1 Introduction

In the wake of the Covid-19 pandemic, which has hit certain countries particularly hard and continues to distress many more, a new trouble is brewing down the road. As the economic slowdown is prolonged, and government revenues and capital flows continue falling, the realization of a global debt crisis becomes even more imminent. A wave of sovereign debt restructuring is then foreseeable in the coming years, including those with official creditors. As recently shown by Horn *et al.* (2020), official lending is much larger than generally assumed, often surpassing total private cross-border capital flows, especially in times of global turmoil (such as financial crisis, wars or natural disasters), when private flows generally shrink.[1]

Multilateral lending institutions have been quick to react, granting forms of debt suspension to low income countries (the Debt Service Suspension Initiative, hereafter DSSI) and encouraging other official and private lenders to follow (see Bolton *et al.* 2020).[2] Despite the eased credit conditions in major advanced economy (thanks to massive liquidity injection by central banks), rising budget pressures have been accompanied by a new wave of sovereign debt downgrades (Bulow *et al.* 2020). How market players react to these dynamics will in turn influence the fate of borrowers in the future (Daehler *et al.* 2020, Hevia and Neumeyer 2020).[3] It is therefore important to have information about how credit agencies and the bond market in particular evaluate specific restructuring episodes, especially considering private and official restructurings, given the historical evidence on the interplay between the two (Horn *et al.* 2020). Not enough is known, however, on the implications of debt restructurings involving official creditors, despite the role historically played in the resolution of debt crises (IMF 2013) and the fact that official debt accounts for a substantial share of total sovereign debt, especially in developing countries.

In this paper, we document the relationship between sovereign debt default and a country's credit risk, by taking as dependent variable both an indirect and a direct measure of borrowing costs, such

[1] For example, during the Eurozone crisis (2010-2012) private international lending was replaced by official international loans and the governments of Cyprus, Greece, Ireland Portugal and Spain all received official funds from both the International Monetary Fund and the newly created European Financial Stability Facility (now the European Stability Mechanism ESM).

[2] The World Bank and the International Monetary Fund urged G20 countries to establish the DSSI, which took effect on 1st May 2020, by delivering about $5 billion in relief to more than 40 countries (in all 73 are eligible). The G20 has also called on private creditors to participate in the initiative on comparable terms. The DSSI is a form of debt relief that eases financing constraints through liquidity provision by deferring debt service repayments without affecting the NPV of public debt.

[3] Lang *et al.* 2020 show that the DSSI led to a substantial decrease in sovereign borrowing costs by providing liquidity. Hence, most importantly, their results do not support the widespread concern that such debt relief could generate stigma and signal debt sustainability problems (The Economist June 6th 2020, Financial Times July 21st 2020).

as agency ratings and bond yield spreads (from J.P. Morgan's EMBI Global -EMBIG). Compared to bond spreads, credit ratings are available for a larger set of countries and a reliable measure in times of crisis. Moreover, as a consequence of the Covid-19 crisis, credit-rating agencies are likely to be put under the spotlight, as it is normally the case during downturns.[4] Our results may then provide some insight for the debate on the consequences of debt heterogeneity, which introduces the possibility for governments to operate selective defaults discriminating across investors (e.g., Erce and Mallucci 2018, D'Erasmo and Mendoza (2019).[5]

We take into account a measure of creditors' loss (or haircut), as in Cruces and Trebesch (2013a). Hence we take restructurings - and not default - as our main explanatory variable. Restructurings typically take place at the end of a renegotiation spell, which may take years after the default occurs.[6] Figure 1 describes the timeline we consider for our analysis. What is more we distinguish between *official* and *private restructurings.* More specifically, *official restructuring* stands for agreements reached with official creditors (in the Paris Club of official creditors, hereafter Paris Club). In contrast, *private restructuring* denotes a restructuring deal with private creditors (foreign banks and bondholders). We add to previous works by comparing the rating outcome of official and private restructurings, hence primarily contributing to the emerging empirical literature on official debts. To the best of our knowledge, it is the first time in this literature that the distinction between private and official deals, as well as the occurrence and magnitude of a default, are taken into account in the context of credit agencies.

FIGURE 1 HERE

Sovereign credit ratings can be interpreted as a forward-looking summary indicator of macroeconomic and (often) political conditions as these affect repayment prospects and tend to be highly correlated with borrowing costs.[7] We should clarify, however, that these measures explicitly pertain to a sovereign's ability (and willingness) to service financial obligations to nonofficial

[4]For example, during the last financial crisis they were accused of accelerating the euro-zone sovereign-debt crisis by downgrading some of the bloc's big economies, including France (The Economist May 9th 2020).

[5]Erce and Malluce (2018) assume that a government issues debt both domestically and abroad and can operate selective defaults between the two types of debt. Using new data on the legal jurisdiction of sovereign defaults (hence distinguishing between defaults under domestic law and default under foreign law), they show that selectiveness is the norm. D'Erasmo and Mendoza (2019) take a novel approach by building a model in which the government chooses optimal debt and default on domestic and foreign creditors by taking the distributional consequences of a default into account.

[6]In a recent paper Meyer *et al.* (2020) show that default episodes take, on average, seven years to resolve and that they typically involve multiple restructurings.

[7]Cantor and Packer (1996) were among the first to focus on the relationship between default history and credit ratings, finding that countries that defaulted after 1970 are associated with a significant drop in a country's credit rating.

(commercial) creditors. Hence, they are "biased" in favour of measuring the probability of default on debt owed to private creditors. Understanding how rating agencies and institutional investors evaluate the repayment ability towards official creditors is not straightforward. This depends on how "visible" official debt risk is and on how rating agencies incorporate it into their rating models.

From their official documentation, rating agencies seem to evaluate official risk only to the extent to which it can also affect the repayment prospects of government obligations to the private sector, due to the preferred creditor status associated with many of official claims (e.g., DBRS 2018).[8] In other words, official debt seems to be generally perceived as "problematic", and hence adversely affect sovereign rating, only to the extent to which arrears to official creditors may indicate growing financial distress and/or lack of willingness to pay, which eventually is going to affect private repayments as well. What is more, official creditors (notably the Paris Club) may directly seek comparable treatment for private-creditor claims as part of any restructuring of their own claims (e.g., Fitch 2019).[9]

Debt restructuring could affect a country's prospects in at least two alternative ways. Default involving higher haircuts/restructurings may entail more severe reputational costs. On the other hand, the channel of debt relief operates in the opposite direction. Since higher haircuts reduce the level of government's debt more substantially, such debt reduction may allow countries to exit a debt overhang improving in this way economic prospects, as described by Krugman (1988). The overall impact of a debt restructuring on a country's economy is then theoretically ambiguous and remains an empirical question. Showing the heterogeneous determinants of default, as well as the heterogeneous treatment of creditors in the event of default, is important as it could help to shed light on what precisely are the costs of default to a sovereign country.[10]

Analyzing 264 default episodes over the 1990-2013 period, and using dyadic monthly data for 8 rating agencies and 130 countries, we find that commercial and official defaults are associated with

[8] Such preferred status, however, is not confirmed by a recent paper of Schlegl *et al.* (2019), who, while confirming that multilateral institutions are senior creditors, show that official bilateral debt is junior, or at least not senior, to bank loans and bonds. In sum, private creditors seem to "free ride" on official ones: they are typically paid first and lose less than bilateral official creditors.

[9] The Paris Club's "comparability of treatment" principle dictates that private creditors (mainly banks, bondholders and suppliers) should receive "a treatment on comparable terms" to those granted by the Paris Club. Hence, creditor governments expect private creditors to share the debt burden by accepting haircuts that are at least as high as those negotiated by the Paris Club. Timing is also very important as rating agencies may consider an agreement with the Paris Club a positive (or negative) event depending on whether it is (or not) followed by a private deal. In a similar vein, they may positively evaluate a private agreement which is directly followed by an official one that may contribute to reducing the overall debt burden.

[10] A recent paper (Arellano *et al.* 2019) present a theory of sovereign default able to rationalize the large heterogeneity in debt crisis, which are typically partial and vary in their duration. Yue (2010) theoretically investigates sovereign default and the role of debt renegotiation in sovereign debt markets. Consistent with the empirical evidence, the model predicts that interest rates and haircuts increase with the level of debt.

different outcomes. Our data allows us to take into account of the dyadic relationship between agency-country pairs, at least as time-invariant factors are concerned.[11] We find that private defaults seem to involve some reputational costs up to seven years since the last agreement, while official defaulters may even benefit from the present value reduction. Thus, the main result is that private credit events are more costly than private ones, when it comes to ratings. Moreover, the rating decline is larger for cases with deeper haircuts, which are both new results. The higher cost of large defaults is most likely driven by a less creditor-friendly negotiation process, which in turn results in higher economic uncertainty and more severe punishment from the creditors. Using the EMBIG spread as dependent variable, we confirm the results of Cruces and Trebesch (2013a) in the case of private haircuts, while we find that spreads go down up to seven years after final official deals.

Limitations to the data, and the endogenous nature of the default-outcomes relationship, could present a problem if one were to try and claim causal effects from the initial analysis. As a robustness measure, the final section implements a novel methodology for estimating the average treatment effect of a default episode on our outcome variables, agency ratings and bond yield spreads. We estimate the adjusted inverse propensity score weighted estimator based on the Jordà and Taylor (2016) methodology for estimating causal effects of sovereign defaults, using our same sample of default episodes. This causal inference estimator suggests similar conclusions on possible reputational effects. When we explicitly model for the endogenous defaulting choice and re-balance our sample to imitate a quasi-random scenario, the average treatment effect on ratings is negative (and positive for bond spreads) over the 7 years following a default episode. The opposite holds for a default involving official creditors.

Even if our results may depend on how rating agencies incorporate official risk into their rating models, they are important because they document that the costs of default vary with the amounts of debt and the type of creditors affected.[12] Consistently with Schlegl *et al.* (2019), we find that defaulting on private debt is highly visible and then less likely to result in a rating downgrade. On the other hand, an official default, which often occurs without much media coverage, is much less visible and hence less likely to determine some collateral damage. In particular, official restructuring that are arranged within the "Paris Club umbrella" are supposed to guarantee a

[11] Recent studies document the existence of incentives of ratings agencies to distort ratings in favor of their respective home countries, as well as economically and culturally aligned countries (Fuchs and Gehring 2017) or of issuers, in the market for commercial mortgage-backed securities (Sean *et al.* 2019). More recently, Kempf and Tsoutsoura (2020) find that partisan perception affects the actions of professionals in the financial sector.

[12] The importance of the way in which restructuring are actually arranged, at least for private defaulters, is also confirmed by the results of both Asonuma and Trebesch (2016), Trebesch and Zabel (2017) and Asonuma *et al.* (2019), who find that less confrontational (or preemptive) restructurings are associated with a lower output loss as compared to soft (non-preemptive) defaults.

relatively smoother approach to the way in which deals are actually orchestrated than private ones, hence lowering even further the collateral damage of a default.[13] Sovereigns are aware that the consequences of a default depend in important ways on who the defaulted creditors are and what bargaining power each creditor group has, hence they may decide to prioritize their repayments accordingly. Documenting this difference can then help shed light on why countries default, which creditors are the most affected, and why.

The empirical literature on sovereign defaults has generally found that default costs are difficult to quantify and short lived.[14] Only recently, thanks to novel measurement strategies of a country's repayment record can persistent effects of default be precisely detected, bringing the empirical results in line with the effects of a default according to the theory. This paper contributes to the (empirical) literature of default costs. In particular, to the emerging literature focusing on the characteristics and the economic relevance of debt restructuring, both from both a private sector perspective (Asonuma and Trebesch 2016; Asonuma *et al.* 2019; Forni *et al.* 2016; Kuvshinov and Zimmermann 2019; Meyer *et al.* 2019, Reinhart and Trebesch 2016; Schlegl *et al* 2019; Trebesch and Zabel 2017) and an official sector perspective (Cheng *et al.* 2017, 2018a, 2018b; Corsetti and Erce 2018; Marchesi and Masi 2020a, 2020b; Reinhart and Trebesch 2016).

This paper also contributes to the literature by sorting out some of the effects of the current pandemic, by looking at the reaction of credit agencies and bond markets to the global crisis (e.g., Born *et al.* 2020, Daehler *et al* 2020, Hale *et al.* 2020, Kempf and Tsoutsoura 2020). Born *et al.* (2020) also rely on the causal model by Kuvshinov and Zimmermann (2019) to look the behavior of bond spreads in emerging countries and advanced economies, finding that after 2008 the behavior of spreads has converged across country groups.[15]

The rest of this paper is organized as follows. Section 2 describes the data. Section 3 presents the empirical model and the results in the dyadic setting of rating agencies, while the results obtained using the EMBIG bond spread as the dependent variable are presented in Section 4. Section 5 applies an inverted-propensity score local projection approach to the data in order to

[13] As argued by Tomz (2007) concerns about reputation sustain international lending and repayments. Hence, any measure that would help to reinforce the reputational mechanism between debtors and creditors are particularly important as they would be to help investors distinguish excusable defaults and inexcusable ones (e.g., Grossman and Van Huyck 1988).

[14] This literature has mainly looked at the effects of sovereign defaults on international trade (e.g., Rose 2005, Borensztein and Panizza 2010, Broner *et al.* 2010), international credit market (e.g., Borensztein and Panizza 2009, Gelos *et al.* 2011 and Panizza *et al.* 2009), and GDP growth (Sturzenegger and Zettelmeyer 2008, Borensztein and Panizza 2009, De Paoli *et al.* 2009, Levy Yeyati and Panizza 2011), finding, overall, short lived effect of sovereign defaults. For a survey of this literature see Panizza *et al.* (2009) and Tomz and Wright (2013).

[15] They also find that spread shocks have become a more important source of output fluctuations in advanced economies after 2008.

more precisely establish causal effects. Section 6 concludes.

2 Data

As a proxy for the severity of the debt restructuring, we consider the corresponding present value reduction, or "haircut", and (as robustness) the face value reduction.[16] We focus on restructurings with foreign creditors, thus excluding debt restructurings that mainly affected domestic creditors. The share of official debt to total debt is about 25%, a value that remains stable over the period 1970-2013. In light of this observation, there is still too little research on the relative treatment of official versus private defaults.

We rely on the original dataset by Cruces and Trebesch (2013b) for the data on debt restructurings with commercial creditors.[17] This dataset provides a list of 187 distressed sovereign debt restructurings with external banks and bondholders that occurred between 1970 and 2013. It includes information on the amount of debt restructured, the face value reduction, and a measure of debt relief (*Preferred Haircut HSZ*) computed by the authors considering the present value of both old and new debt instruments.

For official debt restructurings, we rely on the original dataset built by Cheng *et al.* (2017), which contains 429 sovereign debt restructurings with the Paris Club, between 1956 and 2015.[18] Paris Club creditors may provide (official) debt treatments to debtor countries in the form of rescheduling (i.e., debt relief by postponement of debt service payments) or, in the case of concessional rescheduling, reduction in debt service obligations during a defined period (flow treatment) or as of a set date (stock treatment). Following Cheng *et al.* (2017), by looking at the terms of

[16] The two measures of private and official haircut come from two different sources and are computed in two different ways. For this reason, as a robustness check, we will also consider the private and official nominal haircut, which are computed, in both cases, as the ratio of face value debt reduction to the amount of debt treated in the restructuring deal (see Reinhart and Trebesch 2016; and Cheng *et al.* 2018a, 2018b).

[17] In August 2014, the authors provided an update of their data covering the year 2013 as well.

[18] The Paris Club is an informal forum of the most important official creditor countries and was designed to deal with the payment difficulties of debtors. The restructuring approach of the Paris Club has evolved over time. In the 1980s, negotiations took place on a case-by-case basis and focused on short-term liquidity problems, mostly implementing maturity extensions without nominal debt reduction. During the 1990s and 2000s, especially for low income countries, restructurings became increasingly concessional, including debt stock cancellations. Specifically, as low-income countries are concerned, the possibility of a partial debt stock cancellation of non-ODA debt was gradually extended from 33% of the eligible debt in 1988 (Toronto Terms) to 50% in 1991 (London Terms) and 66% in 1994 (Naples Terms). In 1996, the World Bank and the IMF have implemented the Heavily Indebted Poor Countries (hereafter HIPC) Debt Initiative, which was first strengthened in 1999, and, more recently, in 2005, when, under the Multilateral Debt Relief Initiative (hereafter MDRI) multilateral institutions were encouraged to increase their specific contribution to debt reduction. Debt relief at completion point under the HIPC Initiative is provided within the HIPC Exit Terms.

treatment, we were able to compute the present value reduction for official deals and to compare this value with the corresponding haircut measure in the case of private agreements (or *Preferred Haircut HSZ)* used by Cruces and Trebesch (2013a).[19]

Our sample includes a maximum of 130 developing countries. Since the data on private debt restructurings are available only up to 2013, our year sample ends then. It includes 68 defaulting countries which experienced at least one debt crisis during the sample period as well as 62 non-defaulters. Among defaulters, 47 countries had both private and official debt restructurings, 14 countries had only an official restructurings (through the Paris Club) while only 7 countries experienced only private defaults. Table A1 in the Appendix shows all countries and years, including a list of debt crisis episodes studied here.

Table 1 shows summary statistics for different subperiods in the full sample of 264 restructurings.[20] While the average haircut is about 34 percent over the full sample mean, looking at the three different subperiods, we detect a sizeable increase in this amount over time. Average haircut size is more than double during the last subperiod (2002-2013), as compared to the initial period (1970-1988), and about 20 percent higher with respect to the intermediate one (1989-2001).[21]

When comparing the size of (private) face value reduction, we can see that there was some nominal debt reduction in the first subperiod in only two cases.[22] One reason is that almost all the settlements up to the beginning of the Brady plan (1989-1994) mainly implied maturity extensions without face value reduction. Nevertheless, this amount (about 58 percent) exceed, on average, the reductions granted in the other two subperiods.

As official restructurings are concerned, we find that the average haircut over the full period is about 64 percent, much lower than the corresponding average for private.[23] Looking at the three different subperiods, we also find an increase in their size over time. Average haircut size during

[19] Cheng *et al.* (2017) provide a detailed overview of the different terms and report the net present value relief associated with the different Paris Club Terms of Treatment over the years. We calculated the net present value relief associated with the "ad hoc" agreements by directly looking at the Paris Club documentation. (http://www.clubdeparis.org/en/traitements).

[20] Among those, 158 episodes involved restructuring with private creditors while 106 involved deals with official creditors.

[21] As Cruces and Trebesch (2013a) mention, negative haircuts were obtained for a small subset of cases, most of which happened in the first half of the 1980s (when most deals involved rescheduling only). Negative haircuts may result from a restructuring in which the interest rate on the new debt exceeds the estimated discount rate prevailing at the time. In such cases, any lengthening of maturities will increase the present value of the new debt, instead of decreasing it. While these look like bad deals for the government, a successful agreement can buy time and avoid a disorderly default.

[22] These two episodes refer to the Bolivian buyback and the Mexican "Morgan Bond plan", both taking place in 1988.

[23] As said, in order to compare the two types of defaulters, we only consider official restructurings that were agreed until 2013, which is the last year for which we have information about the size of private restructurings.

the last subperiod (2002-2013) is more than two times the average haircut implemented during the initial period (1970-1988), and almost double with respect to the average size of the intermediate period (1989-2001). On the other hand, there are no instances of nominal (official) face value reduction in the first subperiod (1979-1988), while the size of official nominal relief peaks in the intermediate years (1989-2001) and slightly decreases in the last period (2002-2013).

As documented by the different debt relief initiatives, we detect a sizeable and stable amount of official face value reduction over time. Figure 2 shows the evolution over time of the percentage of both private and official debt haircut and face value reduction. As can be seen, while private agreements were more common up to the mid-nineties, Paris club deals prevail in more recent years. What is more, both haircuts and nominal debt reductions are much higher under official deals.

Table 2 presents summary statistics of the haircut, according to a country's income. As the number of countries is concerned, we find that middle-income countries tend to default more with both types of creditors, while low-income countries tend to benefit from the highest average haircuts.[24] Finally, Figure 3 illustrates the frequency, by size, of haircut and face value debt reduction. While lower haircuts (and face value reduction) are more common in the case of private agreements, the opposite holds in the case of official restructurings.

TABLES 1 & 2 HERE

FIGURES 2 & 3 HERE

3 Agency ratings

This Section assesses the link between debt crisis and subsequent agency ratings, while in Section 4 the monthly average secondary market bond stripped yield spread (EMBIG) will be the dependent variable.[25]

Our main proxy to measure the creditworthiness of a country is its sovereign's long-term foreign-currency rating. As shown by Reinhart (2002), ratings predict defaults. Hence this makes them an informative measure of creditworthiness for countries with severe payment problems. Moreover, ratings may also represent a ceiling for the credit rating of private companies from the respective

[24] The only high-income country which receives an official haircut of 100% is Seychelles in 2009.

[25] Data on bond spread, however, are available only for a reduced sample of 47 countries and for the period 1993-2013. Table A5c, in the Appendix, shows the correlation between the (average) agency rating and bond spread in this reduced sample.

country (Borensztein *et al.* 2013). They may also capture the private sector's ease of access to foreign capital (Gehring and Lang 2020) as well as representing a good proxy for a country's access to international financial markets.[26]

We retrieve monthly information via Bloomberg on eight rating agencies: CI, Dagong, DBRS, Fitch, JCR, Moody's, R&I, and S&P. To analyze the dynamics around default times, we use data at a monthly frequency. We obtained an unbalanced panel, as each agency assigns ratings to a different set of countries over varying time periods. The pair-wise correlation between sovereign ratings from the eight credit rating agencies under analysis ranges from 0.869 (between Standard and Poor's and Dagong Global) and 0.992 (between Fitch and Japan Credit Rating Agency) (see Table A5b in the Appendix).

For our empirical analysis, all ratings have been translated to a 21-point scale. This means that we assign the highest value of 21 for an "AAA" rating. "C" and "D" in turn are translated into a value of one (see Fuchs and Gehring 2017 for a similar approach).

3.1 Method

Since the data on credit agencies are available for the full sample of countries only since 1990, our monthly data are organized in an unbalanced panel, including a maximum of 130 developing countries, over the years 1990-2013 (instead of the full period 1970-2013). In order to account for the possible influence of agency-country time-invariant characteristics (what is called the "home bias" in sovereign rating, see Fuchs and Gehring 2017) we estimate the model using fixed effects OLS at the agency-country-period-level.[27]

We estimate the model with agency-country (pair) fixed effects (and cluster the standard errors at the pair-level), include period-fixed effects, and lag the explanatory variables by one period. We therefore control for unobserved effects that exclusively vary at the pair and period-level, substantially reducing concerns over endogeneity. Ordinary least squares treat the dependent variable as cardinal. This implies that the difference between an "AA" and an "AA+" rating, for example, is the same as between "BB" and "BB+." [28]

[26] Afonso *et al.* (2012) related ratings to changes in government bond spreads.

[27] Fuchs and Gehring (2017) investigates how the home country of rating agencies could affect rating decisions as a result of political economy influences and cultural distance. They find that agencies have biases in favor of the respective home countries, as well as in favor of culturally more similar countries, and countries in which home-country banks have a larger risk exposure. In particular, cultural proximity (as measured by linguistic similarity) is shown to be the main transmission channel that explains the advantage of the home country.

[28] We should emphasize, however, that the economic consequences of the rating contraction may not be linear, as loosing the two notches from junk territory is clearly different than switching, for example, from AAA to AA

To identify post-crisis episodes, we focus on "final" restructurings only, which we define as those that were not followed by another restructuring vis-a-vis private or official creditors within the subsequent four years. Moreover, due to our focus on post-restructuring effects, we exclude observations during crisis years.[29] Following Cruces and Trebesch (2013a), we take up to seven years after the last haircut, in order to capture the existence of persistent effects. The regression equation then is:

$$c_{i,k,t} = \alpha + \beta Z_{i,t-1} + \gamma_j C_{i,t-j} + \delta_j R_{i,t-j} + \eta_{i,k} + \tau_t + u_{i,k,t}, \qquad j = 1, ...3,\ 4\&5,\ 6\&7 \qquad (1)$$

where $c_{i,k,t}$ represents the credit rating provided to country i, by agency k at period t; $C_{i,t-j}$ is a dummy equal to one when a country has finalized its final private/official restructuring and $R_{i,t-j}$ denotes the corresponding amount of private/official haircut, and Z is a vector containing the control variables lagged one period. $\eta_{i,k}$ and τ_t denote agency-country pair and year fixed effects, which allow us to control for both countries time-invariant variation and common trends. In this way we can also account for global factors that might have influenced the simultaneous dating choice of debt restructuring events (e.g., Baker or Brady plan in the two periods, 1985-88, or 1989-94). Finally, $u_{i,k,t}$ is the error term.

The advantage of including both official and private restructurings in the same specification is that it allows us to detect their effects by avoiding an omitted variable bias. Moreover, we are also able to distinguish the rating variation associated with the default *per se* from that associated with the amount of the debt affected, i.e. "occurrence" versus "magnitude."

As the control variables are concerned, we rely on the specification by Cruces and Trebesch (2013a). Therefore, in order to capture the sovereign's domestic economic performance, we included public debt to GDP, the general government net lending/borrowing, GDP real growth, reserves to imports, inflation rate (based on consumer prices), current account, the ICRG and the political risk indicator.[30] Following Fuch and Gehring (2017), all time-varying control variables enter as lagged moving averages over one or three years.

Table A2 and Table A5a in the Appendix provides a detailed description of all our variables, while Table A4a presents some summary statistics.

(in S&P's rating).

[29] The information on the duration of private debt crisis come from Asonuma and Trebesch (for private), while we rely on Beers and Mavalwalla (2018) and Cheng *et al.* (2017) for information regarding the duration of official debt crises.

[30] As a robustness check, in column 1 of Table 4, we report the results obtained including further control variables, such as per capita GDP, total population (in log), and the number of years the chief executive has been in office.

3.2 Results

Table 3 presents the results obtained by considering the size of private and official haircut.[31] In columns 1-2 of Table 3, we include the haircut size, expressed in percentage points, up to seven years after the final restructuring (with and without control variables, respectively). Column 2 shows that a one percentage point increase in the private haircut size is associated with a decrease of about 0.05 notch in the credit rating, in year one after the final haircut. This implies that a haircut of about 50 percent, which is roughly the mean for our sample, can be associated with a decrease of about 2.4 notches in year one.

In the case of an official agreement, a one percentage point increase in an official haircut is associated with an increase of about 0.02 notch in the credit rating, in year one after the restructuring. Hence, a haircut of about 45 percent (the mean for our sample) can be associated with an increase of about 1 notch, in year one.[32] When considering the present value reduction, these results are economically relevant both in the case of private and official deals. In turn, in columns 3-4, we include only the dummy indicating the occurrence of the private and official restructuring, while the last two columns contain the full specification (with and without control variables). While all these results are reported for comparison, we mostly base the discussion on the fully specified model of column 6.

TABLE 3 HERE

To be able to comment these results, however, it should be kept in mind that the coefficients shown in the fully specified model have to be interpreted conditionally, as in any interaction model. The best way to interpret the findings of Table 3 is to look at Figure 4a and 4b, which show the expected variation in agency ratings conditional on the private and official haircut size. In other words, we plot the marginal effect $\delta_j R_{i,t-j} + \gamma_j$ from equation 1 above. The different panels correspond to the number of years after the restructuring, and the dotted lines show 90 percent confidence bands. The effects are calculated from the complete specification (column 6). Aside from an easier interpretation, this joint estimate and the resulting graphs are important because the high correlation between C and R makes it complicated to draw inference about individual effects, but facilitates inference about their sum (see Cruces and Trebesch 2013a).[33]

[31] The results obtained using the private and official face value reduction are reported in the Appendix, in Table A3, and in Figures A1a and A1b. Due to data limitations, however, we were able to use this variable only in the specification with agency rating as the dependent variable.

[32] Accordingly, a one standard deviation increase in private (official) haircut is associated with a rating which is 1.25 notch smaller (1 notch higher) one year after the private agreement.

[33] As pointed out by Cruces and Trebesch (2013a), multicollinearity does not bias least squares estimates, but

FIGURES 4a & 4b HERE

The bottom line of Figure 4a is that private haircuts are negative and statistically significant for years one to seven after the final agreement. This can be seen because the upper confidence band is always below the zero horizontal line for every haircut size greater than 20 percent (the mean of this sample being around 50 percent). The reduction in credit rating associated with haircut size is also economically substantial, especially for years four to seven after a restructuring.

In the case of official agreements, in Figure 4b, the rating increase of a restructuring is statistically significant for levels of haircut at which the lower confidence band is above the zero horizontal line. In years one to two after the final agreements, haircuts greater than 40 percent (the mean of this sample being about 45 percent) can be associated with significantly higher ratings. From year three to seven after the restructuring, the rating increase can be considered significant only for much larger haircuts (i.e., greater than 60 percent).

The results are robust to including further variables to control for the presence of omitted variable bias, such as the number of years the chief executive has been in office, total population (in log) and per capita GDP.[34] The results also hold when using an ordered-logit model for the discrete 21-step end-of-month rating, which accounts for the bounded nature of the dependent variable. They are also robust to using, as the dependent variable, an average of all the agencies' ratings (rather than dyadic data), as well as the two separate averages of only American agencies (i.e., Moody's, Fitch, Standard & Poor's, Dominion Bond Rating Services) as opposed to Asian agencies (Dagong Global, Rating and Investment Information, Japan Credit Rating Agency). Columns 1-5 of Table 4 report all these robustness checks. Taken together, this is strong evidence pointing to a significant difference between the effects on credit ratings from private and official restructuring events. Finally, results are robust to using bond yield spread as the dependent variable. The results obtained using bond spread are presented in the next Section.

TABLE 4 HERE

In summary, the haircut size seems to involve some reputational costs and the correlation between private restructuring and agency credit rating is negative for years one to seven after the restructuring episode. These results are consistent with Meyer *et al.* (2019) who document that the

the high correlation between C and R will tend to increase the estimated standard errors. The high correlation between C and R (about 0.7 in our sample) lowers the variance of the estimated effect of interest, $\gamma + \delta R$.

[34] Our estimation results could still be biased due to the omission of time-varying country-specific variables correlated with both the government negotiation behavior and rating (e.g., the haircut size may vary when new governments take over).

decline in investor returns is much smaller for low-haircut cases (i.e., lower than the median value) and with Asonuma *et al.* (2019), who find that post-default restructurings are associated with a decline in bank credit, an increase in lending interest rates, and a higher likelihood of triggering a banking crisis (especially in the case of pre-emptive agreements). They are also in line with Gennaioli *et al.* (2014) who show that the spillovers of a default, on domestic and foreign banks, are larger the higher the haircut.

The opposite holds in the case of official agreements, where agency rating generally improve, and the more so the larger the haircut. Since many cases of official haircut concern countries which are eligible for the HIPC Initiative, these results are in line with to Raddaz (2011).[35] Similar findings were found by Arslanalp and Henry (2005) in the context of the Brady plan (1989-1994). More recently, Lang *et al.* (2020) study the bond market effects of the DSSI (i.e., a NPV-neutral debt service suspension) showing that countries eligible for official debt relief experience a larger decline in borrowing costs compared to similar but ineligible countries. We then find that official debt relief do not generate stigma, even when it is associated to an NPV reduction.

Consistently with Schlegl *et al.* (2019), we find that defaulting on private debt is highly visible and then more likely (than official crisis) to result in a rating downgrade. On the other hand our results contrast with those of Reinhart and Trebesch (2016), who document a strong increase in average ratings in emerging markets in the case of private agreements following a debt relief and the crisis-exit year. They also find that despite the substantial relief obtained, ratings in advanced economies do not recover after the war official debt forgiveness of 1934.

This evidence then suggests that while for private defaulters negative spillovers dominate, for official defaulters positive (debt relief) spillovers seem to prevail.[36] The results in this section, however, should be taken cautiously, as identification is difficult and we cannot claim any causal effect but only strong conditional correlations. In the next Section we will consider a more direct measure of borrowing costs, such as the bond spread, as in Cruces and Trebesch (2013a).

[35] He finds that the stock prices of companies having subsidiaries in countries benefited by multilateral debt relief (through the HIPC and the MDRI, increase significantly above those of other firms, especially around the launching of these initiatives.

[36] Very similar results are obtained when considering the Institutional Investor rating (Marchesi and Masi 2020b).

4 EMBIG spread

In this Section we consider as the dependent variable the monthly average secondary market bond stripped yield spread from J.P. Morgan's EMBI Global (EMBIG) for each country.[37] EMBIG spreads have been used to proxy foreign currency borrowing costs of both governments and the private sector in emerging market economies. Due to data availability, the sample is now restricted to 47 countries over the year 1993-2013. Among the 47 countries covered by the EMBIG, 23 are defaulters which restructured their debt, while the other 24 countries are non-defaulters.[38] Table A4b in the Appendix presents some summary statistics. We estimate the following equation:

$$E_{i,t} = \alpha + \beta Z_{i,t-1} + \gamma_j C_{i,t-j} + \delta_j R_{i,t-j} + \eta_i + \tau_t + \varepsilon_{i,t}, \qquad j = 1, ...3,\ 4\&5,\ 6\&7 \qquad (2)$$

where $E_{i,t}$ represents monthly bond spread of a country i, at period t; $C_{i,t-j}$ is a dummy equal to one when a country has finalized its last private/official haircut, $R_{i,t-j}$ denotes the corresponding amount of private/official haircut in the last restructuring and Z is a vector containing the control variables (lagged one period). Finally, η_i, and τ_t denote country and time dummies, respectively.

TABLE 5 HERE

The results are presented in Table 5. As in the previous Section, in columns 1-2 of Table 5, we include the haircut size, expressed in percentage points, up to seven years after the final agreement (with and without control variables). Column 2 shows that a one percentage point increase in haircut is associated with bond spread spreads that are about 3 bp higher in year 1 after the restructuring. Thus, a restructuring involving about 40 percent (which is about the mean for our sample) can be associated with 120 bp higher in year one. In the case of an official agreement, a one percentage point increase in an official haircut is associated with a decrease of about 1.8 bp in the credit rating, in year one after the restructuring. This implies that a restructuring with

[37] The stripped yield spread is the difference between the weighted average yield to maturity of a given country's bonds included in the index and the yield of a US Treasury bond of similar maturity.

[38] The 23 defaulters are Algeria, Argentina, Belize, Brazil, Bulgaria, Cote d'Ivoire, Croatia, Dominican Republic, Ecuador, Iraq, Mexico, Nigeria, Pakistan, Panama, Peru, Philippines, Poland, Russia, Serbia and Montenegro, South Africa, Ukraine, Uruguay, and Venezuela. The 24 non-defaulters are: Chile, China, Colombia, Egypt, El Salvador, Gabon, Georgia, Ghana, Greece, Hungary, Indonesia, Jamaica, Kazakhstan, Lebanon, Lithuania, Malaysia, Morocco, South Korea, Sri Lanka, Thailand, Trinidad and Tobago, Tunisia, Turkey and Vietnam. This list includes countries with no external sovereign debt restructuring in the chosen period, as well as countries that entered the EMBIG more than seven years after their restructuring. For more information, see Cruces and Trebesch (2013a).

a haircut of about 54 percent (the mean for our sample) can be associated with a reduction of almost 100 bp, in year one after the last official agreement. When considering the present value reduction, these results are economically relevant both in the case of private and official deals.

In columns 3-4, as before, we include only the dummy indicating the occurrence of the private/official default, while the last two columns contain the full specification, which confirm the relationship between private haircut and subsequent spreads for years four to seven after the restructuring. In particular, Figures 5a and 5b, which are based on the full specification, show the mean increase in bond spreads associated with a debt restructuring for different levels of haircut and at different lag lengths. The main message of Figure 5a is that restructurings with haircuts above 40 percent (the mean of this sample) can be associated with significantly higher spreads from four to the seven years after a restructuring.[39] For further illustration, suppose that haircuts increase by 1 standard deviation; this implies spreads that are 145 bp higher in years 4 and 5 after the restructuring, and 132 bp higher in years 6 and 7. These results are economically relevant and very similar to those obtained by Cruces and Trebesch (2013a).

FIGURES 5a & 5b HERE

Finally, as official restructuring are concerned, Figure 5b shows that haircuts above 54 percent (the mean of this sample) can be associated with significantly lower spreads only from three to the seven years after the final official restructuring. Hence, the positive growth prospect observed for official defaulters after the end of the default (see for example Marchesi and Masi (2020a) might be due to the absence of a negative stigma in the credit markets. On the other hand, Marchesi and Masi (2020a) document that higher private haircuts are not associated with lower growth in the aftermath of the debt crisis. As argued by Trebesch and Zabel (2017), emerging markets often see a quick recovery of output after financial crises, even if credit and capital flows remain depressed and market access is unfavorable.

As in Cruces and Trebesch (2013a), we find that controlling for both the occurrence and the magnitude of default is crucial to detecting a more lasting link between debt default and borrowing costs. Most importantly, private (official) restructurings are generally associated with lower (higher) ratings and higher (lower) spreads up to seven years since the last restructuring. As rating and spread represent indirect and direct measures for borrowing costs, respectively, our result suggest that the costs of default may vary with the restructuring terms and the relative treatment of official versus private creditors. Our results, therefore, points to the importance of the way in

[39] In years one and two after the restructuring, the rating variations are only marginally significant.

which debt restructurings are orchestrated, in line with the distinction between "excusable and inexcusable" (Grossman and van Huyck 1988) and "hard" and "soft" defaults (Trebesch and Zabel 2017).

Nevertheless, we should interpret our result with caution, as we cannot detect any causal effect but only strong conditional correlations. In the next section we present some evidence of causality between restructuring and both credit rating and bond spread, adopting an alternative methodology developed by Jordà and Taylor (2016).

5 Local Projection

In this Section, we exploit a novel econometric methodology developed by Jordà and Taylor (2016) for the identification of causal effects. By using a propensity-score based method, combined with local projections (Jordà 2005), we find the average treatment effect (ATE) of a default on our outcome variables over a 7 year period. The resulting adjusted inverse propensity score weighted (henceforth AIPW) estimator can provide a causal interpretation of the effects of defaults on sovereign ratings.

Calculating the average, unbiased, effect of a sovereign default on ratings would require comparing two contrasting scenarios: one where we can measure the change in ratings following a default, and one where we measure the change in ratings when no default has occurred, ceteris paribus. If the decision was fully exogenous, we could simply compare the average change in ratings of defaulters versus non-defaulters. However, the choice to enter into a restructuring both with private or official creditors is endogenous to a number of observable and non-observable factors influencing ratings. Furthermore, it is difficult to pinpoint the direction of the effect, as falling ratings are just as likely to signal a default as they are to be a consequence of defaults. With the methodology in this Section we accept the endogeneity of default, and instead attempt to explicitly model and account for it.

This technique was first applied to the area of sovereign debt distress by Kushinov and Zimmerman (2019), who estimate the effect of defaults on GDP. We rely on a series of country-level indicators to estimate the probability of a country entering a debt crisis with either a private or an official creditor.[40] If the decision is modeled correctly, we can re-balance the sample as if the decisions were taken at random (Jordà and Taylor 2016; Kushinov and Zimmerman 2019). We follow Manasse

[40] We should emphasize here that we do not consider the probability to enter a private, or an official debt crisis, as two separate events, as these two type of default are, in most cases, intertwined. As described in Section 2, among the 68 defaulters in our sample, 47 countries had both private and official debt restructurings.

and Roubini (2009), who provide a comprehensive survey of indicators suitable for estimating the likelihood of default, for modeling our sample of sovereign defaults.

We use as the potential outcome variables in the second stage the agency-country pairs of ratings (dyadic) as in Section 3 and the monthly bond spread (EMBIG) as in Section 4. The AIPW estimator gives us an unbiased estimate for the average treatment effect of a final restructuring on sovereign credit ratings. Local projections have the attractive property of being free of structural constraints that would instead be imposed on a parallel VAR model, and therefore our ATE response varies non-linearly over the forecast horizon. In the scope of this paper, we apply this methodology to cases of defaults with private and official creditors in order to compare the differential effects on sovereign credit ratings and bond spreads.

5.1 Method

The methodology is divided into two stages. First, we model the probability of entering a debt crisis by estimating a propensity score for each element in our sample. As an indicator for the start of the debt crisis, we use data from Asonuma and Trebesch (2016), for private defaults, and data from Cheng *et al.* (2017) for official ones. The propensity score is then the likelihood of said event as predicted by the logit model:

$$PD_{i,t} = \Lambda(\beta, Z_{i,t-1}) \tag{3}$$

where Λ is the logistic distribution function and Z is a vector of macro and political control variables, lagged by one year. As mentioned before, our predictor variable set is based on Manasse and Roubini (2009), who provide a survey of relevant macro variables associated to sovereign defaults, as well as Kushinov and Zimmerman (2019), which apply the same methodology in a similar context. In particular, we use as predictor variables: Current account balance to GDP, Change in executive, External debt to GDP, GDP per capita, General government gross debt to GDP, Government consumption, Inflation index, Openness, Polity IV indicator for democracy, Reserves to external debt, Terms of trade, War, U.S treasury 3-year T-bill rate, and Share of past months in default. The standard errors are clustered at the country level, as in the reference papers (Jordà and Taylor 2016; Kushinov and Zimmerman 2019). The estimated $\widehat{PD}_{i,t}$ is then the predicted default probability for country i at time t conditional on our set of predictor variables.

Then, the second stage re-balances in order to create a synthetic sample where the default decision is as good as random. Using our logit estimates, we can estimate the extent of the non-randomness

in our sample. Specifically, a highly endogenous default would be predictable based on observables and have a high $\widehat{PD}_{i,t}$, while a highly endogenous control country would have a low $\widehat{PD}_{i,t}$. We assign the weights $1/\widehat{PD}_{i,t}$ to the defaulter (treatment) group and $1/(1-\widehat{PD}_{i,t})$ to the non defaulter (control) group. The average treatment effect, given the re-balanced sample, will then be the difference of the average weighted potential outcomes of defaulters and non-defaulters across our sample.

The potential outcome, which is modeled in the second stage, is the change in ratings following the end of a restructuring as measured with a local projection (Jordà, 2005):

$$\Delta y_{i,k,t+h} = \alpha + \beta Z_{i,t-1} + \gamma_j C_{i,t} + \delta_j R_{i,t} + \eta_{i,h} + \tau_t + u_{i,h,t}, \qquad h = 1, ...,7. \tag{4}$$

Here $\Delta y_{i,k,t+h}$ is the conditional forecast of the change in outcome for years t to $t+h$, and h is our forecast horizon spanning to 7 years. We consider as outcome both the credit rating, measured at country i and agency k, and in the case of bond spreads only for country i. We take as time t for the treatment the period corresponding to the final private/official restructuring, therefore estimating the conditional forecast of changes in ratings following the end of a debt crisis. Furthermore, because we are interested in evaluating the stigma effects, and not just the mechanical co-movements of ratings over the restructuring period, we exclude the years of the crisis, as in the previous Sections.

Similarly to our previous specifications, $C_{i,t}$ is a dummy equal to one when a country has finalized its final private/official restructuring and $R_{i,t}$ denotes the corresponding amount of private/official haircut. $Z_{i,t-1}$ is a vector containing macroeconomic and political control variables lagged one period as in the first stage. In line with Jordà and Taylor (2016), the set of controls in the second stage is a subset of the predictors used in the logit estimation.[41] τ_t denotes period fixed effects, which allows us to control for common trends, $\eta_{i,k}$ indicates agency-country pair fixed effects in the case of agency rating, and country fixed effects in the EMBIG regression. Finally, $u_{i,k,t}$ is the error term. As in the first stage, we cluster the standard errors at the country level, because the treatment occurs at the country level.

We run the above regression, for each point in horizon h on the re-balanced sample and reach the desired average treatment effect, or ATE:

[41] Table B1 in the Appendix lists all the variables used in the first and the second stage.

$$ATE_h = \frac{1}{n}\sum_i \sum_t \left\{ \left[\frac{(y_{i,t+h} - y_{i,t})(C_{i,t})}{PD_{i,t}} - \frac{(y_{i,t+h} - y_{i,t})(1 - C_{i,t})}{1 - PD_{i,t}} \right] \right.$$
$$\left. - \frac{(C_{i,t} - PD_{i,t})}{PD_{i,t}(1 - PD_{i,t})} \left[(1 - PD_{i,t})(y_{i,t+h} - y_{i,t}) + PD_{i,t}(y_{i,t+h} - y_{i,t}). \right] \right\} \tag{5}$$

Here $y_{i,t+h} - y_{i,t}$ is the estimated conditional forecast from our local projections, and $C_{i,t}$ is the dummy used to distinguish between defaulters and non-defaulters and $PD_{i,t}$ are the estimated propensity scores from the first stage. The first part is a standard inverse score weighted estimator of the ATE. Intuitively, this is like a group-means comparison between defaulters and non-defaulters, with the difference that we correct for allocation bias of the treatment by modeling for it with the propensity score, afterwards inverting it to achieve a random distribution. The second part is an adjustment term consisting of the weighted average of the two regression estimators. The purpose of the adjustment term is to stabilize the estimator as the propensity score gets close to the extremes (0 or 1) and therefore alleviates the need to truncate the weights. Hence ATE_h is the average treatment effect of finale restructuring computed over the seven-year horizon.

The AIPW estimator has a number of features that make it suitable for calculation of the dynamic effects and for estimation under endogeneity issues. The combination of local projections and propensity score weighting is doubly-robust, in that the estimator will be unbiased, as long as either of the stages is specified correctly, an assumption referred to as selection on observables. The underlying idea is that the predictor set in the first stage, and the control set in the second stage, should be expansive enough so as to explain as much variation in sovereign default decisions as possible.[42]

5.2 Credit Agency

This Section presents the results for credit agency ratings, while in the next one we will show the result taking bond spread as the dependent variable. We find the AIPW for the restructuring events in our sample, with both private and official creditors, using dyadic data. Figure B1, in the Online Appendix B, confirms the predictive ability of the first stage and Table B2, in the Online Appendix B, reports the estimated coefficients from the first stage. More specifically, levels of

[42] With this, we do not need to rely on exclusion restrictions. Even if all our variables were endogenous, as long as there is no unexplained deviation from the conditional forecasted change in ratings, the ATE will be unbiased (Jordà and Taylor 2016).

debt are less important for predicting the start of a debt crisis, while level of reserves to external debt is negatively and significantly correlated with a debt crisis. There is strong evidence of path dependency, political variables also affect the probability of a crisis and measures of systemic financial risk increase the probability of default.

Table 6 shows our results for the average treatment effect in the case of private restructurings. The estimates indicate a persistent negative effect of a restructuring with private creditors on agency ratings. While in the first years there is a drop by less than one notch in our scale of agency ratings, by the third year the drop in agency ratings increases to more than one notch. The effect peaks after 3 years with a 1.36 drop in agency ratings. Our panel analysis implied effects which were similar yet larger in magnitude, recalling that we found for example an average private haircut of 50% was associated to a decrease of about 2.4 notches one year after the event. Notably, the estimated ATE's are negative and significant for all 7 years in the analysis, a result which matches the computed marginal effects from Figure 4a.

The dynamics of ratings in a post-crisis setting is therefore in line with what our panel analysis suggests, namely that a private restructuring likely implies a long-lasting, reputational effect on the sovereign defaulter. Clearly this is influenced by the size of the haircut imposed on creditors, which is why we control for the severity of default. The second stage local projection used in the estimation of this ATE do well in forecasting the change in agency ratings both in the short and long term, with the R-squared going from 21% to 70%.[43]

TABLE 6 HERE

Table 7 shows instead the results for official restructurings. We find an average increase on our scale of ratings which is always positive following the end of a restructuring with official creditors. As before the results are significant for every year considered; the effect peaks after 6 years, where the expected change in ratings is of 0.55 notches with respect to the base year. Once again the effects are lower than the comparable estimates from the panel analysis (which found an increase of about 1 notch a year after the event, considering an average official haircut of 45%), but positive and significant throughout the sample period as in the original analysis (see Figure 4b).

As in our panel analysis, positive spillover effects seem to dominate following a restructuring with official creditors. Both the ATE's from Table 6 and Table 7 are plotted in Figure 6. As we can see, the dynamic response of agency ratings following the end of a restructuring episode for both event types is persistent for all the years in our estimates. Recalling the results from the panel

[43] The coefficients from the second stage LP are reported in Table B3, in the Appendix.

analysis in Section 3.2, we find average treatment effects which are consistent with the mean size of haircuts of our sample, both for private and official restructurings.

TABLE 7 HERE

FIGURE 6 HERE

5.3 EMBIG spread

Finally, the AIPW methodology is applied to the monthly average secondary market bond stripped yield spread (EMBIG). Given the direct connection between ratings and spread we expect our results to mirror those on ratings. Figure B2 and Table B2, in the Appendix, report the results for the first stage which are in line with those found when using dyadic data on agency ratings, confirming the predictive ability of the first stage.

Tables 8 and 9 show the computed average treatment effect, while Table B4, in the Appendix, report the coefficients from the second stage. As above, the estimated local projection controls for country and time fixed effects, thereby estimating the average treatment effect of the conditional forecast of bond spreads for h-steps ahead. Following the end of a private restructuring, the average treatment effect is large. One year after the event, we find an increase of about 267 basis points in the spread. The effect peaks after 3 years, when the spread with respect to the base period is 10.8 percent (1800 bp) higher, after which this change in spread falls. The magnitude of these effects under our AIPW estimates which correct for the endogeneity bias are considerably larger than in our OLS estimates, where for example the estimated average effect of a private haircut equaling 40% (the sample average) is only about an 120 bp increase in year one. Finding such results for secondary market yields reveals that the aforementioned reputational effects are felt on markets as well as being perceived by credit rating agencies. Even after the end of a debt crisis involving private creditors, investors sentiment remains sour with respect to sovereign debt instruments.

Table 9 highlights the results for official restructurings. The change in spread with respect to the base year is always falling, where in the first period the spread falls by a little more than 100 basis points, or about 1 percent, and then falls consistently over the forecast horizon. Both the ATE's from Table 8 and Table 9 are plotted in Figure 7. As we can see, the dynamic response of bond spread following the end of a restructuring episode for both event types is persistent for all the years in our estimates, unlike in our panel marginal effects estimates, where we only find significant effects 3 years after the event.

The motivations behind the differential effect we find between private and official restructurings is the same as has been argued consistently throughout the paper. Despite the supposed seniority of official debt, the empirical literature (Schlegl *et al*, 2019) and evidence from collective memory of private restructurings (read Greece 2010 and Argentina v. NML Capital) indicate that private restructurings are considerably more public and therefore influential for the markets. Unsurprisingly, following such an event, bond spreads spike. On the other hand, new evidence from Horn *et al.* (2020) suggests that official lenders typically shoulder the burden for private creditors, which is one explanation for why following official restructurings we find evidence of positive market sentiment.

TABLE 8 & 9 HERE

FIGURE 7 HERE

6 Conclusions

This paper studies the relationship between sovereign debt default and a country's creditworthiness, by taking into account the depth of a debt restructuring and by distinguishing between commercial and official sovereign debt agreements. We analyze 264 default episodes in 130 countries over the period 1990-2013, and we consider agency ratings and bond spreads as indirect and direct measure of borrowing costs, respectively. Controlling for both the occurrence and the magnitude of defaults, we find a more lasting relationship between debt default and credit risk.

In the case of sovereign ratings, private defaulters are associated with a negative stigma in the aftermath of the restructuring, while official defaulters are overall not affected (or they may even benefit) by the restructuring episodes. These results are confirmed by taking the EMBIG bond spread as dependent variable over a subsample of countries.

Hence, the trade-off concerning the effects of sovereign debt restructurings seems to be associated with opposite outcomes for private and official defaulters. For the former, negative (reputational) spillovers seem to prevail, while for official defaulters the positive spillovers of a debt reduction are more important. Thus, our results point to the importance of considering the heterogeneous treatment of creditors in the event of default. Debtor countries, being aware that the consequences of default depend on who the defaulted creditors are, may then decide to prioritize their repayments accordingly. As the looming presence of debt restructurings, including those with official creditors, are expected to materialize in the next years as a result of the negative shock from Covid-19, it becomes crucial to consider the specific characteristics of sovereign debt renegotiations.

The initial analysis is limited in several respects. We do not claim to draw causal inferences from our panel models, given the nature of the data available, and hence we prefer to interpret the coefficients as conditional correlations rather than causal effects. To correct for this, we apply a propensity score weighting and local projection as a causal inference methodology. We find equally robust results in the second part of our analysis, which supports our initial panel models. Applied to both agency ratings and bond spreads, we find average treatment effects that support the hypothesis of a negative stigma effect following a restructuring with private creditors, and an opposite positive signaling effect when the restructuring occurred with official creditors.

In a companion paper (Marchesi and Masi 2020b) we find similar results using the Institutional Investor's index as the dependent variable, and the Synthetic Control Method to provide causal evidence on the relationship between default and credit ratings. Due to data limitations, we could only apply this method to the ratings provided by the Institutional Investor Magazine, but not to agency ratings, which are only available since the '90s. What is more, while the SCM allows us to contrast the rating outcome of either private or official defaulters, the local projection analysis allows us to enlarge the sample by considering countries defaulting with both types of creditors, and to take the severity of the default into account as well.

Therefore, in this paper, we find further evidence for the heterogeneity of the economic impact of debt restructurings, confirming that official and private defaults may have different costs and then induce selective defaults. Applied to the incoming global debt crisis, this evidence from historical episodes suggests that sovereigns and global financial institutions weary of the negative effects of defaults should act now to coordinate accordingly.

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Table 1: Restructurings and Haircuts over time (in %)

	Observations	Mean	SD	Min	Max
Private haircut					
1970-1988	81	23	53	-10	93
1989-2001	57	43	26	-8	92
2002-2013	20	53	31	5	96
Official haircut					
1970-1988	1	33	0	33	33
1989-2001	71	58	20	12	100
2002-2013	34	77	28	4	100
Private face value reduction					
1970-1988	2	58	40	30	86
1989-2001	34	41	30	1	92
2002-2013	14	56	30	4	96
Official face value reduction					
1970-1988					
1989-2001	13	74	30	14	100
2002-2013	30	63	25	17	100

Table 2: Haircuts and face value reduction by country's income

		High Income	Middle Income	Low Income
Haircut %				
	Private	27	33	53
	Official	100	65	62
# of restructuring countries				
	Private	7	42	5
	Official	1	22	9
Face value reducion %				
	Private	38	41	91
	Official	45	56	80
# of restructuring countries				
	Private	4	30	4
	Official	1	13	9

Table 3: Private and Official Haircut and Agency credit rating, 1990-2013, OLS

	(1)	(2)	(3)	(4)	(5)	(6)
Final Private Haircut (-1)	-0.064***	-0.046***			-0.030*	-0.034**
	(-4.901)	(-4.505)			(-1.679)	(-2.491)
Final Private Haircut (-2)	-0.048***	-0.032***			-0.019	-0.028**
	(-4.658)	(-3.801)			(-1.255)	(-2.366)
Final Private Haircut (-3)	-0.028***	-0.018***			-0.003	-0.011
	(-5.107)	(-3.707)			(-0.344)	(-1.363)
Final Private Haircut (-4 & 5)	-0.023***	-0.017***			-0.007	-0.014**
	(-4.610)	(-3.677)			(-0.775)	(-2.001)
Final Private Haircut (-6 & 7)	-0.015***	-0.013***			-0.012	-0.012**
	(-3.404)	(-3.532)			(-1.468)	(-2.151)
Final Official Haircut (-1)	0.001	0.021***			0.032***	0.025***
	(0.165)	(5.851)			(3.260)	(3.880)
Final Official Haircut (-2)	-0.000	0.015***			0.030***	0.021***
	(-0.067)	(4.617)			(3.464)	(3.146)
Final Official Haircut (-3)	-0.003	0.009**			0.022***	0.017**
	(-0.700)	(2.585)			(2.694)	(2.525)
Final Official Haircut (-4 & 5)	-0.002	0.009***			0.018***	0.019***
	(-0.571)	(3.051)			(2.730)	(3.723)
Final Official Haircut (-6 & 7)	0.001	0.008***			0.010***	0.014***
	(0.394)	(2.777)			(2.693)	(3.948)
Final Priv. Haircut Dummy (-1)			-3.117***	-2.458***	-1.879***	-0.828*
			(-5.768)	(-4.777)	(-3.024)	(-1.809)
Final Priv. Haircut Dummy (-2)			-2.239***	-1.444***	-1.522***	-0.243
			(-5.593)	(-3.584)	(-2.901)	(-0.506)
Final Priv. Haircut Dummy (-3)			-1.317***	-0.756***	-1.242***	-0.389
			(-5.072)	(-2.849)	(-2.733)	(-0.908)
Final Priv. Haircut Dummy (-4 & 5)			-0.948***	-0.635***	-0.719*	-0.120
			(-4.376)	(-2.732)	(-1.847)	(-0.335)
Final Priv. Haircut Dummy (-6 & 7)			-0.504***	-0.421**	-0.124	-0.028
			(-2.756)	(-2.494)	(-0.390)	(-0.107)
Final Off. Haircut Dummy (-1)			-0.647	0.997***	-2.183***	-0.252
			(-1.414)	(2.709)	(-3.456)	(-0.501)
Final Off. Haircut Dummy (-2)			-0.792**	0.513	-2.097***	-0.465
			(-2.080)	(1.534)	(-3.995)	(-0.916)
Final Off. Haircut Dummy (-3)			-0.771**	0.186	-1.713***	-0.609
			(-2.440)	(0.651)	(-3.884)	(-1.348)
Final Off. Haircut Dummy (-4 & 5)			-0.687**	0.073	-1.475***	-0.795**
			(-2.515)	(0.276)	(-4.065)	(-2.479)
Final Off. Haircut Dummy (-6 & 7)			-0.266	0.113	-0.705***	-0.538***
			(-1.537)	(0.728)	(-3.361)	(-3.715)
GDP real growth (-1)		0.044***		0.047***		0.046***
		(3.263)		(3.333)		(3.370)
Primary balance to GDP (-1)		0.003		0.002		0.004
		(0.206)		(0.133)		(0.243)
Current Account to GDP (-1)		-0.030***		-0.030***		-0.029***
		(-3.157)		(-3.142)		(-3.025)
Reserves to imports (-1)		0.003		0.003		0.002
		(0.995)		(1.079)		(0.811)
Public debt to GDP (-1)		-0.045***		-0.045***		-0.044***
		(-5.218)		(-5.036)		(-5.082)
Inflation (-1)		0.581		0.586		0.567
		(0.357)		(0.356)		(0.347)
(Absence of) Political risk (-1)		0.159***		0.153***		0.157***
		(8.562)		(8.263)		(8.268)
Constant	13.135***	5.503***	13.225***	5.807***	13.213***	5.566***
	(18.575)	(3.264)	(18.614)	(3.456)	(18.596)	(3.292)
Observations	57,984	43,616	57,984	43,616	57,984	43,616
R-squared	0.134	0.394	0.142	0.387	0.151	0.396
Number of pair_id	454	363	454	363	454	363
Pair FE	YES	YES	YES	YES	YES	YES
Period FE	YES	YES	YES	YES	YES	YES

Notes: This table shows coefficients of an unbalanced panel data regression with OLS fixed effects at the agency-country-period-level. The dependent variable is the monthly country agency rating, while the key explanatory variables are the lagged values of C and R taken up to seven years after each final restructuring. Agency-country and period-fixed effects are included. Standard errors are clustered at the agency-country-level, t statistics are in parentheses. Significance levels: *0.10, ** 0.05, *** 0.01.

Table 4: Private and Official Haircut and Agency rating, 1990-2013, OLS

	(1)	(2)	(3)	(4)	(5)
Final Private Haircut (-1)	-0.032**	-2.402***	-1.425**	-0.020	-0.171***
	(-2.431)	(-2.953)	(-2.247)	(-1.409)	(-10.979)
Final Private Haircut (-2)	-0.027**	-1.187	-0.659	-0.018	-0.162***
	(-2.371)	(-1.300)	(-0.942)	(-1.232)	(-6.179)
Final Private Haircut (-3)	-0.012	-0.847	-0.880	-0.007	-0.131***
	(-1.537)	(-0.855)	(-1.369)	(-0.596)	(-3.481)
Final Private Haircut (-4 & 5)	-0.014*	0.075	-0.284	-0.011	-0.135***
	(-1.880)	(0.095)	(-0.490)	(-1.069)	(-3.680)
Final Private Haircut (-6 & 7)	-0.012**	0.239	0.017	-0.013	0.034***
	(-2.129)	(0.441)	(0.037)	(-1.404)	(3.025)
Final Official Haircut (-1)	0.022***	-0.022	-0.018	0.020*	
	(3.409)	(-1.192)	(-1.265)	(1.750)	
Final Official Haircut (-2)	0.020***	-0.022	-0.016	0.016	
	(2.811)	(-1.347)	(-1.129)	(1.327)	
Final Official Haircut (-3)	0.016**	-0.009	-0.002	0.014	0.006
	(2.314)	(-0.572)	(-0.168)	(1.102)	(0.912)
Final Official Haircut (-4 & 5)	0.019***	-0.024*	-0.012	0.016*	0.005
	(3.626)	(-1.624)	(-1.118)	(1.742)	(1.173)
Final Official Haircut (-6 & 7)	0.013***	-0.022*	-0.013	0.014***	0.001
	(3.765)	(-1.886)	(-1.445)	(2.673)	(0.354)
Final Priv. Haircut Dummy (-1)	-0.926**	-1.048	0.097	-1.250*	0.427
	(-2.008)	(-1.001)	(0.095)	(-1.923)	(0.363)
Final Priv. Haircut Dummy (-2)	-0.271	-1.560	-0.275	-0.439	1.350
	(-0.563)	(-1.525)	(-0.294)	(-0.557)	(1.185)
Final Priv. Haircut Dummy (-3)	-0.297	-1.570*	-0.554	-0.568	1.377
	(-0.691)	(-1.781)	(-0.762)	(-0.861)	(1.042)
Final Priv. Haircut Dummy (-4 & 5)	-0.138	-1.597***	-0.751	-0.207	1.523
	(-0.373)	(-2.617)	(-1.386)	(-0.347)	(1.332)
Final Priv. Haircut Dummy (-6 & 7)	-0.031	-0.942***	-0.755**	0.028	-0.958*
	(-0.116)	(-3.385)	(-2.265)	(0.060)	(-1.969)
Final Off. Haircut Dummy (-1)	-0.060	0.051***	0.018	-0.061	-0.947
	(-0.122)	(3.600)	(1.363)	(-0.070)	(-0.972)
Final Off. Haircut Dummy (-2)	-0.343	0.045***	0.015	-0.325	-1.390**
	(-0.650)	(3.218)	(1.186)	(-0.356)	(-2.353)
Final Off. Haircut Dummy (-3)	-0.517	0.035**	0.012	-0.594	-1.306***
	(-1.112)	(2.565)	(1.047)	(-0.685)	(-2.744)
Final Off. Haircut Dummy (-4 & 5)	-0.805**	0.033***	0.015	-0.733	-1.185***
	(-2.453)	(3.244)	(1.599)	(-1.241)	(-3.646)
Final Off. Haircut Dummy (-6 & 7)	-0.475***	0.021***	0.014**	-0.627***	-0.332**
	(-3.237)	(3.277)	(2.182)	(-2.681)	(-2.069)
GDP real growth (-1)	0.171***	0.037*	0.036	0.043*	0.047
	(3.191)	(1.913)	(1.624)	(1.885)	(1.360)
Primary balance to GDP (-1)	0.001	0.020	0.011	0.019	-0.058
	(0.066)	(0.724)	(0.492)	(0.810)	(-1.110)
Current Account to GDP (-1)	-0.030***	-0.063***	-0.030**	-0.029**	-0.011
	(-3.130)	(-3.493)	(-2.112)	(-2.226)	(-0.258)
Reserves to imports (-1)	0.003	0.001	0.001	0.003	-0.003
	(0.925)	(0.230)	(0.234)	(0.548)	(-0.300)
Public debt to GDP (-1)	-0.043***	-0.081***	-0.040***	-0.038***	-0.054*
	(-5.014)	(-5.804)	(-3.196)	(-2.890)	(-1.811)
Inflation (-1)	0.527	-1.665	1.287	1.049	-5.871
	(0.323)	(-0.540)	(0.475)	(0.406)	(-1.272)
(Absence of) Political risk (-1)	0.159***	0.238***	0.141***	0.150***	0.157**
	(8.298)	(7.774)	(5.005)	(5.085)	(2.325)
Change in government	-0.317***				
	(-3.907)				
Population	-0.000				
	(-0.550)				
Growth	-0.127**				
	(-2.484)				
Constant	5.221***		5.469**	4.992*	5.909
	(3.065)		(2.174)	(1.923)	(1.240)
Observations	43,424	43,616	12,937	12,903	5,297
R-squared	0.403		0.411	0.406	0.538
Number of id	359	363	84	83	58

Notes: The dependent variables are: the dyadic monthly rating (column 1 and 2); the monthly mean of all agencies' rating (column 3); the monthly mean of the four North American Agencies, i.e., Standard & Poor's, Moody's, Fitch, Dominion Bond Rating Services (column 4); the monthly mean of the three Asian Agencies, i.e., Dagong Global, Rating, Investment Information, Japan Credit Rating Agency (column 5). In column 1 the regressions are estimated using fixed effects OLS at the agency-country-year-level, (s.e. are clustered at the agency-country-level). In column 2, the regression is estimated using an ordered-logit model (s.e. are clustered at the agency-country-level. In columns 3-5, the regressions are estimated using fixed effects OLS at the country-year-level (s.e. clustered at the country-level). t- statistics are in parentheses. Significance levels: *0.10, ** 0.05, *** 0.01.

Table 5: Private and Official Haircut and bond spread, 1990-2013, OLS

	(1)	(2)	(3)	(4)	(5)	(6)
Final Private Haircut (-1)	4.724*	2.784			6.177	2.269
	(1.762)	(1.322)			(1.589)	(0.872)
Final Private Haircut (-2)	3.732*	3.000*			6.087	3.777
	(1.824)	(1.888)			(1.664)	(1.154)
Final Private Haircut (-3)	3.275	1.404			4.878	3.570
	(1.663)	(1.131)			(1.337)	(1.299)
Final Private Haircut (-4 & 5)	3.291***	2.826***			7.145***	6.626***
	(2.749)	(3.711)			(2.834)	(2.796)
Final Private Haircut (-6 & 7)	1.416	1.922**			8.160***	6.015**
	(1.146)	(2.252)			(3.721)	(2.630)
Final Official Haircut (-1)	-3.482***	-1.781*			-4.301***	-2.108
	(-3.146)	(-1.883)			(-2.833)	(-0.824)
Final Official Haircut (-2)	-4.423***	-2.441*			-6.393***	-3.995
	(-2.798)	(-1.717)			(-3.023)	(-1.234)
Final Official Haircut (-3)	-3.850**	-3.012***			-3.157*	-1.798
	(-2.376)	(-3.617)			(-1.727)	(-0.589)
Final Official Haircut (-4 & 5)	-4.216***	-3.793***			-3.859**	-3.727
	(-4.498)	(-5.792)			(-2.502)	(-1.341)
Final Official Haircut (-6 & 7)	-3.470***	-1.488***			-1.924	-0.697
	(-3.002)	(-4.016)			(-1.264)	(-0.402)
Final Priv. Haircut Dummy (-1)			153.344	109.244	-124.943	0.349
			(1.416)	(1.170)	(-0.979)	(0.004)
Final Priv. Haircut Dummy (-2)			108.032	103.066	-151.820	-64.137
			(1.388)	(1.502)	(-1.291)	(-0.491)
Final Priv. Haircut Dummy (-3)			89.847	14.486	-106.076	-132.969
			(1.056)	(0.251)	(-0.749)	(-1.126)
Final Priv. Haircut Dummy (-4 & 5)			68.665	51.534	-204.243	-192.159
			(1.017)	(0.861)	(-1.633)	(-1.462)
Final Priv. Haircut Dummy (-6 & 7)			-24.053	14.458	-304.426***	-181.834
			(-0.419)	(0.284)	(-3.202)	(-1.616)
Final Off. Haircut Dummy (-1)			-83.458	-25.141	159.246	111.896
			(-0.384)	(-0.187)	(1.628)	(0.629)
Final Off. Haircut Dummy (-2)			14.007	-9.020	309.909	191.847
			(0.060)	(-0.059)	(1.666)	(0.870)
Final Off. Haircut Dummy (-3)			-98.585	-122.897	74.600	22.056
			(-0.516)	(-1.098)	(0.742)	(0.121)
Final Off. Haircut Dummy (-4 & 5)			-101.383	-86.462	98.741	97.595
			(-0.666)	(-0.660)	(0.873)	(0.531)
Final Off. Haircut Dummy (-6 & 7)			-128.873	-69.479	-100.634	-68.184
			(-1.281)	(-0.763)	(-1.128)	(-0.490)
GDP real growth (-1)		-4.856		-4.474		-4.134
		(-1.540)		(-1.489)		(-1.481)
Primary balance to GDP (-1)		-16.698***		-17.488***		-16.806***
		(-3.266)		(-3.538)		(-3.224)
Current Account to GDP (-1)		-10.003***		-9.764***		-9.525***
		(-2.963)		(-2.737)		(-2.751)
Reserves to imports (-1)		-1.328		-1.561		-1.165
		(-0.999)		(-1.067)		(-0.690)
Public debt to GDP (-1)		9.834***		10.510***		9.349***
		(3.512)		(3.347)		(3.542)
Inflation (-1)		-0.093		-0.038		-0.141*
		(-0.936)		(-0.334)		(-1.832)
(Absence of) Political risk (-1)		-7.709***		-7.249**		-6.429**
		(-2.764)		(-2.257)		(-2.380)
Constant	363.940***	951.647***	364.566***	956.923***	434.986***	942.554***
	(5.245)	(3.947)	(4.121)	(3.465)	(4.604)	(3.593)
Observations	5,115	3,935	5,115	3,935	5,115	3,935
R-squared	0.344	0.455	0.330	0.444	0.364	0.465
Number of country_id	46	34	46	34	46	34
Country FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES

Notes: This table shows coefficients of an unbalanced panel data OLS regression with fixed effects at the country-year-level. The dependent variable is the monthly average country yield spread over US Treasury bonds (EMBIG stripped spread) measured in basis points (bp). Standard errors are clustered at the country-year level, t statistics are in parentheses. Significance levels: *0.10, ** 0.05, *** 0.01.

Table 6: ATE on change in ratings, private restructuring

Year	1	2	3	4	5	6	7
AIPW	-0.79***	-0.34***	-1.36***	-1.03***	-1.09***	-1.03***	-1.03***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	24624	22701	20795	18857	16807	14788	12852

Notes: Table shows average treatment effect of private restructurings on change in agency ratings. Standard errors (in parenthesis) are clustered at the agency-country level. The model uses predictors and controls for first and second stage listed in the Online Appendix B and controls for agency-pair invariant and time-varying heterogeneity. Significance levels: *0.10, ** 0.05, *** 0.01.

Table 7: ATE on change in ratings, official restructuring

Year	1	2	3	4	5	6	7
AIPW	0.13***	0.04***	0.39***	0.28***	0.51***	0.55***	0.54***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Observations	24624	22701	20795	18857	16807	14788	12852

Notes: Table shows average treatment effect of official restructurings on change in agency ratings. Standard errors (in parenthesis) are clustered at the agency-country level. The model uses predictors and controls for first and second stage listed in the Online Appendix B and controls for agency-pair invariant and time-varying heterogeneity. Significance levels: *0.10, ** 0.05, *** 0.01.

Table 8: ATE on change in bond spread, private restructuring

Year	1	2	3	4	5	6	7
AIPW	267.29***	493.63***	1842.99***	388.58***	758.13***	205.65***	-49.74***
	(0.11)	(0.23)	(1.00)	(0.25)	(0.57)	(0.13)	(0.04)
Observations	3363	2968	2586	2208	1878	1587	1301

Notes: Table shows average treatment effect of private restructurings on change in monthly average country yield spread over US Treasury bonds (EMBIG stripped spread) measured in basis points (bp). Standard errors (in parenthesis) are clustered at the country level. The model uses predictors and controls for first and second stage listed in the Online Appendix B and controls for country invariant and time-varying heterogeneity. Significance levels: *0.10, ** 0.05, *** 0.01.

Table 9: ATE on change in bond spread, official restructuring

Year	1	2	3	4	5	6	7
AIPW	-112.07***	-269.20***	-298.35***	-145.17***	-348.06***	-21.03***	-67.94***
	(0.07)	(0.15)	(0.22)	(0.13)	(0.36)	(0.03)	(0.12)
Observations	3363	2968	2586	2208	1878	1587	1301

Notes: Table shows average treatment effect of official restructurings on change in monthly average country yield spread over US Treasury bonds (EMBIG stripped spread) measured in basis points (bp). Standard errors (in parenthesis) are clustered at the country level. The model uses predictors and controls for first and second stage listed in the Online Appendix B and controls for country invariant and time-varying heterogeneity. Significance levels: *0.10, ** 0.05, *** 0.01.

Figure 1: Crisis timeline

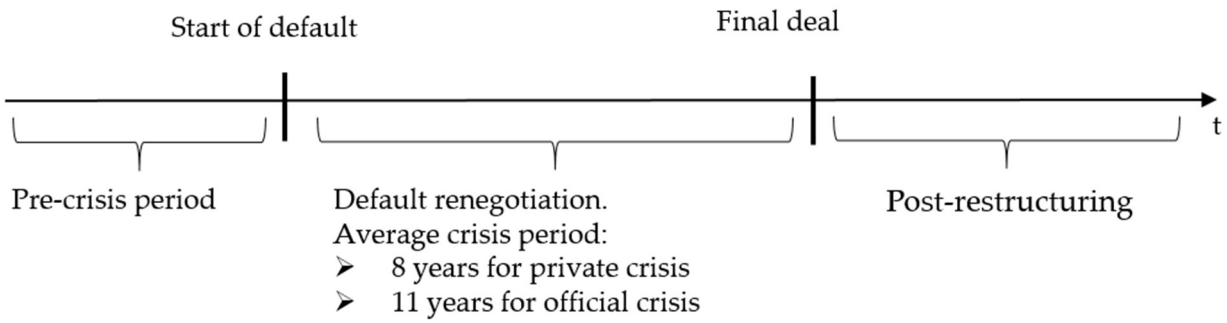


Figure 2: Share of private and official haircut and face value reduction over time

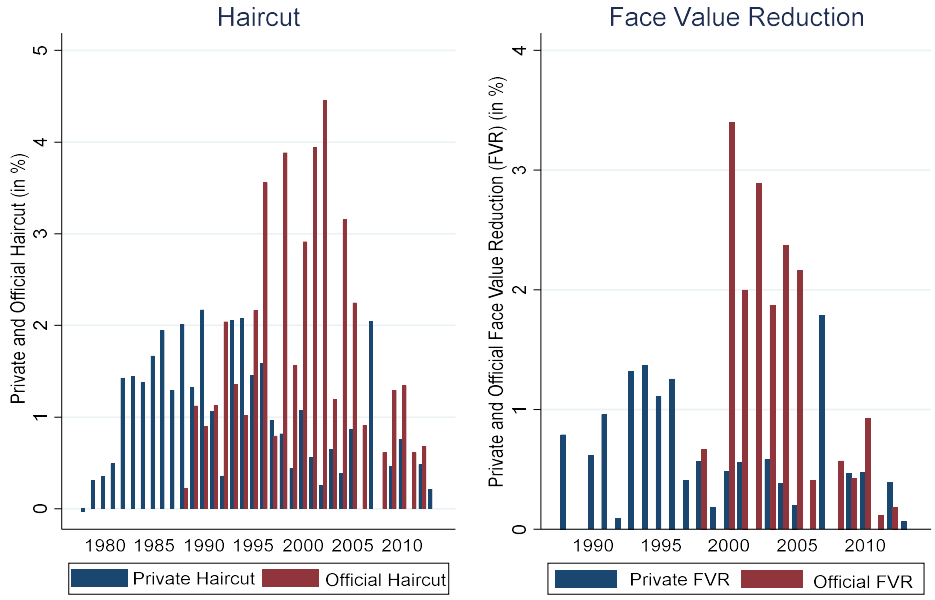


Figure 3: Frequency by size of private and official restructurings, haircuts and face value reduction

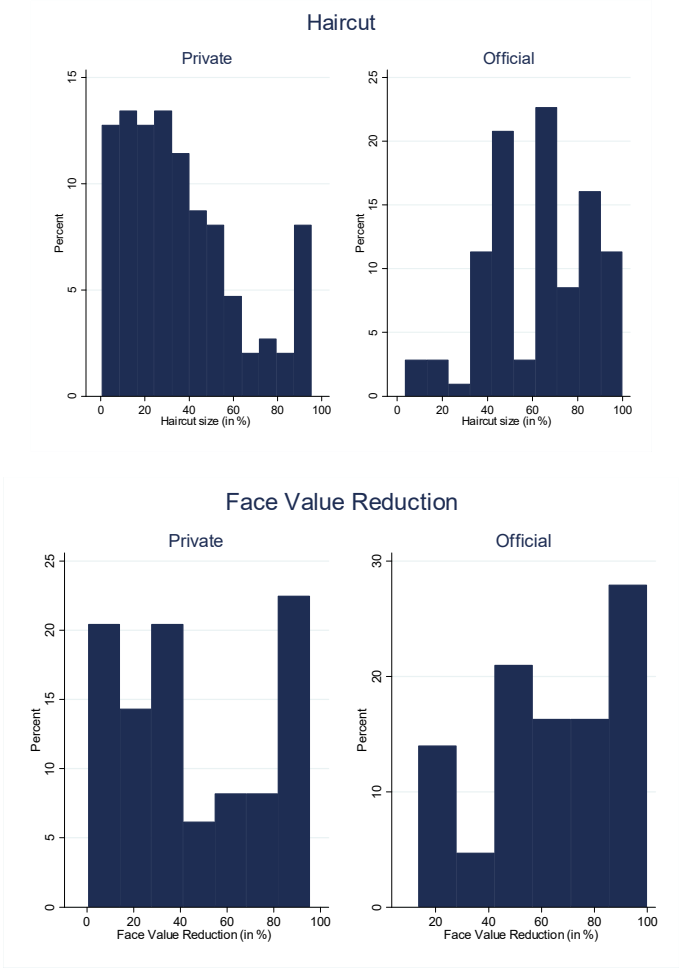
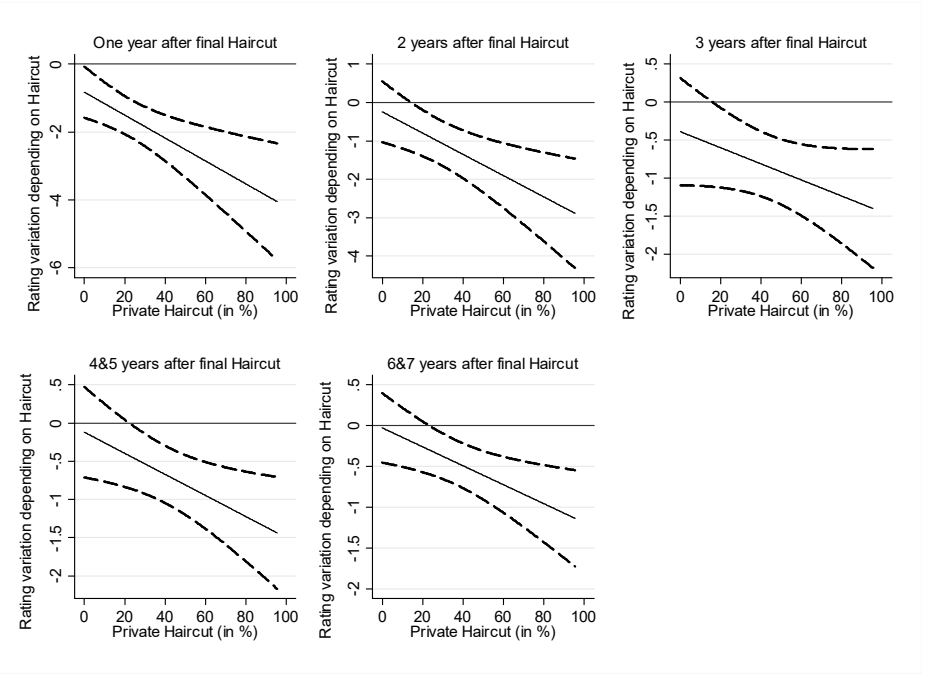
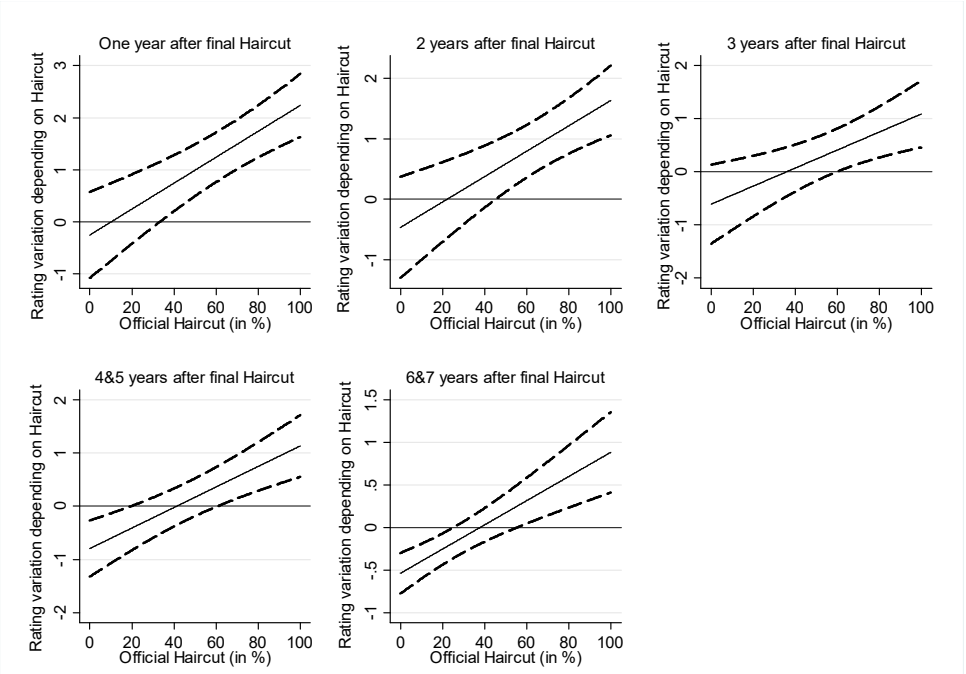


Figure 4a: Expected effect on agency rating for different levels of private haircut



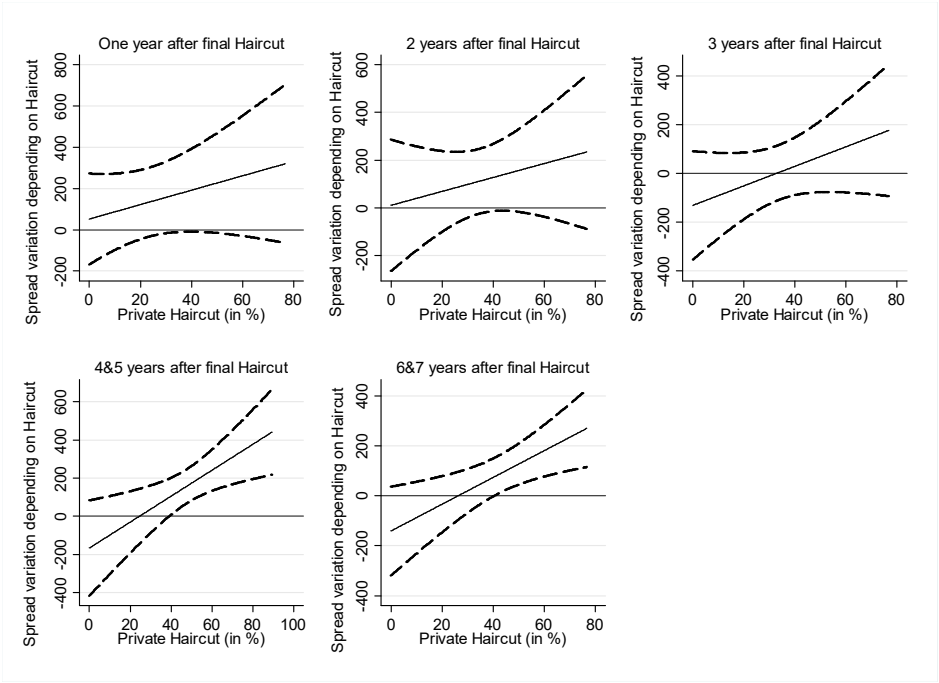
Notes: Each graph shows the marginal effect of private haircut on agency rating, for different haircut sizes and at different lag lengths. The dashed lines show 90 percent confidence bands. The effects are calculated using the coefficients from Table 3, column 6. The rating contraction of a restructuring is statistically significant for levels of haircut at which the upper confidence band is below the zero horizontal line. We can see that haircut greater than 20 percent (the mean of this sample being about 48 percent) can be associated with significantly lower ratings during the seven years after a restructuring.

Figure 4b: Expected effect on agency rating for different levels of official haircut



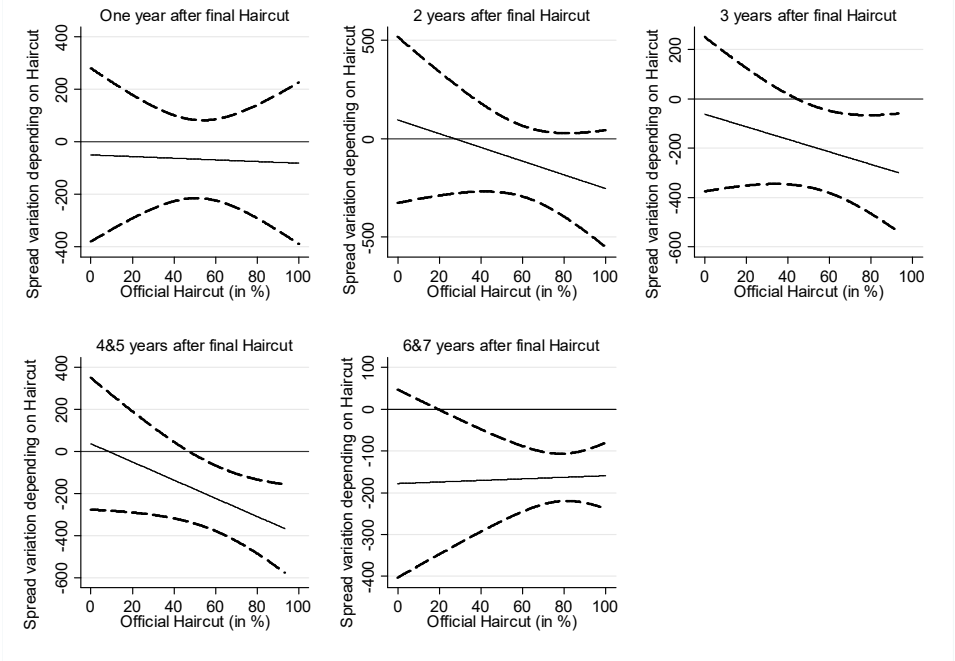
Notes: Each graph shows the marginal effect of official haircut on agency rating, for different haircut sizes and at different lag lengths. The dashed lines show 90 percent confidence bands. The effects are calculated using the coefficients from Table 3, column 6. The rating increase of a restructuring is statistically significant for levels of haircut at which the lower confidence band is above the zero horizontal line. From year one to two years after the agreements, we can see that haircut greater than 40 percent (the mean of this sample being about 45 percent) can be associated with significantly higher ratings. From year three to seven years after the restructuring, the rating increase can be significant only for much larger haircuts, i.e., greater than 60 percent.

Figure 5a: Expected effect on bond spread for different levels of private haircut



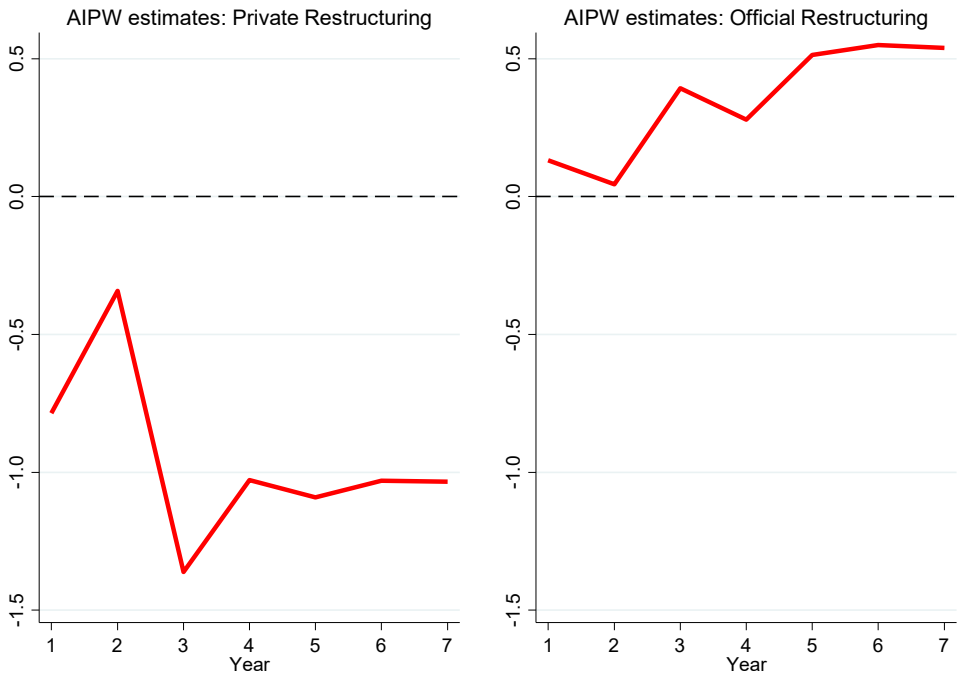
Notes: Each graph shows the marginal effect of private haircut on bond spreads, for different haircut sizes and at different lag lengths. The dashed lines show 90 percent confidence bands. The effects are calculated using the coefficients from Table 7, column 6. The spread increase of a restructuring is statistically significant for levels of haircut at which the lower confidence band is above the zero horizontal line. We can see that haircuts above 40 percent (the mean of this sample) can be associated with significantly higher spreads from four to the seven years after a restructuring.

Figure 5b: Expected effect on bond spread for different levels of official haircut



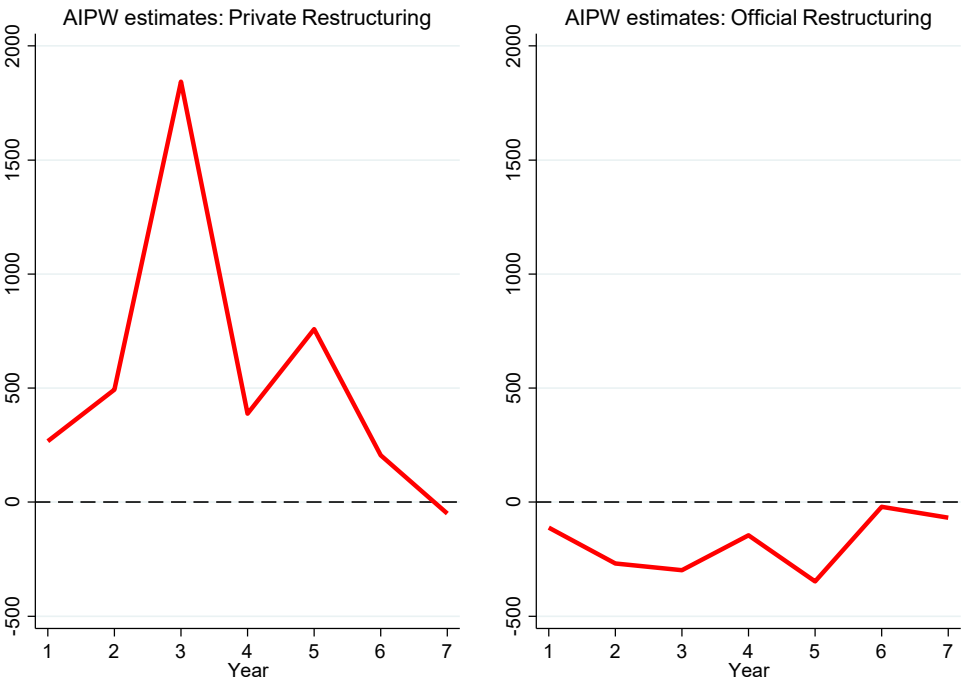
Notes: Each graph shows the marginal effect of official haircut on bond spreads, for different haircut sizes and at different lag lengths. The dashed lines show 90 percent confidence bands. The effects are calculated using the coefficients from Table 7, column 6. The spread decrease of a restructuring is statistically significant for levels of haircut at which the upper confidence band is below the zero horizontal line. We can see that haircuts above 40 percent (the mean of this sample) can be associated with significantly lower spreads from three to the seven years after a restructuring.

Figure 6: Year-by-year ATE, Agency Rating



Notes: Graphs show AIPW average treatment effect estimates for each h-step ahead forecast of change in agency ratings following the end of a private and official restructuring.

Figure 7: Year-by-year ATE, Bond Spreads



Notes: Graphs show AIPW average treatment effect estimates for each h-step ahead forecast of change in monthly average country yield spread over US Treasury bonds (EMBIG stripped spread) measured in basis points (bp) following the end of a private and official restructuring.

Online Appendix A

Table A1a: Country sample, defaulters

	Private restructurings			Official restructurings	
Albania	1991-1995			1993-2000	
Angola				1989	
Argentina	1982-1993	2001-2005		1985-1992	2014
Belize	2006-2013				
Benin				1989-2003	
Bolivia	1980-1993			1986-2001	
Bosnia Herzegovina	1992-1997			1998-2000	
Brazil	1983-1994			1983-1992	
Bulgaria	1990-1994			1991-1994	
Burkina Faso				1991-2002	
Cambodia				1995	
Cameroon	1985-2003			1989-2006	
Chile	1983-1990			1975-1987	
Congo, Dem. Rep.	1975-1989			1976-1989	2002-2010
Congo, Rep.	1983-1988	2007		1986-2004	2010
Costa Rica	1981-1990			1983-1993	
Cote d'Ivoire	1983-1998	2000-2012		1984-1994	1998-2012
Croatia	1992-1996			1995	
Cuba	1983-1985			1985-1986	
Dominican Republic	1982-1994	2004-2005		1985-1991	2004-2005
Ecuador	1982-1995	1999-2000	2008-2009	1983-2003	
Egypt, Arab Rep.				1987-1991	
El Salvador				1990	
Ethiopia	1990-1996			1992-2004	
Gabon	1986-1994			1987-1995	2000-2004
Georgia				2001-2004	
Ghana				1996-2004	
Greece	2012				
Grenada	2004-2005			2006	
Guatemala				1993	
Honduras	1981-2001			1990-2005	
Indonesia				1994-2005	
Iraq	1986-2006				
Jamaica	1977-1990			1984-1993	
Jordan	1989-1993			1989-2002	
Kenya	1992-1998			1994-2004	
Kyrgyz Republic				2002-2005	
Macedonia	1983-1988	1992-1997		1984-1988	1995-2000
Mali				1988-2003	
Mexico	1982-1990			1983-1989	
Moldova	2001-2004			2006	
Morocco	1983-1990			1983-1992	
Mozambique	1983-1991	2007		1984-2001	
Nicaragua	1978-1995	2007		1991-2004	
Nigeria	1982-1991			1986-1991	2000-2005
Pakistan	1998-1999			1981	1999-2001
Panama	1984-1996			1985-1990	
Paraguay	1986-1993				
Peru	1978-1997			1978-1996	
Philippines	1983-1992			1984-1994	
Poland	1981-1994			1981-1991	
Romania	1981-1983	1986		1982-1983	

Russia	1991-2000		1993-1999
Rwanda			1998-2005
Senegal	1980-1985	1990-1996	1981-2004
Serbia			
Seychelles	2008-2010		
Slovenia			
South Africa	1985-1993		
Sri Lanka			2005
Trinidad and Tobago	1988-1989		1989-1990
Turkey	1976-1982		1978-1980
Uganda	1979-1993		1981-2000
Ukraine	1998-2000		2001
Uruguay	1983-1991	2003	
Venezuela, RB	1983-1990		
Viet Nam	1982-1997		1993
Zambia	1983-1994		1983-2005

Notes: Countries in bold correspond to are those with only private restructurings, while countries in italics are those with only official restructurings.

Table A1b: Country sample, non-defaulters

Andorra	Czech Rep.	Lesotho	Slovak Rep.
Armenia	Estonia	Libya	St. Vincent and the Gren.
Aruba	Faroe Islands	Liechtenstein	Suriname
Azerbaijan	Fiji	Lithuania	Taiwan
The Bahamas	French Polynesia	Macao	Tajikistan
Bahrain	Gibraltar	Malaysia	Thailand
Bangladesh	Hong Kong	Maldives	Tunisia
Barbados	Hungary	Malta	Turkmenistan
Belarus	India	Mauritius	Turks and Caicos Islands
Bermuda	Iran	Mongolia	United Arab Emirates
Botswana	Isle of Man	Montenegro	Uzbekistan
Cabo Verde	Israel	Namibia	
Cayman Islands	Kazakhstan	Oman	
China	South Korea	Papua New Guinea	
Colombia	Kuwait	Qatar	
Curacao	Latvia	Saudi Arabia	
Cyprus	Lebanon	Singapore	

Table A2: Variable definitions and sources

Variable	Definition	Source
DEPENDENT VARIABLE		
Sovereign Rating	Sovereign rating on a 21-point scale, monthly (8 agencies, see Table A2b)	Bloomberg
EMBIG spreads	Monthly average secondary market bond stripped yield spread, (EMBIG)	J.P. Morgan
VARIABLES OF INTEREST		
Final Private Haircut	Private debt haircut, in percent	Built by the authors, based on Cruces and Trebesch (2013b)
Final Private Haircut Dummy	Dummy =1 in case of a private haircut	Built by the authors
Final Private Face Value Reduction	Private debt face value reduction, percent of treated debt	Built by the authors, based on Cruces and Trebesch (2013b)
Final Private Face Value Reduction Dummy	Dummy =1 in case of a private face value reduction	Built by the authors
Final Official Haircut	Official debt haircut, in percent	Built by the authors, based on Cheng *et al.* (2017)
Final Official Haircut Dummy	Dummy =1 in case of an official haircut	Built by the authors
Final Official Face Value Reduction	Official debt face value reduction, percent of treated debt	Built by the authors, based on Cheng *et al.* (2017)
Final Official Face Value Reduction Dummy	Dummy =1 in case of an official face value reduction	Built by the authors
CONTROL VARIABLES		
Current Account	Current account to GDP	World Development Indicators, World Bank (2018)
External debt to GDP	Ratio of external debt to GDP	World Development Indicators, World Bank (2018)
Government change	Dummy variable with a value of one	Database of Political Institutions, World Bank (2017)
GDP growth	Per capita GDP (constant 2015 US$), Annual rate of change	World Development Indicators, World Bank (2018)
Inflation	Consumer price index (2010 = 100), Annual rate of change	World Development Indicators, World Bank (2018)
(log) Popolation	Log of total population	World Development Indicators, World Bank (2018)
Net lending/borrowing	General government net lending/borrowing	World Economic Outlook Database, IMF (2018)
Per capita GDP	Per capita GDP (constant 2005 US$)	World Development Indicators, World Bank (2018)
Political Risk	ICRG Political Risk Index	International Country Risk Guide, The PRS Group (2018)
Reserves to imports	Total reserves (% of total imports)	World Development Indicators, World Bank (2018)

Table A3: Private and Official Face Value Reduction and Agency credit rating, 1990-2013, OLS

	(1)	(2)	(3)	(4)	(5)	(6)
Final Private FVR (-1)	-0.076***	-0.059***			-0.048*	-0.056**
	(-3.897)	(-4.663)			(-1.814)	(-2.140)
Final Private FVR (-2)	-0.061***	-0.048***			-0.052**	-0.066***
	(-3.771)	(-4.415)			(-2.419)	(-3.742)
Final Private FVR (-3)	-0.037***	-0.031***			-0.037**	-0.053***
	(-3.833)	(-4.573)			(-2.413)	(-4.445)
Final Private FVR (-4 & 5)	-0.030***	-0.030***			-0.037***	-0.052***
	(-3.398)	(-4.446)			(-2.674)	(-4.773)
Final Private FVR (-6 & 7)	-0.022***	-0.025***			-0.040***	-0.044***
	(-2.971)	(-4.457)			(-3.143)	(-4.714)
Final Official FVR (-1)	0.008	0.022***			0.001	-0.028*
	(1.049)	(3.851)			(0.095)	(-1.914)
Final Official FVR (-2)	0.004	0.015***			-0.008	-0.017
	(0.882)	(2.877)			(-0.707)	(-1.094)
Final Official FVR (-3)	-0.001	0.006			-0.014	-0.014
	(-0.372)	(1.227)			(-1.126)	(-0.870)
Final Official FVR (-4 & 5)	-0.001	0.010***			-0.010	0.027**
	(-0.382)	(3.163)			(-0.824)	(2.469)
Final Official FVR (-6 & 7)	-0.002	0.005*			-0.007	0.012
	(-0.677)	(1.748)			(-0.855)	(1.287)
Final Priv. FVR Dummy (-1)			-3.335***	-2.800***	-1.677*	-0.324
			(-4.428)	(-4.185)	(-1.871)	(-0.236)
Final Priv. FVR Dummy (-2)			-2.153***	-1.527***	-0.507	0.999
			(-3.873)	(-2.836)	(-0.876)	(1.485)
Final Priv. FVR Dummy (-3)			-1.001***	-0.584*	-0.018	1.152***
			(-3.294)	(-1.726)	(-0.038)	(2.724)
Final Priv. FVR Dummy (-4 & 5)			-0.590**	-0.557*	0.370	1.024***
			(-2.302)	(-1.906)	(0.976)	(3.089)
Final Priv. FVR Dummy (-6 & 7)			-0.195	-0.320	0.766**	0.839***
			(-0.790)	(-1.547)	(2.042)	(3.259)
Final Off. FVR Dummy (-1)			0.417	1.706***	0.529	3.800***
			(1.378)	(5.029)	(0.580)	(3.104)
Final Off. FVR Dummy (-2)			0.258	1.134***	0.985	2.413**
			(1.093)	(5.070)	(0.978)	(2.187)
Final Off. FVR Dummy (-3)			-0.155	0.532**	1.028	1.514
			(-0.630)	(2.370)	(0.939)	(1.404)
Final Off. FVR Dummy (-4 & 5)			-0.216	0.593**	0.737	-1.401*
			(-0.830)	(2.439)	(0.620)	(-1.824)
Final Off. FVR Dummy (-6 & 7)			-0.231	0.312	0.377	-0.681
			(-1.208)	(1.563)	(0.524)	(-0.998)
GDP real growth (-1)		0.041***		0.045***		0.040***
		(3.165)		(3.247)		(3.136)
Primary balance to GDP (-1)		0.004		-0.000		-0.000
		(0.265)		(-0.013)		(-0.026)
Current Account to GDP (-1)		-0.029***		-0.029***		-0.033***
		(-3.044)		(-3.034)		(-3.499)
Reserves to imports (-1)		0.003		0.003		0.003
		(0.953)		(1.022)		(0.936)
Public debt to GDP (-1)		-0.048***		-0.046***		-0.049***
		(-5.668)		(-5.094)		(-5.545)
Inflation (-1)		0.238		0.487		-0.007
		(0.146)		(0.294)		(-0.004)
(Absence of) Political risk (-1)		0.159***		0.155***		0.161***
		(8.669)		(8.314)		(8.588)
Constant	13.046***	5.821***	13.107***	5.738***	13.062***	5.788***
	(18.512)	(3.517)	(18.459)	(3.314)	(18.366)	(3.413)
Observations	57,984	43,616	57,984	43,616	57,984	43,616
R-squared	0.124	0.401	0.116	0.385	0.130	0.408
Number of pair_id	454	363	454	363	454	363
Pair FE	YES	YES	YES	YES	YES	YES
Period FE	YES	YES	YES	YES	YES	YES

Notes: This table shows coefficients of an unbalanced panel data regression with OLS fixed effects at the agency-country-period-level. Agency-country and period-fixed effects are included. Standard errors are clustered at the agency-country-level, t statistics are in parentheses. Significance levels: *0.10, ** 0.05, *** 0.01.

Table A4a: Descriptive Statistics (agency rating)

Variable	N	Mean	SD	Min	Max
Agency rating	43616	12.2	3.77	1	21
Final Priv. Haircut Dummy (-1)	43616	0.01	0.09	0	1
Final Priv. Haircut Dummy (-2)	43616	0.01	0.1	0	1
Final Priv. Haircut Dummy (-3)	43616	0.01	0.12	0	1
Final Priv. Haircut Dummy (-4 & 5)	43616	0.03	0.18	0	1
Final Priv. Haircut Dummy (-6 & 7)	43616	0.04	0.2	0	1
Final Private Haircut (-1)	43616	0.39	5.09	0	95.5
Final Private Haircut (-2)	43616	0.45	5.29	0	95.5
Final Private Haircut (-3)	43616	0.52	5.48	0	95.5
Final Private Haircut (-4 & 5)	43616	1.41	8.95	0	95.5
Final Private Haircut (-6 & 7)	43616	1.58	9.13	0	95.5
Final Off. Restr. Dummy (-1)	43616	0	0.07	0	1
Final Off. Restr. Dummy (-2)	43616	0.01	0.08	0	1
Final Off. Restr. Dummy (-3)	43616	0.01	0.08	0	1
Final Off. Restr. Dummy (-4 & 5)	43616	0.01	0.12	0	1
Final Off. Restr. Dummy (-6 & 7)	43616	0.02	0.13	0	1
Final Official Haircut (-1)	43616	0.23	4.23	0	100
Final Official Haircut (-2)	43616	0.25	4.39	0	100
Final Official Haircut (-3)	43616	0.28	4.67	0	100
Final Official Haircut (-4 & 5)	43616	0.61	6.74	0	100
Final Official Haircut (-6 & 7)	43616	0.72	7.38	0	100
GDP real growth (-1)	43616	4.19	3.55	-15.14	33.72
Primary balance to GDP (-1)	43616	-1.81	5.67	-20.35	43.3
Current Account to GDP (-1)	43616	-0.62	8.77	-46.72	45.45
Reserves to imports (-1)	43616	51.53	39.15	1.11	320.27
Public debt to GDP (-1)	43616	45.77	29.28	2.22	183.07
Inflation (-1)	43616	0.5	0.15	0.12	1
(Absence of) Political risk (-1)	43616	68.78	8.66	37.87	89.13

Notes: Descriptive statistics refer to the specification of Table 3, column 6.

Table A4b: Descriptive Statistics (Bond Spread)

Variable	N	Mean	SD	Min	Max
Bond spread	4271	358.32	308.91	13.87	3158.22
Final Priv. Haircut Dummy (-1)	4271	0.02	0.13	0	1
Final Priv. Haircut Dummy (-2)	4271	0.02	0.15	0	1
Final Priv. Haircut Dummy (-3)	4271	0.03	0.17	0	1
Final Priv. Haircut Dummy (-4 & 5)	4271	0.07	0.26	0	1
Final Priv. Haircut Dummy (-6 & 7)	4271	0.08	0.27	0	1
Final Private Haircut (-1)	4271	0.79	6.68	0	76.8
Final Private Haircut (-2)	4271	0.82	6.47	0	76.8
Final Private Haircut (-3)	4271	0.88	6.31	0	76.8
Final Private Haircut (-4 & 5)	4271	2.8	11.74	0	89.4
Final Private Haircut (-6 & 7)	4271	2.81	10.89	0	76.8
Final Off. Restr. Dummy (-1)	4271	0.01	0.09	0	1
Final Off. Restr. Dummy (-2)	4271	0.01	0.08	0	1
Final Off. Restr. Dummy (-3)	4271	0.01	0.1	0	1
Final Off. Restr. Dummy (-4 & 5)	4271	0.03	0.16	0	1
Final Off. Restr. Dummy (-6 & 7)	4271	0.02	0.14	0	1
Final Official Haircut (-1)	4271	0.56	7.23	0	100
Final Official Haircut (-2)	4271	0.22	4.1	0	100
Final Official Haircut (-3)	4271	0.26	4.37	0	93.33
Final Official Haircut (-4 & 5)	4271	1.08	9.09	0	93.33
Final Official Haircut (-6 & 7)	4271	1.23	10.13	0	100
GDP real growth (-1)	4271	4.31	3.64	-15.14	18.29
Primary balance to GDP (-1)	4271	-2.23	3.29	-12.75	8.69
Current Account to GDP (-1)	4271	-0.74	5.44	-20.52	21.18
Reserves to imports (-1)	4271	53.87	33.72	5.12	238.24
Public debt to GDP (-1)	4271	46.19	25.63	3.88	183.07
Inflation (-1)	4271	0.48	0.17	0.12	1
(Absence of) Political risk (-1)	4271	67.3	8.45	40.71	87

Notes: Descriptive statistics refer to the specification of Table 5, column 6.

Table A5a: List of Agencies

Variable	Observations	Countries	Years	Headquarter	Source
Standard & Poor's (S&P)	24621	114	1977-2018	United States	Bloomberg
Moody's Investors Service	22950	117	1986-2018	United States	Bloomberg
Fitch Ratings	18596	99	1994-2018	United States/France	Bloomberg
Dominion Bond Rating Services (DBRS)	1609	20	2006-2018	Canada	Bloomberg
Dagong Global	6079	67	2010-2018	China	Bloomberg
Rating and Investment Information (R&I)	6189	28	1998-2018	Japan	Bloomberg
Japan Credit Rating Agency (JCR)	4041	21	1998-2018	Japan	Bloomberg
Capital Intelligence (CI)	4884	36	2002-2018	Cyprus/Kuwait	Bloomberg

Table A5b: Correlations between Agency credit rating, 1990-2018

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standard & Poor's (S&P)	1							
Moody's Investors Service	0.979	1						
Fitch Ratings	0.991	0.987	1					
Dominion Bond Rating Services (DBRS)	0.977	0.992	0.988	1				
Dagong Global	0.869	0.913	0.907	0.919	1			
Rating and Investment Information (R&I)	0.934	0.955	0.957	0.954	0.973	1		
Japan Credit Rating Agency FN (JCR)	0.942	0.966	0.968	0.972	0.980	0.992	1	
Capital Intelligence (Cyprus)	0.974	0.991	0.988	0.989	0.942	0.979	0.986	1

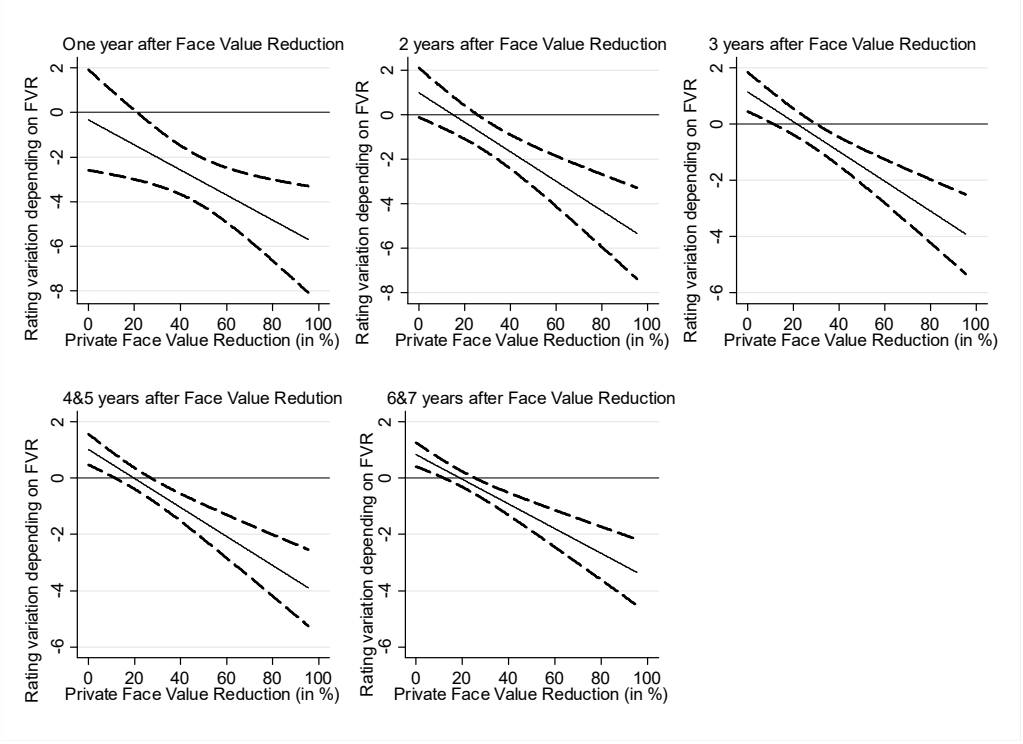
(obs. 245)

Table A5c: Correlation between Agency and EMBIG spread

	(1)	(2)
Agency rating (mean)	1	
EMBIG spread	-0.563	1

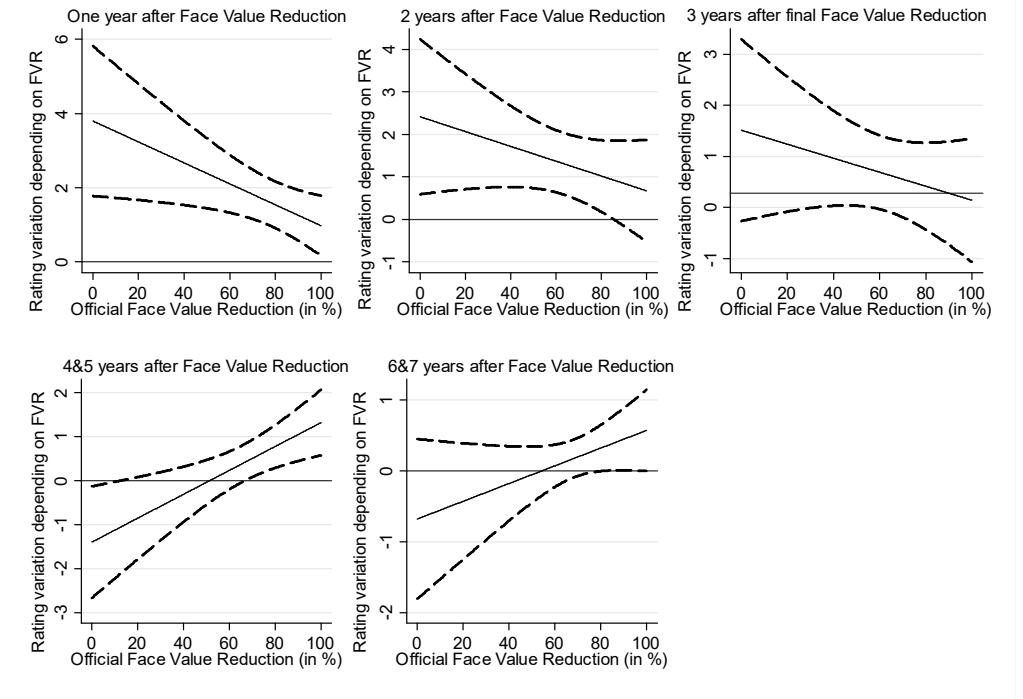
(obs=7,220)

Figure A1a: Expected effect on agency rating for different levels of private face value reduction



Notes: Each graph shows the marginal effect of private face value reduction on agency rating, for different face value reduction sizes and at different lag lengths. The dashed lines show 90 percent confidence bands. The effects are calculated using the coefficients from Table A3, column 6. The rating contraction of a restructuring is statistically significant for levels of nominal haircut at which the upper confidence band is below the zero horizontal line. We can see that haircut greater than 20 percent (the mean of this sample being about 50 percent) can be associated with significantly lower ratings during the seven years after a restructuring.

Figure A1b: Expected effect on agency rating for different levels of official face value reduction



Notes: Each graph shows the marginal effect of official face value reduction on agency rating, for different face value reduction sizes and at different lag lengths. The dashed lines show 90 percent confidence bands. The effects are calculated using the coefficients from Table A3, column 6. The rating increase of a restructuring is statistically significant for levels of nominal haircut at which the lower confidence band is above the zero horizontal line. From year one to two years after the agreements, we can see that any haircut can be associated with significantly higher ratings. From year five to seven years after the agreements nominal haircut greater than 60 percent (which corresponds to mean of this sample) can be associated with significantly higher ratings.

Online Appendix B

Table B1: AIPW - Variable definitions and sources

Variable	Definition	Source
CONTROLS & PREDICTORS: USED IN BOTH STAGE 1 (LOGIT) AND STAGE 2 (LOCAL PROJECTION)		
Current account	Current account to GDP	World Development Indicators, World Bank (2018)
Government change	Dummy variable with a value of one	Database of Political Institutions, World Bank (2017)
External debt to GDP	Ratio of external debt to GDP	World Development Indicators, World Bank (2018)
Per capita GDP	Per capita GDP (constant 2005 US$)	World Development Indicators, World Bank (2018)
General gov. gross debt to GDP	General government gross debt to GDP	International Financial Statistics, IMF (2018)
Government consumption	General government final consumption expenditure (% of GDP)	World Development Indicators, World Bank (2018)
Inflation	Consumer price index (2010 = 100), Annual rate of change	World Development Indicators, World Bank (2018)
Openness	Exports plus imports of goods and services, ratio to GDP	World Development Indicators, World Bank (2018)
Polity2	Revised combined Polity IV score (Polity2) ranging from -10 (hereditary monarchy) to 10 (consolidated democracy)	Polity IV Project (Marshall et al. 2014)
Reserves to external debt	Total reserves (% of total external debt)	World Development Indicators, World Bank (2018)
Terms of trade	Annual change in terms-of-trade (in million)	World Development Indicators, World Bank (2018)
War	ICRG war index. A score of 4 points equates to Very Low Risk and a score of 0 points to Very High Risk.	International Country Risk Guide, The PRS Group (2018)
PREDICTORS USED IN STAGE 1 (LOGIT) ONLY		
U.S treasury 3-year T-bill rate	3-Month Treasury Bill, Secondary Market Rate (Percent). Monthly (Averages of Business Days, Discount Basis) data, not seasonally adjusted.	Board of Governors of the Federal Reserve System (US), retrieved from FRED, Federal Reserve Bank of St. Louis
Share of past months in default	Share of past months in default, specific to years available for each country in sample.	Built by the authors
CONTROLS USED IN STAGE 2 (LOCAL PROJECTION) ONLY		
Final Private Haircut	Private debt haircut, in percent	Built by the authors, based on Cruces and Trebesch (2013b)
Final Private Haircut Dummy	Dummy =1 in case of a private haircut	Built by the authors
Final Official Haircut	Official debt haircut, in percent	Built by the authors, based on Cheng *et al*. (2017)
FInal Official Haircut Dummy	Dummy =1 in case of an official haircut	Built by the authors

Table B2: AIPW first stage, logit results

	Agency rating	Bond spread
External debt to GDP (-1)	-0.001**	-0.001*
	(-2.206)	(-1.798)
Reserves to external debt (-1)	-0.161**	-0.087***
	(-2.189)	(-3.357)
General gov. gross debt to GDP (-1)	-0.003	-0.007
	(-0.220)	(-1.335)
Per capita GDP (-1)	-0.0001	-0.0001
	(-1.245)	(-1.479)
Inflation (-1)	0.020	0.009***
	(0.719)	(2.576)
Terms of trade (-1)	0.000	0.000
	(1.591)	(1.537)
Current account (-1)	0.062	0.058
	(1.117)	(0.980)
Openness (-1)	0.021	0.012*
	(1.346)	(1.775)
Government consumption (-1)	-0.164	-0.041
	(-0.736)	(-0.854)
Government change (-1)	1.164**	-0.003
	(2.059)	(-0.003)
Polity2 (-1)	0.061	0.041
	(0.381)	(0.902)
War (-1)	-	0.804
		(1.119)
Share of past months in default (-1)	32.643**	-1.328
	(2.251)	(-0.962)
U.S treasury 3-year T-bill rate (-1)	0.522***	0.212
	(2.646)	(1.322)
Constant	-3.067	-6.775**
	(-1.499)	(-2.339)
Pseudo R-squared	0.36	0.24
Adjusted pseudo R-squared	0.15	0.07
Hosmer-Lemeshow p-value	1.00	0.99
Income group FE	YES	YES
Observations	25269	11628

Notes: The model uses predictors listed in Table B1 in the first stage and income group dummies as fixed effect. For Hosmer-Lemeshow test, reporting p-value of test using 15 groups (p number of covariates): null is that observed and expected proportions are the same across all doses (model adequately fits the data). Standard errors are clustered at the country level, t-statistics in parenthesis. Significance levels: *0.10, ** 0.05, *** 0.01.

Table B3: AIPW second stage Agency rating, private and official restructuring

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Final private haircut (dummy)	-0.786*	-0.342	-1.362**	-1.028	-1.091	-1.031	-1.034
	(-1.766)	(-0.608)	(-2.025)	(-1.262)	(-1.135)	(-1.117)	(-1.081)
Final official haircut (dummy)	0.132	0.044	0.393	0.279	0.514	0.551	0.539
	(0.534)	(0.133)	(1.013)	(0.641)	(1.495)	(1.531)	(1.422)
Final private haircut	0.984*	0.150	2.094**	1.532	1.601	1.272	1.054
	(1.672)	(0.196)	(2.317)	(1.405)	(1.262)	(1.015)	(0.791)
Final official haircut	0.001	-0.002	-0.003	-0.005	-0.009	-0.014*	-0.011
	(0.118)	(-0.321)	(-0.452)	(-0.638)	(-1.312)	(-1.842)	(-1.413)
External debt to GDP (-1)	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001**	-0.001***
	(-3.316)	(-3.517)	(-3.428)	(-3.161)	(-2.643)	(-2.339)	(-2.719)
Reserves to external debt (-1)	0.000	-0.001	-0.005**	-0.008**	-0.008**	-0.009**	-0.012***
	(0.440)	(-0.962)	(-2.305)	(-2.584)	(-2.464)	(-2.290)	(-2.939)
General gov. gross debt to GDP (-1)	-0.002	-0.001	-0.009	-0.011	-0.013	-0.011	-0.010
	(-0.944)	(-0.180)	(-1.485)	(-1.471)	(-1.428)	(-1.152)	(-0.925)
Per capita GDP (-1)	-0.001**	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(-2.211)	(-3.124)	(-4.109)	(-4.462)	(-3.856)	(-3.238)	(-3.272)
Inflation (-1)	0.007*	0.011	0.010	-0.001	-0.005	-0.010	-0.019
	(1.714)	(1.492)	(0.990)	(-0.079)	(-0.313)	(-0.631)	(-1.157)
Terms of trade (-1)	0.001	0.001	0.001*	0.001**	0.001***	0.001***	0.001***
	(0.753)	(1.162)	(1.657)	(2.392)	(3.145)	(4.480)	(3.996)
Current account (-1)	0.023***	0.031***	0.058***	0.050***	0.057***	0.068***	0.072***
	(4.958)	(3.556)	(5.002)	(3.607)	(3.493)	(3.725)	(3.534)
Openness (-1)	-0.001	-0.005	-0.012**	-0.014**	-0.017**	-0.014	-0.010
	(-0.549)	(-1.392)	(-2.464)	(-2.285)	(-2.109)	(-1.385)	(-0.920)
Government consumption (-1)	-0.005	-0.019	-0.032	-0.054	-0.065	-0.101*	-0.188***
	(-0.421)	(-0.778)	(-0.839)	(-1.129)	(-1.238)	(-1.910)	(-2.933)
Government change (-1)	0.079**	0.091	0.098	0.105	0.075	-0.064	0.065
	(2.185)	(1.597)	(1.184)	(1.346)	(0.948)	(-0.730)	(0.673)
Polity2 (-1)	-0.006	-0.022	-0.002	-0.007	-0.032	-0.052	-0.058
	(-0.431)	(-1.005)	(-0.086)	(-0.187)	(-0.705)	(-0.984)	(-0.918)
R-squared	0.21	0.34	0.43	0.50	0.58	0.65	0.70
Observations	24624	22701	20795	18857	16807	14788	12852

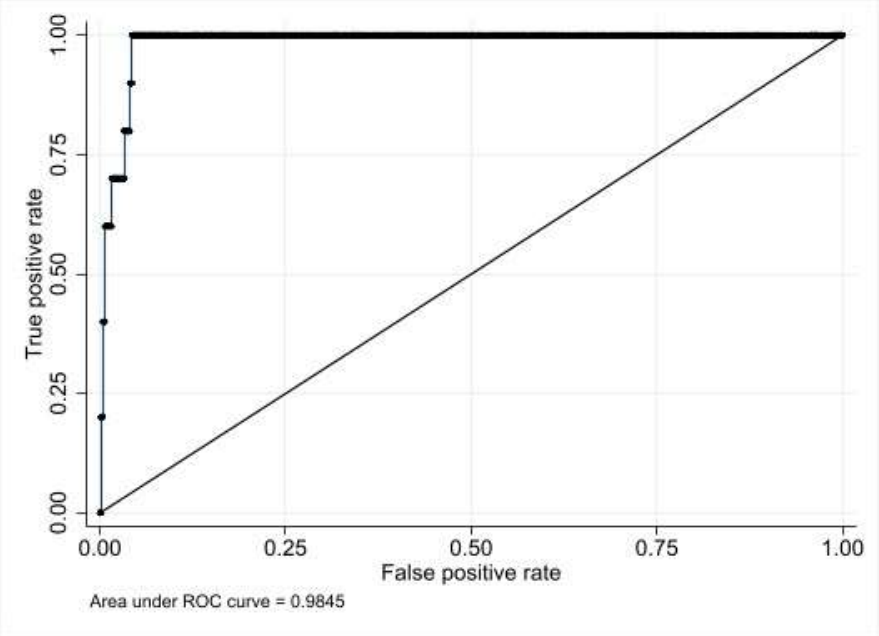
Notes: Table shows inverse propensity weighted regression results for each h-step ahead forecast on change in agency ratings using dyadic data. The model uses controls listed in Table B1 and controls for agency-pair invariant and time-varying heterogeneity. Standard errors are clustered at the agency-country level, t-statistics in parenthesis. Significance levels: *0.10, ** 0.05, *** 0.01.

Table B4: AIPW second stage bond spread, Private and Official restructuring

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7
Final private haircut (dummy)	267.453	493.963**	1844.424***	388.931	758.947	205.780	-49.778
	(1.575)	(2.366)	(5.546)	(1.282)	(1.584)	(1.025)	(-0.281)
Final official haircut (dummy)	-112.236	-269.469***	-298.810	-145.436	-348.808	-21.093	-68.202
	(-1.439)	(-3.358)	(-1.624)	(-0.858)	(-0.797)	(-0.312)	(-1.159)
Final private haircut	-542.631*	-1240.984***	-3226.600***	-1524.982***	-2736.179***	0.001	0.001
	(-2.013)	(-3.800)	(-7.034)	(-4.117)	(-4.854)	(.)	(.)
Final official haircut	-2.164	37.263***	-4.076	-6.287***	-5.890	-3.662	2.413
	(-0.702)	(3.134)	(-1.539)	(-2.805)	(-1.491)	(-0.729)	(1.342)
External debt to GDP (-1)	0.001	0.001	0.001	-0.001	-0.001	-0.001	-0.001**
	(0.678)	(0.330)	(0.027)	(-0.757)	(-1.249)	(-0.820)	(-2.135)
Reserves to external debt (-1)	1.061*	2.479**	3.077**	3.215	1.369	0.387	0.503
	(1.962)	(2.571)	(2.133)	(1.626)	(1.064)	(0.614)	(0.753)
General gov. gross debt to GDP (-1)	0.020	-0.796	-3.129	-4.536	-4.802	-1.003	5.644
	(0.012)	(-0.278)	(-0.953)	(-1.044)	(-0.956)	(-0.241)	(1.103)
Per capita GDP (-1)	0.015	0.022	0.008	0.069	0.120	0.110	0.384**
	(0.603)	(0.520)	(0.109)	(0.645)	(0.880)	(0.688)	(2.318)
Inflation (-1)	-4.921*	-5.942*	-4.341	-6.264**	-4.620	-5.270	1.855
	(-1.985)	(-1.977)	(-1.543)	(-2.297)	(-1.074)	(-1.326)	(0.417)
Terms of trade (-1)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.800)	(-0.693)	(-0.610)	(-1.062)	(-1.061)	(-0.559)	(-0.332)
Current account (-1)	0.453	1.620	4.755	11.730	12.278	16.562*	7.566
	(0.125)	(0.311)	(1.042)	(1.210)	(1.042)	(2.000)	(0.728)
Openness (-1)	0.608	0.899	-0.148	1.205	0.246	-0.721	-5.464
	(0.599)	(0.501)	(-0.082)	(0.451)	(0.058)	(-0.172)	(-1.273)
Government consumption (-1)	3.637	-6.328	-17.516	-5.850	-19.604	-8.350	84.033*
	(0.417)	(-0.428)	(-0.746)	(-0.133)	(-0.442)	(-0.220)	(1.799)
War (-1)	188.009	275.036*	290.178	258.849	69.714	-134.034	-242.091**
	(1.276)	(1.708)	(1.552)	(1.221)	(0.331)	(-1.079)	(-2.182)
Government change (-1)	52.018	94.411**	66.795	11.081	0.337	17.951	19.305
	(1.329)	(2.582)	(1.521)	(0.340)	(0.010)	(0.466)	(0.436)
Polity2 (-1)	-15.203	-20.927	-25.614	-21.430	-40.799	-50.435	83.209**
	(-1.447)	(-1.013)	(-1.442)	(-0.801)	(-0.922)	(-0.882)	(2.290)
R-squared	0.21	0.33	0.39	0.40	0.43	0.49	0.64
Observations	3363	2968	2586	2208	1878	1587	1301

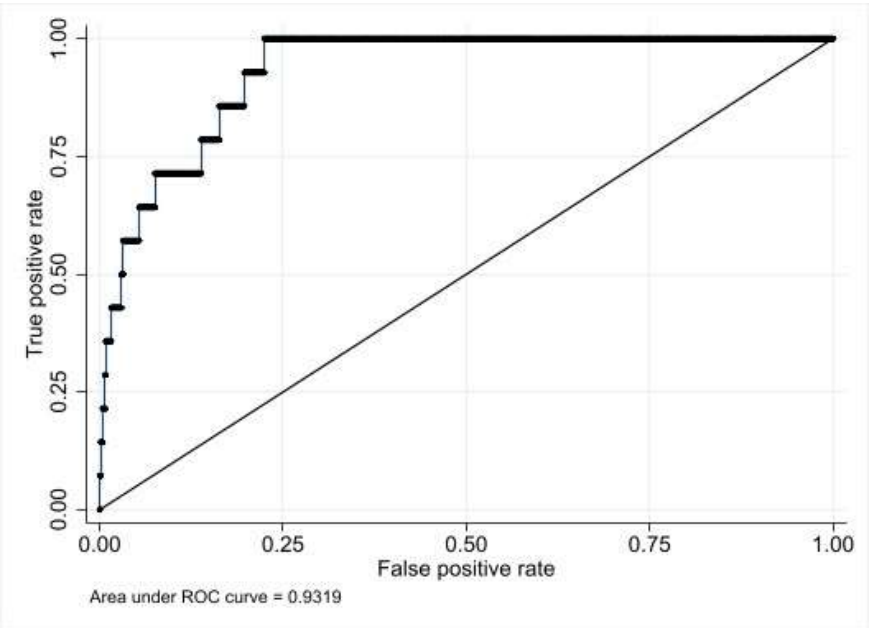
Notes: Table shows inverse propensity weighted regression results for each h-step ahead forecast on change in monthly secondary market yield spreads. The model uses controls listed in Table B1 and controls for country-level invariant and time-varying heterogeneity. Standard errors are clustered at the country level, t-statistics in parenthesis. Significance levels: *0.10, ** 0.05, *** 0.01.

Figure B1: AIPW first stage ratings, ROC



Notes: Figure B1 gives some results on the predictive ability of our first stage, when using data for agency ratings. The Receiver Operating Characteristic (ROC) curve plots the true positive rates against the false positive rates, and we can interpret the area under the curve (AUC statistic) as the predictive ability of the model. Under the null that the covariates have no predictive ability, the AUC is equal to 0.50, and perfect predictive ability corresponds to an AUC statistic of 1. The first stage for estimating the probability of entering into a debt crisis returns an AUC of 0.98.

Figure B2: AIPW first stage bond spread, ROC



Notes: Figure B2 gives some results on the predictive ability of our first stage, when using data on bond spread. The Receiver Operating Characteristic (ROC) curve plots the true positive rates against the false positive rates, and we can interpret the area under the curve (AUC statistic) as the predictive ability of the model. Under the null that the covariates have no predictive ability, the AUC is equal to 0.50, and perfect predictive ability corresponds to an AUC statistic of 1. The first stage for estimating the probability of entering into a debt crisis returns an AUC of 0.93.