The seniority structure of sovereign debt

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Abstract

Sovereign governments owe debt to many foreign creditors and can choose which creditors to favor when making payments. This paper documents the de facto seniority structure of sovereign debt using new data on defaults (missed payments or arrears) and creditor losses in debt restructuring (haircuts). We overturn conventional wisdom by showing that official bilateral (government-to-government) debt is junior, or at least not senior, to private sovereign debt such as bank loans and bonds. Private creditors are typically paid first and lose less than bilateral official creditors. We confirm that multilateral institutions such as the IMF and World Bank are senior creditors.

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1 Introduction

The typical debtor has many creditors. Hence, a debtor that is unable to pay must choose which debts to repay and on which debts to default. For individual and corporate borrowers, contract and bankruptcy law determines which creditor gets repaid first; creditor seniority is a straightforward legal issue. In contrast, for the foreign creditors of a sovereign government, the lack of an international bankruptcy regime combined with the difficulty of enforcing sovereign contracts makes creditor seniority a matter of custom and convention. By this convention, the debts of multilateral government lenders such as the International Monetary Fund (IMF) and World Bank are senior to the debts of all other government creditors, which are in turn senior to the bonds and bank loans owed to private sector creditors.[1] Relying on this convention, government creditors have been able to lend at relatively low interest rates, even in times of financial distress.[2]

Is this seniority convention honored in practice? In this paper, we provide the first systematic empirical study of the *de facto* seniority structure of external sovereign debt. We construct two complementary measures of creditor seniority. Our primary measure examines a sovereign defaulter's relative tendency to default on different types of debt. We use unpublished data on missed payments (also known as "arrears") from the World Bank's Debtor Reporting System, supplemented by public data from the IMF, to measure the extent to which 127 low- and middle-income countries prioritize repayment of debts to different classes of creditors from 1979 to 2006. The novel dataset covers six classes of creditors: the IMF; other multilateral creditors such as the World Bank and regional development banks; bilateral official creditors, representing government-to-government loans; commercial banks; bondholders; and trade creditors and suppliers. The second measure captures the size of creditor losses ("haircuts") resulting from the restructuring of sovereign bank loans and bonds (using data from Cruces and Trebesch, 2013) and from the restructuring of 414 bilateral official loans between 1978 and 2015 (using data from Reinhart and Trebesch, 2019, and Tolvaisaite, 2010, that are updated here).

The results show a clear pecking order of sovereign debt repayments and default that is robust across both countries and time, and which holds after controlling for macroeconomic fundamentals, debt composition, and fixed effects. Consistent with convention, the IMF is the most senior creditor, followed by other multilateral creditors. Inconsistent with convention, bilateral (government-to-government) official loans are *not* senior to private

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[1]See Kaletsky (1985), Tirole (2002), Steinkamp and Westermann (2014), and many references below.

[2]See IMF (2007) for a discussion of how low default rates justify IMF lending at below-market interest rates and Joshi and Zettelmeyer (2005) on the scope of implicit transfers in official lending.

creditors. That is, sovereigns facing repayment difficulties are more likely to default on official bilateral creditors by missing payments more often and by larger amounts (relative to the amount of debt outstanding to that creditor group) than to either commercial banks or bondholders. The average haircut suffered in sovereign debt restructurings is also significantly higher for official creditors than for private creditors. In addition, we find that trade creditors are at the bottom of the pecking order, which contrasts with the convention that trade creditors are always senior (e.g., Kaletsky, 1985; Buchheit, 2013), although we caution that this finding may reflect the particular set of long-term trade credits for which we have data.

These results necessitate a substantial change in the way both policymakers and academics think about sovereign debt and default. For policymakers, the *de facto* junior status of bilateral official loans suggests that these loans should either be repriced to reflect the greater risk of delayed payments and losses or else be treated as subsidized (or "concessional") lending. For academics, our findings speak to the fundamental question underlying all research on sovereign debt and default: why do countries ever repay their debts? Benchmark models in the literature assume that the cost of default primarily results from the economic dislocation associated with a default, and that this cost is independent of the size and severity of the default. Our finding that sovereign borrowers discriminate both between which creditors they default upon, as well as in the severity of default, is strong evidence against this assumption. More importantly, the patterns we observe are suggestive that the costs of default vary with the amounts of debt and the type of creditors affected.

The observed pecking order of sovereign debt repayment could be explained as follows. A default on IMF or World Bank loans is most consequential, as governments will be cut off from crisis lending when it is most needed, and countries risk losing their voting rights in these institutions (Reinhart and Trebesch, 2016b). Defaulting on bondholders is highly visible in the international press and will result in downgrades by the major credit rating agencies as well as potential legal disputes with specialized hedge funds.[3] In contrast, a sovereign default on commercial bank loans or bilateral official loans may be less consequential. These defaults often occur "silently", without much media coverage, and may trigger less collateral damage. Sovereigns are aware that the consequences of default depend in important ways on who the defaulted creditors are and what bargaining power each creditor group has, so they prioritize their repayments accordingly.

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[3]See Pitchford and Wright (2012) and Schumacher et al. (2018) on the risk of holdouts and litigation.

Our paper contributes to several distinct literatures. First, our systematic empirical study of creditor seniority in external sovereign debt markets complements the large and well-established corporate finance literature on priority rules and seniority in bankruptcy (see Franks and Torous, 1989; Gilson et al., 1990; Weiss, 1990; Hart and Moore, 1995; Bolton and Scharfstein, 1996; Bebchuk, 2002; Bolton and Oehmke, 2015, to name just a few). In contrast to this literature, we find that trade creditors are relatively junior creditors in a sovereign context.

Second, our paper expands the treatment of seniority issues in the sovereign debt literature. To date, much of the focus of this literature has been on seniority *within the same group of creditors*, and in particular the risk of debt dilution in sovereign bond markets through the issuance of new short-term instruments (see, e.g., Zettelmeyer, 2005; Bolton and Jeanne, 2009; Hatchondo et al., 2016; Chatterjee and Eyigungor, 2015; Ari et al., 2018). In addition, some work has been done on the differential treatment of domestic as opposed to international sovereign creditors both theoretically (in particular, Guembel and Sussman, 2009; Broner et al., 2010, 2014) and empirically. On the empirical side, Sturzenegger and Zettelmeyer (2007), Erce and Diaz-Cassou (2010), Kohlscheen (2010), Erce (2012), and Meyer (2019) find mixed evidence on discrimination between domestic and external creditors, either by conducting case studies or by using Standard & Poor's binary simple indicator of external and domestic defaults. Our paper expands this literature by providing the first systematic analysis of discrimination between different classes of external creditors.

Third, we add to research on the vast and largely unexplored universe of official sovereign debts. The bulk of the sovereign debt and default literature focuses on debts owed to private external creditors such as banks or bondholders (see Panizza et al., 2009; Aguiar and Amador, 2014). These private creditors, however, account for only about half of all debts owed by developing countries. Also, advanced countries such as Greece and Portugal now owe large amounts of debt to official creditors. Here, we study private *and* official defaults and creditor losses simultaneously and systematically, thus complementing a small but growing empirical literature focusing on official debts (see, Chauvin and Kraay (2005), Cheng et al. (2016, 2017), and Reinhart and Trebesch (2016a, 2016b, 2019)). The results shed doubt on the view that all official creditors are senior to private creditors (an assumption made by, among others, Corsetti et al., 2006; Boz, 2011; Fink and Scholl, 2016; Dellas and Niepelt, 2016; Roch and Uhlig, 2018). Moreover, we contribute to the literature by showing new haircut estimates on official sovereign debt (government-to-government loans) on a broad sample covering more than 400 restructurings and spanning

four decades (building on data by Tolvasaite, 2010, and Reinhart and Trebesch, 2019, and expanding the exercise by Cheng et al. (2018)).

Finally, we add to the small literature that has focused on arrears as a measure of sovereign default, including Easton and Rockerbie (1999) and Arellano et al. (2019). Almost all other work on sovereign default has focused on measures of creditor losses or haircuts resulting from a sovereign debt restructuring operation (see, e.g., Sturzenegger and Zettelmeyer, 2008; Benjamin and Wright, 2009; Cruces and Trebesch, 2013). More research on arrears is overdue, not least because the protracted nature of arrears makes them a substantial burden for the individual creditor.[4]

The rest of this paper is organized as follows. Section 2 discusses basic concepts and definitions and provides an overview of existing views about, and policy claims on, seniority in sovereign debt markets. In Section 3, we analyze creditor seniority based on a new dataset on external sovereign debt arrears. We introduce measures of seniority and use these to establish stylized facts of creditor seniority over different subsets of the sample and over time. We also study the determinants of debt repayment and arrears across creditor groups by running panel regressions. Section 4 compares haircuts on official and private external creditors. We present the data, the procedure for estimating haircuts for restructurings with the Paris Club, and the associated problems. We then present stylized facts of sovereign debt restructurings and haircuts and an empirical framework to assess the differential treatment of creditors during restructurings. Finally, we analyze the behavior of arrears during restructurings, thereby providing a synthesis with the previous section. Section 5 concludes and gives an outlook for future research.

2   Seniority of sovereign debts - concepts and definitions

2.1   Basic concepts and creditor groups

The concept of seniority in sovereign lending is old,[5] but it still lacks a clear definition. Seniority captures the idea that sovereigns typically borrow from different creditors, both domestic and external, in the form of various debt contracts and that they have in principle discretionary power to prioritize repayments of these claims. In the absence of

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[4]Having large amounts of non-performing debt that remain on the balance sheet for years is a burden to almost every creditor. In addition, arrears are costly for various regulatory reasons. Financial institutions such as banks have to set aside capital if a loan or bond has been in arrears for a while, even if they think they will eventually be made whole in a restructuring.

[5]The classic work by Borchard and Wynne (1951) documents that questions of priority among sovereign creditors go back to at least the early 19th century.

an internationally enforceable insolvency scheme, their sovereignty allows governments to provide preferential treatment to some creditors while discriminating against others. While no *de jure* seniority structure exists in the sovereign context, a set of conventions are considered to guide government decisions in sovereign debt markets (Gelpern, 2004).

Figure 1: Composition of sovereign external debt by creditor group
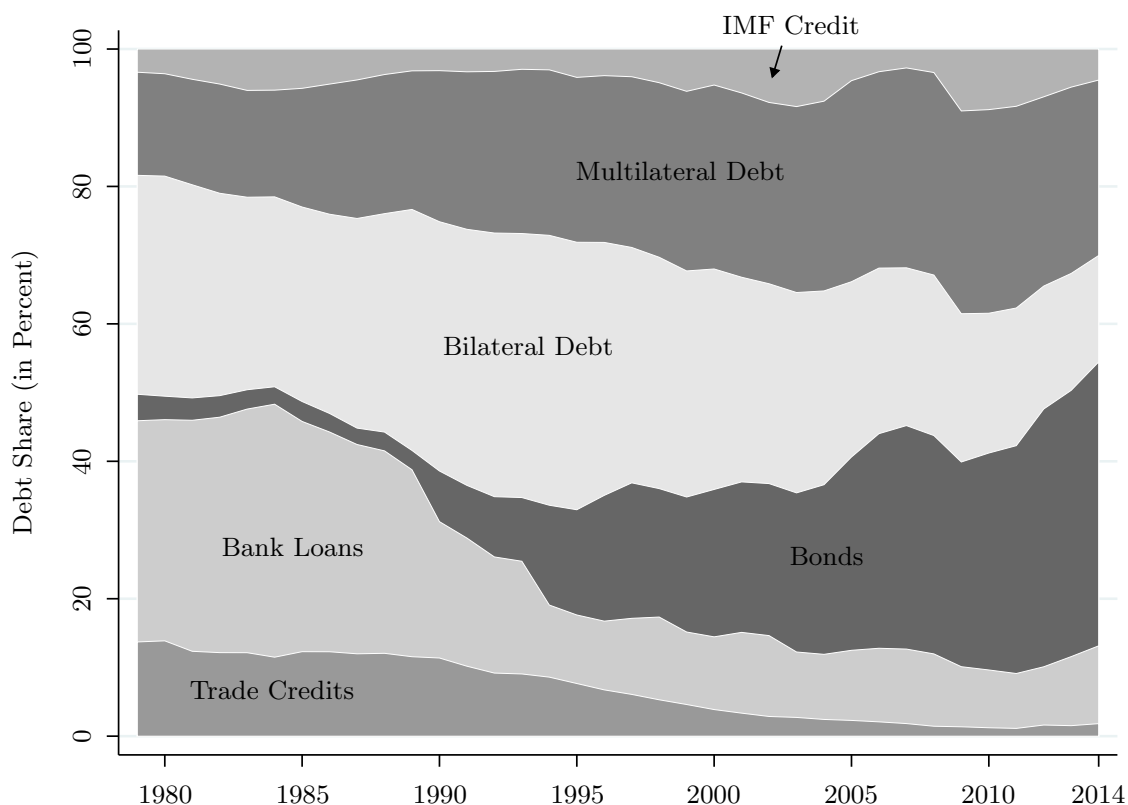
Note: The figure shows the share of each creditor group's debt in the total stock of public and publicly guaranteed long-term external debt over a sample of 127 developing and emerging economies. Data are from the World Bank's World Development Indicators (WDI) dataset. For IMF debts, we use the variable "use of IMF credit" from the WDI.

At the most basic level, a distinction is made between domestic debt and external debt. As data coverage on domestic debt is far from complete, empirical evidence in most cases relies on case studies of sovereign debt restructurings with both domestic and external creditors.[6] We have no systematic data on arrears on domestic sovereign debt.

In this paper, we exclusively focus on external debts owed or guaranteed by the public sector of sovereign countries as reported by the World Bank's Debtor Reporting System

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[6]See Gelpern and Setser (2004), Erce and Diaz-Cassou (2010), Broner et al. (2014) and Meyer (2019).

(DRS) and by the IMF (for IMF loans).[7] That requires that we further restrict attention to long-term debt, defined as debt with an original maturity of more than one year. Data on short-term debts are not available broken down by borrower-creditor pair. Following the definition of the World Bank, **we distinguish six groups of external creditors**: (i) *Bilateral* creditors are official agencies that make loans on behalf of one government to another government or to public and publicly guaranteed borrowers in another country. (ii) *Multilateral* loans are those made by official agencies owned or governed by more than one country that provide loan financing. They include international financial institutions such as the World Bank, regional development banks, and other intergovernmental agencies, but not the IMF. (iii) Sovereign *bonds* are debt instruments issued on capital markets by public and publicly guaranteed debtors with durations of one year or longer. (iv) *Bank* creditors are private banks that provide loans and other financial services, often in the form of syndicated lending. (v) Long-term *trade credits* and supplier credits to the public sector include credits from manufacturers, exporters, and other sellers of goods. (vi) The *International Monetary Fund (IMF)*, which is a multilateral creditor but treated as a separate category because of its unique position in the international financial system.

The relative importance of these creditor groups has substantially fluctuated over time. Figure 1 shows the share of each group's outstanding debt in the total amount of public and publicly guaranteed external debt over time for the sample of 127 developing and emerging economies, which we will also use in the analysis of arrears in Section 3.

Two observations stand out in Figure 1. First, official debt accounts for a substantial share of total sovereign debt, particularly in developing countries. In light of this observation, there is surprisingly little research on defaults and the relative treatment of official versus private creditors. One explanation is that the most widely used dataset on defaults and haircuts by Moody's or Standard & Poor's or Reinhart and Rogoff (2009) focuses on private creditors only, hence ignoring roughly half of the other claims in international sovereign debt markets. Secondly, the relative importance of creditor groups shifts over time. In particular, the share of bond debt relative to bank loans and trade credits increased dramatically in the early 1990s following the Brady debt exchange deals.[8] In

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[7]To measure external debt, the relevant criterion is the residency of the creditor. Domestic debt is owed to residents, while external debt is owed by residents to nonresidents of a specific country (see World Bank (2015)). Other definitions are related to the currency denomination or the governing law under which the debt is issued.

[8]Bolton and Jeanne (2009) interpret this shift from bank lending to bond contracts as the result of differences in seniority across these instruments. Specifically, they argue that lenders endogenously shift their funds into instruments that are more difficult to restructure, such as bonds, and hence enjoy a higher seniority in the event of sovereign defaults. Although we do not examine this hypothesis, our findings are consistent with this view.

addition, there seems to be a slight decline in the share of bilateral debt relative to lending by multilateral creditors. In contrast, the shares of official debt and private debt themselves have remained relatively stable.

2.2 Rules and conventions on sovereign debt seniority

As emphasized above, seniority in sovereign debt markets is guided by a set of informal rules and conventions (see Roubini and Setser, 2003; Gelpern, 2004). First and foremost, there is the widespread view that official creditors are senior. Seniority protects a supranational institution such as the IMF from defaults, thus allowing it to lend to crisis countries at below-market interest rates and facilitating its role as an international lender of last resort (Fischer, 1999). To safeguard its preferred status, the IMF has a policy of not tolerating defaults and late payments, neither on its own loans nor on debts extended by its member country governments (IMF, 2015).

However, the IMF's senior status is not written in law. As explained by Martha (1990) the preferred creditor status is not mentioned in the IMF's Articles of Agreement, and it was not until the late 1980s that the institution formally endorsed it. At that point, the IMF had taken on an active role to solve the developing country debt crisis and faced mounting arrears - in excess of 10% of its total outstanding loans (see Reinhart and Trebesch, 2016a). As a result, in 1988, the IMF Board of Governors urged "all members within the limits of their laws to treat the Fund as a preferred creditor."[9] Today, the IMF often refers to this endorsement and openly communicates its claim of being a preferred creditor, for example, in its Annual Report on IMF Financial Operations.

On par with the IMF, the World Bank and regional financial institutions such as the Asian Development Bank typically claim seniority as well. As explained on the World Bank website: "The World Bank is recognized by the major rating agencies to enjoy a preferred creditor status with its borrower-shareholders." Accordingly, in a recent report, Moody's (2017) recognizes the World Bank's (and International Bank for Reconstruction and Development's) "preferred creditor status, in which borrowing members pledge to prioritize debt service to the IBRD over debt service to market and official bilateral creditors."

This "super-seniority" of the IMF and the World Bank rests on the beliefs of market participants but also on the support of other official creditors, in particular, by the 22 large

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[9]Communique of the Interim Committee of the Board of Governors of the IMF, Press Release No. 88/33, September 26, 1988.

creditor governments that are permanent members of the Paris Club. The Paris Club is an informal forum set up to renegotiate bilateral official (government-to-government) loans and thereby to grant debt relief. It has neither legal status nor statutory rules of procedure, but it has become one of the main actors in solving debt crisis situations and therefore plays an important role in influencing the pecking order of sovereign debt repayment. In line with this setup, the IMF (2016, p.40) openly states that its "preferred creditor status originates in the Paris Club, where official bilateral creditors have been willing to exclude the IMF from the restructuring process."[10]

Next in line are governments around the world, who also claim seniority for the loans they extend. 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. Creditor governments thus expect private creditors to share the burden – by accepting haircuts that are *at least as high* as those negotiated by the Paris Club. Similarly, during the euro crisis, creditor governments agreed that loans between governments would "in all cases" enjoy seniority "in order to protect taxpayers' money, and to send a clear signal to private creditors that their claims are subordinated to official creditors."[11] We are not aware of a paper or evidence showing whether or not these principles are enforced.

Indeed, despite these policy claims, there is little hard data or analysis to assess whether official creditors are indeed senior. Anecdotal evidence suggests that the seniority claims are not strictly binding. The seniority of the IMF has been repeatedly under threat, including in the summer of 2015 when Greece briefly defaulted on its IMF payments or during the 1980s when several low-income countries accumulated large IMF arrears (Reinhart and Trebesch, 2016a).[12] Regarding government-to-government debt, Roubini (2001) writes that "debtors know that going into arrears to [bilateral official] creditors has little consequence," while a recent piece by Moody's (2018) studies about 20 recent debt crisis spells and concludes that official debt relief was often larger than the debt relief granted by private creditors.

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[10]The only cases in which both the IMF and the World Bank agreed to debt write-downs occurred in the wake of the so-called "Multilateral Debt Relief Initiative" to 36 poor and highly indebted countries in the mid-2000s (see IMF, 2014).

[11]See Statement by the Eurogroup, November 28, 2010. More precisely, the Treaty of 2011 states that "ESM [European Stability Mechanism] loans will enjoy preferred creditor status in a similar fashion to those of the IMF, while accepting preferred creditor status of the IMF over the ESM." Note that ESM loans or loans between Eurozone governments are not included in this analysis.

[12]In an earlier paper, Bulow and Rogoff (1988) state that the data do "not square with the official view that obligations to the IMF and the World Bank are senior claims."

Recent events in Europe provide further evidence that official loans are not always senior. The rescue loans granted by Eurozone governments to Portugal or Ireland were restructured in 2011 and 2013, as maturities were lengthened to 22 years and interest rates were cut by half. These operations resulted in substantial present value relief on official (taxpayer) debts. In contrast, private investors of Irish or Portuguese bonds avoided any restructuring or relief operation. Also Greece benefited from multiple restructurings on the debt it borrowed from other Eurozone governments. Debt maturities were extended to the year 2060, a drastic present value debt relief. Moreover, the 55% haircut on private bonds in 2012 would likely have been higher without the substantial official transfers (including €30bn in "cash sweeteners" offered to bondholders) that were financed via newly issued loans from other governments (Zettelmeyer et al., 2013).

Within the group of private creditors, the literature offers little guidance on relative seniority. One factor that has been brought up is the relative bargaining power of creditor groups. For example, Bolton and Jeanne (2009) argue that international bonds are senior to bank loans as they are more difficult to restructure because of the dispersion within the creditor group. It is less costly for a sovereign to renegotiate terms with a few big banks instead of a large number of individual bondholders. As a consequence, sovereigns might be more inclined to default on bank loans rather than bond payments. Since creditors anticipate this behavior, the result is a shift from bank to bond finance, as seen in Figure 1. A related argument is that trade creditors are senior because a default on them results in an immediate and costly cut-off from trade (Kaletsky, 1985).

2.3 Arrears versus haircuts

Economists have defined seniority in the context of sovereign debt in different ways.[13] Ultimately, however, seniority comes down to the order of repayment in case of financial distress or default. Two questions are particularly relevant: When are debts (not) repaid (repayment patterns during default)? And how severe is the write-down if claims are eventually restructured (haircuts at the end of an often lengthy sovereign debt renegotiation process)? Both questions are typically (though not necessarily) interrelated, but do matter separately, for example, because of regulatory reasons. We therefore explore both arrears and haircut size in the remainder of the paper. As we will show, the patterns

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[13]In Chatterjee and Eyigungor (2015) seniority means that "in the event of default, a creditor who lent earlier must be paid in full before a later creditor can be paid anything at all." Steinkamp and Westermann (2014) imply that seniority means that "the preferred lender gets his money back first, in case of insolvency." In contrast, Broner et al. (2014) interpret seniority as a higher probability of repayment, and Bolton and Jeanne (2009) relate it to the relative bargaining power of different creditor groups.

of arrears are diverse and vary considerably across countries, and the same is true for haircuts.

Arrears are our first metric of choice to capture implicit seniority, for several reasons. Arrears have a rich data structure, since they are observable from the beginning of a default and they are timevarying, which is important because debt crises often take many years (or even decades) to resolve. In contrast, haircuts are a snapshot measure that is observable only at the end of a default or debt renegotiation spell. Arrears are also collected in a standardized way from the World Bank and the IMF, to which debtor country governments have an obligation to report. Moreover, arrears have broad coverage. They are available for all the main external creditor groups in international capital markets. In contrast, haircut estimates are available only for three groups: banks, bondholders, and official (bilateral) loans restructured via the Paris Club of creditor governments (a dataset newly introduced here).

Haircuts and arrears are highly correlated.[14] The interdependence between arrears and restructurings is illustrated for several country cases in Figures C.2 to C.7 in Appendix C. The figures show official and private arrears (relative to GNI) together with dates of official debt restructurings with the Paris Club or private debt restructurings.

Despite the high overall correlation of arrears and haircuts, there is heterogeneity between debtors and cases. Some countries (such as Ethiopia or Nigeria) accumulate arrears primarily on official debt, while others (such as Argentina or Ecuador) fail to pay their private creditors. Others (such as Morocco or Peru) in turn run arrears on both official and private lenders simultaneously. Arrears can be short-lived or protracted. They can continue to increase after restructurings or can be fully resolved as in Argentina or Ecuador in the 1990s. And some restructurings involve no arrears at all, meaning that creditors agree to a haircut before any payments are missed. Asonuma and Trebesch (2016) study this type of "preemptive" sovereign debt restructuring.

To summarize, there are a variety of perceptions and measurement approaches on seniority in external sovereign debt markets, in both theoretical and applied work. What is lacking is a solid and comprehensive empirical analysis. Our paper attempts to fill this gap.

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[14]In our data, the correlation coefficient between haircuts and accumulated arrears (to total private debt) is 0.69 for private creditors.

3 Creditor seniority: evidence from missed payments

To measure seniority in sovereign debt markets, we compile a unique new dataset on arrears by sovereign debtors toward six creditor groups. The creditor groups are defined with respect to the debt contract under which they provide funds. Three of them are official creditors (IMF, other multilaterals, bilateral governments) and three of them private ones (banks, bondholders, trade creditors), as defined above.

3.1 The dataset: arrears across six creditor groups

Our arrears dataset is constructed from two sources. First and foremost, we obtain detailed data on payment arrears on government and government-guaranteed external debt toward five creditor groups from the World Bank's Debtor Reporting System (DRS), which is the database underlying the Global Development Finance (GDF) and International Debt Statistics (IDS) publications. The DRS database includes loan-level information on all loan and credit agreements by all debtor countries that have committed to report to the World Bank. For reasons of confidentiality, the World Bank publishes aggregated data at the country level without a detailed breakdown by creditor and debtor type. In particular, the arrears series that are publicly available do not distinguish between arrears by different types of private or public debtors.[15] In contrast, our data allow us to isolate the amount of arrears incurred by a country's public sector (government + public firms) and broken down toward five external creditor groups. In addition, we obtain payment arrears on the IMF from the IMF Finances website.

Public sector arrears in the DRS database are defined as late payments as of end of year, or more precisely as principal and interest payments due but not paid on long-term external debt obligations of public debtors or guaranteed by a public entity, thus including government debt and government-guaranteed (quasi-sovereign) debt.[16] Long-term external debt in the DRS is defined as debt that has a maturity of more than one year and that is owed to nonresidents and is repayable in foreign currency. Arrears are measured in current US dollars at the end of each year on a cumulative basis. Arrears toward the

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[15] For example, the publicly available World Bank series "Principal arrears, private creditors" counts arrears toward private external creditors (bondholders, banks) but combines all debts of a country; that is, it adds together late payments by governments, the public sector, and private firms as a total, without a breakdown by type of debtor.

[16] For an overview of the definitions of variables and creditors, see World Bank (2015), for example.

IMF are measured in Special Drawing Rights (SDRs) and converted to US dollars using December averages of the SDR-dollar exchange rate from the IMF website.[17]

The database captures defaults (missed payments) toward the entire spectrum of a government's external creditors. This contrasts earlier work that typically uses data by Standard & Poor's (S&P) or Reinhart and Rogoff (2009), who capture defaults toward private creditors (bondholders and banks) but not toward official creditors (see Appendix A for a comparison). The arrears data thus provide a more complete picture of creditor seniority.

To measure the share of arrears per unit of lending, we match the arrears data with disaggregated debt stock data of the face values of public and publicly guaranteed debt by creditor group, which we also obtain from the DRS dataset.[18] For the debt owed to the IMF, we use the "use of IMF credit" stock variable from the World Bank, also measured in current US dollars. These IMF data are available for all but 5 countries for which we have data on payment arrears from the DRS.[19] In addition, we choose to drop two countries (Afghanistan and Montenegro) that have observations on debt stocks for only two years. In line with the DRS documentation, we code arrears as zero whenever debt stock data are available and arrears are not reported.

The result is an unbalanced panel of sovereign arrears toward six external creditor groups covering 127 countries and up to 28 years. The time coverage by country ranges from 8 to 28 years. Data for all years are available for roughly 75% of the sample countries. Formerly communist countries in Eastern Europe enter the sample in the early 1990s when they became members of the World Bank and IMF.

The data show that sovereign arrears are widespread and sizable. On average, 8.0% of the stock of public and publicly guaranteed external debt is in arrears. However, there is a large amount of heterogeneity across creditor groups, with some creditors being particularly likely to suffer from arrears, as we will show below. The data also show that defaults are partial, as emphasized by Arellano et al. (2019) and Meyer et al.

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[17]To ensure comparability of the data, we restrict IMF arrears to payments that are six or more months overdue and use end-of-year IMF data.

[18]There are 31 countries in our sample for which we have disaggregated data on arrears but not on debt stocks. For these countries, we substitute the aggregate debt stock data from the World Bank's WDI dataset, which is available on the creditor level. The comparison of the debt stock data for countries for which both sets of data are available shows that there are no significant inconsistencies between the two sources. This is to be expected since the disaggregated data are the raw data underlying the WDI.

[19]Data on IMF debt stocks is not available for Croatia, Iraq, Latvia, Russia, and the Slovak Republic. Yet, these omissions are not likely to alter the results much because arrears are quantitatively small (less than 1% of GNI on average, except for Russia), and the pecking order as measured by the share of creditor-specific arrears in total arrears does not qualitatively differ from the results presented here.

(2019). Countries usually continue to make partial debt service payments at the same time that they accumulate arrears. Symbolic token payments are also frequent. Indeed, and quite remarkably, there are only three observations in the entire sample with a full payment suspension (i.e., with zero debt service payments and complete arrears accumulation).

3.2 Measuring creditor seniority from arrears: methods and stylized facts

This section presents new stylized facts on implicit creditor seniority in sovereign debt markets of the past decades. We start by describing our approach to measure discrimination and show results for the entire sample. We then refine the analysis by looking at specific subsamples and at the seniority measures over time.

To capture the heterogeneous treatment of creditors, we propose two alternative measures of creditor seniority based on the arrears data. The first captures the scope of arrears per unit of lending of each creditor group, irrespective of the scope of lending and arrears to other creditors. The second measure is more sophisticated and captures the relative distribution of arrears across creditor groups, controlling for the debt composition of each sovereign. For each measure, we then compare the results for the six creditor groups for the entire sample and various subsamples.

The first measure is simple and quantifies the absolute scope of arrears per unit of lending. The arrears-to-debt ratio of creditor group k at time t in country i is defined as

$$ATD_{i,t,k} = \frac{arrears_{i,t,k}}{debt_{i,t,k} + arrears_{i,t,k}}.$$ (1)

This measure normalizes arrears by the nominal stock of public and publicly guaranteed debt of each creditor group. Debt stocks are adjusted for the level of arrears so that $ATDs$ are bounded below by 0 and bounded above by 1. This also allows us to interpret the denominator as the total amount of payments due in case debts can be accelerated, that is, if creditors are legally entitled to receive the entire face value of their claim upon default (as is customary for sovereign bonds).

The pecking order of external sovereign debt implied by the ATD measure is illustrated in Figure 2, which shows the unweighted average of the ATD in the full sample. There is a clear seniority structure: bonds, IMF credit, and multilateral loans are senior, whereas bilateral loans, bank loans, and trade credits are junior. Arrears-to-debt ratios are lowest for the IMF (2.5% on average) and highest for exporters and suppliers (more than 20%

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of their outstanding claims on average). These averages are biased by outliers, however. For the IMF, for example, the occurrence of arrears is rare, but once arrears occur, they tend to accumulate fast, resulting in a high ATD.

The ATD measure is simple and intuitive, but it has an important disadvantage: it does not account for the debt composition and the relative arrears burden across creditor groups. To see this, take a low-income country that receives much official lending but has limited access to international bond markets. In a crisis, such a country is likely to accumulate arrears mostly toward its main lenders: official creditors. If low-income countries are also more likely to enter a crisis or miss payments in the first place, then the high average ATDs to official creditors in Figure 2 could merely reflect country fundamentals and the (in-)ability to tap private capital markets. Hence, a high ATD ratio for banks or bilateral loans does not necessarily imply that these creditors are junior.

As an alternative, we therefore propose a measure that captures the relative distribution of arrears controlling for country debt composition and, thus, for differences in external borrowing patterns. The relative percentage in arrears ($RPIA$) captures the difference between the arrears-to-debt ratio of a specific creditor group k and the total arrears-to-debt ratio of a country:

$$RPIA_{i,t,k} = \frac{arrears_{i,t,k}}{debt_{i,t,k} + arrears_{i,t,k}} - \frac{\sum_k arrears_{i,t,k}}{\sum_k \left(debt_{i,t,k} + arrears_{i,t,k}\right)}. \tag{2}$$

Intuitively, in equation (2), the average arrears ratio (as a percentage of total sovereign debt) serves as a benchmark to evaluate discrimination. Creditors are favored if they face lower arrears per unit of debt than the average creditor. Conversely, a creditor group is discriminated against if it faces higher arrears per unit of debt than the average creditor. The $RPIA$ is bounded in [-1,1] with a positive sign indicating discrimination and a negative sign indicating favoritism. A value of zero indicates fair treatment.

More specifically, the $RPIA$ of a creditor group k is closely related to a weighted average of the arrears-to-debt ratios of all creditor groups via the following expression:

$$RPIA_{i,t,k} = ATD_{i,t,k} - \sum_k ds_{i,t,k} \cdot ATD_{i,t,k}, \tag{3}$$

where $ds_{i,t,k}$ is the debt share of group k (i.e., the fraction of creditor group k's debt stock (adjusted for arrears) in the total debt stock of country i at time t). Hence, by construction the $RPIA$ will always be zero if a country borrows from one group only, irrespective of the level of the arrears to this group. In addition, the $RPIA$ formula

Figure 2: Arrears-to-debt ratio by creditor group

Creditor Group	Arrears to Debt Ratio (in Percent)
Trade Creditors	20.4
Banks	14.7
Bilateral	10.3
Bonds	5.4
Multilateral	3.0
IMF	2.5

Higher Seniority ↓
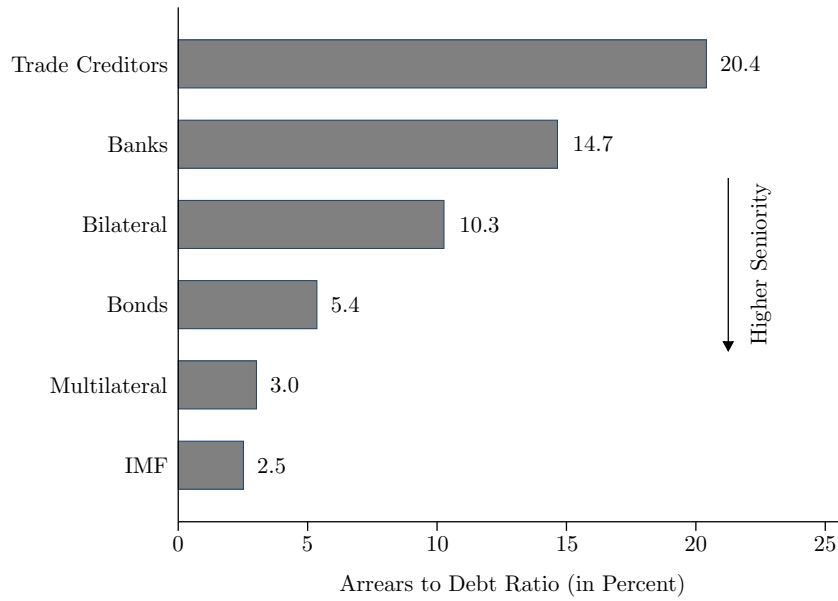
Note: The bars show the average ATD ratios over the period 1979-2006 for each creditor group and as summarized in equation (1). Averages are calculated as unweighted means of country averages.

Figure 3: Relative percentage in arrears (RPIA) by creditor group

Higher Seniority ←

Creditor Group	Relative Percentage in Arrears (in Percent)
IMF	-6.2
Multilateral	-5.0
Bonds	1.0
Bilateral	2.3
Banks	7.8
Trade Creditors	12.6
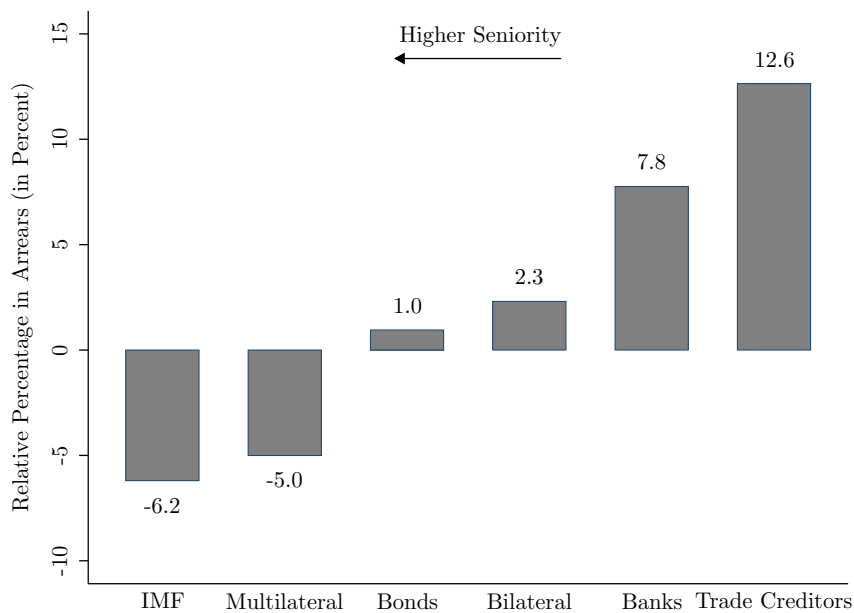
Note: The bars show the average RPIA ratios over the period 1979-2006 for each creditor group and as summarized in equation (2). Averages are calculated as unweighted means of country averages.

assigns a higher weight to country-year observations with higher arrears-to-debt ratios, which is relevant when aggregating $RPIAs$ over countries or time.

For illustration, consider a country with two creditors that chooses to default only toward creditor 1 while creditor 2 is fully paid. Let x denote the share in total debt and arrears of creditor 1. Then, the $RPIA$ of creditor 1 equals $(1-x)\cdot ATD_1 > 0$, where the $RPIA_2$ is simply given by the negative of the total arrears-to-debt ratio. In the limit when all funds are provided by creditor 1, $RPIA_1$ approaches zero, indicating a fair treatment despite the concentration of arrears. Similarly, when all funds are provided by creditor 2, $RPIA_1$ approaches the arrears-to-debt ratio of creditor 1.

Figure 3 summarizes $RPIAs$ for the six creditor groups for the full sample. The results confirm the pecking order observed above. Bilateral creditors, banks, and trade creditors have positive $RPIAs$, indicating discrimination, while multilateral creditors and the IMF have negative ratios. Bondholders have the lowest $RPIA$ within the group of private creditors. Exporters and suppliers are most heavily discriminated against: their ATD is 12.6 percentage points higher than the representative creditor. The IMF is most favored, with an ATD that is 6.2 percentage points lower compared to the average creditor.

The pecking order we observe in Figures 2 and 3 holds when we weight each country by the size of its debt stock so as to mimic a world portfolio of debt (and arrears). It also holds when we use arrears-to-debt ratios without adjusting the debt stock for the stock of arrears, although we get higher arrears ratios on average.

The $ATDs$ vary notably across countries and subsamples. Figure 4 shows the average arrears-to-debt ratios for different income groups based on the classification of the World Bank, where "high income" denotes "high income" or "upper middle income" countries as of 2015, including countries such as Bosnia and Herzegovina, Panama, or Peru. As expected, average $ATDs$ are highest for countries in the lower income group and lowest for countries in the highest income group. Yet, the pecking order is qualitatively similar in each sub-sample we look at. Bonds, IMF credit, and multilateral loans remain senior in all income groups, whereas bilateral loans, bank loans, and trade credits are junior. The ordering is the same when we use other GDP per capita criteria.

The ordering is similar in a breakdown by world regions, using the regional classification of the World Bank. The level of arrears is particularly high in sub-Saharan Africa, which includes most of the low-income countries in the sample. However, the implied pecking

Figure 4: Creditor ATDs by debtor income groups
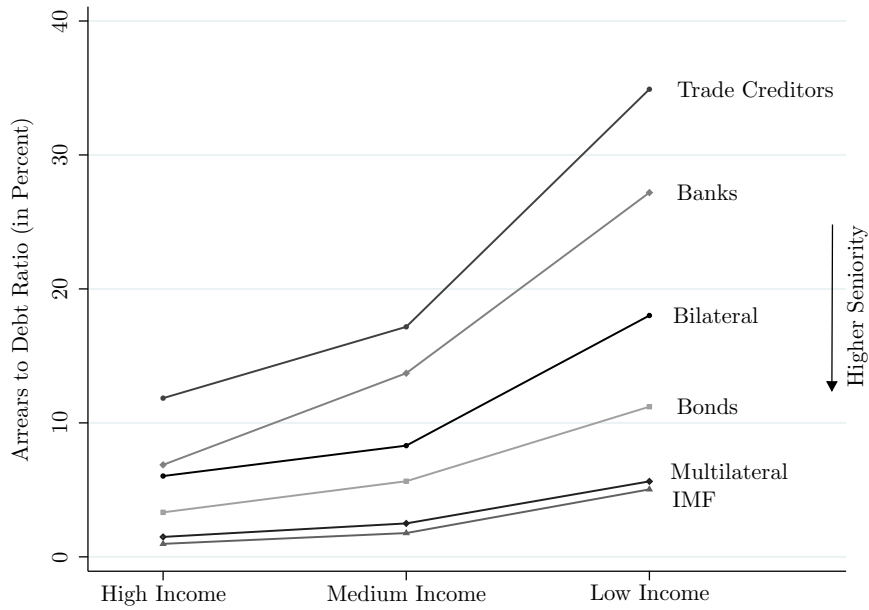
Note: This figure shows average ATD ratios by debtor country income group. Income groups are based on the classification of the World Bank as of 2015, where high income refers to "high income" or "upper middle income" countries. Countries in the high income group with arrears to the IMF include Bosnia and Herzegovina (IMF arrears: 1993-1994), Panama (1988-1991), Peru (1986-1992) and Serbia (1993-1999). Medium income countries are those classified as "lower middle income" by the World Bank. Averages are calculated as unweighted means of country averages.

Figure 5: Creditor RPIAs over time
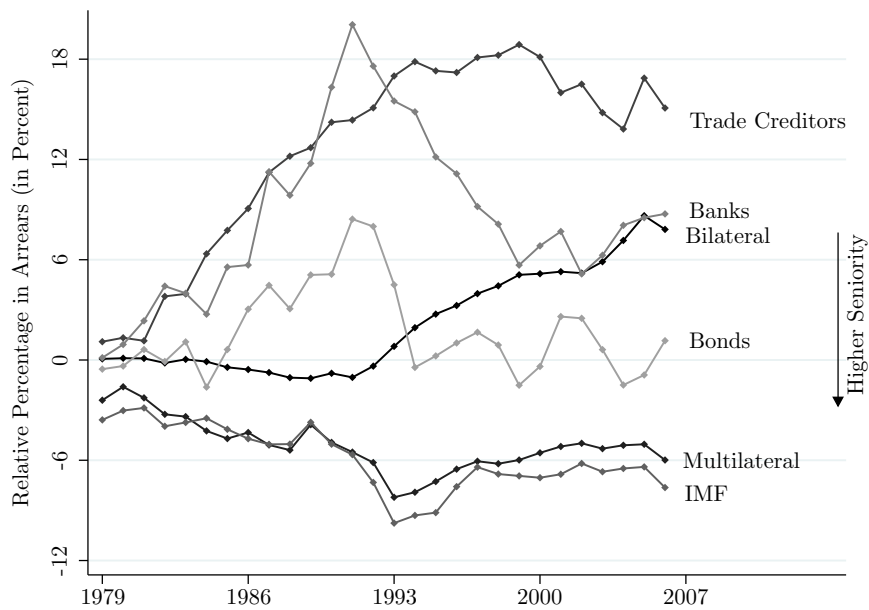
Note: This figure shows the average RPIA ratios for each year from 1979 to 2006. Averages are calculated as unweighted means over all observations in each year.

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order is again largely unaffected. Bonds, IMF credit, and multilateral loans are senior in all regions, whereas bilateral loans, bank loans, and trade credits are junior.[20]

This pecking order is also unaffected if we cut the sample by political regimes, by countries with and without access to international capital markets, or by type of exchange rate regime. Table C.1 in Appendix C summarizes average $RPIAs$ for different country groups. Bilateral creditors are discriminated against in all subsets except for the Middle East and North Africa region. Similarly, the average $RPIA$ is positive for banks and trade creditors in all subsets except for banks in East Asia. In contrast, multilateral creditors and the IMF are always favored. Similarly, bondholders are senior to other private creditors in all subsamples. Taken together, the pecking order is remarkably stable, although the extent of seniority differs across subsets of the sample.

The patterns we observe are also relatively stable across time. Between 1979 and 2006, the seniority order (as measured by $RPIAs$) has remained fairly similar, as shown in Figure 5. The relative seniority of multilateral lenders and the IMF can be observed in each decade. Similarly, the discrimination against banks and trade creditors has occurred in all years, with banks faring the worst in the late 1980s and early 1990s, just prior to the Brady debt exchanges that resolved the developing country debt crisis. The most notable qualitative change in seniority can be observed for bilateral lenders, which were slightly favored until the early 1990s but have been increasingly discriminated against since then.

3.3 Determinants of seniority: fundamentals, country and time effects

In this section, we study whether the observed pecking order holds once we account for observable characteristics of countries and creditor groups. For example, bilateral lenders might face higher arrears simply because they lend more extensively to low-income countries compared to bondholders or the IMF. To account for such a possibility, we can control for the income level of countries and the scope of bilateral lending. If the different treatment of creditor groups cannot be explained away with standard macroeconomic and political variables, then we have a more convincing case that discrimination is at work. The unexplained part of the ATD and $RPIA$ ratios will capture creditor seniority in a narrower sense.

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[20]East Asia is an exception since the IMF faces higher average arrears than banks, mainly because of two outliers: Cambodia and Vietnam. There are also smaller shifts in the relative ranking within the set of junior and senior creditors.

We follow two empirical strategies to separate the role of observable from unobservable characteristics: first, a plain-vanilla OLS regression approach and, second, the Oaxaca-Blinder counterfactual decomposition technique, which has been widely used to identify discrimination in labor markets. The $RPIA$ ratios, our favorite metric of creditor discrimination, are the main dependent variable.

The **pooled OLS regressions** use creditor-specific RPIAs and ATDs as the dependent variable, so that there are up to six observations for each country-year spell. To detect discrimination, we include dummies for each of the creditor groups. The intuition behind this approach is simple. The effect of observable fundamentals will be captured by the control variables, while (unexplained) creditor-specific effects will be picked up by the creditor dummies. If there are systematic differences in the rate of arrears accumulation across creditor groups, then the creditor dummies should be significantly different from zero. Specifically, we use the following regression framework:

$$y_{i,t,k} = \boldsymbol{X}_{i,t,k}\boldsymbol{\beta} + \sum_{k=1}^{K-1} \alpha_k I_k + u_{i,t,k}, \tag{4}$$

where $y_{i,t,k}$ is our default measure (in particular, $RPIAs$) and $\boldsymbol{X}_{i,t,k}$ is the vector of control variables that may include dummies for each country and for each year to capture country-fixed and year-fixed effects. The main focus lies on the α_k coefficients of the dummies for each creditor group k where $k = K$ refers to the benchmark category (here: bilateral creditors). The variable I_k will capture creditor seniority effects under the assumption of equal sensitivities toward $X_{i,t,k}$. The variables $u_{i,t,k}$ are standard errors clustered at the country level.

This framework is an intuitive way to separate the discriminatory component from the effects of economic fundamentals. The ranking of creditors is easy to interpret - both qualitatively and quantitatively. The main limitation is that this approach assumes that sovereigns (should) behave equally across creditors in response to changing economic conditions. Specifically, the coefficients for each control variable are assumed to be the same for each creditor group, which is unlikely to be true. Indeed, when running regressions for the determinants of discrimination for each creditor group separately, we observe substantial differences in the estimated betas for the set of control variables. This indicates that, across creditor groups, arrears react differently to changes in fundamentals.

The **Oaxaca-Blinder decomposition technique** helps to relax the assumption of equal sensitivities across creditors. The approach is based on Blinder (1973) and Oaxaca (1973) and is commonly used in the literature on labor market discrimination, for example, to

estimate the gender wage gap. The basic idea is to decompose an outcome variable of interest into explained and unexplained variation using a set of control variables. More precisely, the technique attributes the difference in mean outcomes to two sources: differences in observable characteristics and differences in factor sensitivities. For example, high arrears to bank creditors relative to bondholders could be the result of more intense borrowing from banks, for example, because countries have no access to bond financing. Alternatively, sovereigns could generally be more inclined to accumulate arrears toward bank creditors rather than toward bondholders. The first explanation reflects fundamental differences, while the second one is interpreted as discriminatory behavior. The Oaxaca-Blinder decomposition technique allows us to separate these effects by controlling for differences in control variables across creditors. The unexplained component then allows us to back out the scope of creditor discrimination.

Formally, consider a standard linear regression model that relates our discrimination measure $y_{i,t}$, the $RPIAs$, to a set of fundamentals $\boldsymbol{X}_{i,t}$ and the error term $u_{i,t}$ for each creditor group k:

$$y_{i,t} = \boldsymbol{X}_{i,t}\boldsymbol{\beta}_k + u_{i,t}, \tag{5}$$

Let $\hat{\boldsymbol{\beta}}_k$ denote the vector of estimated coefficients for creditor group k. We estimate this regression separately for each creditor group via pooled OLS including dummy variables for country-fixed and time-fixed effects in the vector of control variables.[21] The difference in mean $RPIAs$ between *two* creditor groups m and n can then be decomposed as

$$\overline{RPIA}_m - \overline{RPIA}_n = (\overline{\mathbf{X}}_m - \overline{\mathbf{X}}_n)\hat{\boldsymbol{\beta}}^*_{m,n} + \overline{\mathbf{X}}_m(\hat{\boldsymbol{\beta}}_m - \hat{\boldsymbol{\beta}}^*_{m,n}) + \overline{\mathbf{X}}_n(\hat{\boldsymbol{\beta}}^*_{m,n} - \hat{\boldsymbol{\beta}}_n), \tag{6}$$

where $\overline{\mathbf{X}}$ refer to the sample means of the control variables. This decomposition assumes the existence of a fair pricing vector $\hat{\boldsymbol{\beta}}^*_{m,n}$. For example, $\hat{\boldsymbol{\beta}}^*_{m,n}$ would tell us by how much the $RPIA$ should increase if a creditor's debt-to-GNI ratio increases by one unit given fair treatment. However, this vector is not observable and hence needs to be approximated. In the labor market literature on wage discrimination, it is commonly approximated by the coefficient vector of male workers who are assumed to face no wage discrimination. Since we do not know which creditor group faces fair treatment, we obtain $\hat{\boldsymbol{\beta}}^*_{m,n}$ by estimating (5) in a pooled regression for the groups m and n (i.e., by making pairwise comparisons).

Applying decomposition (6), we can attribute differences in $RPIAs$ to the two sources discussed above:

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[21]OLS is the standard approach for Oaxaca-Blinder in the literature and convenient to estimate.

- The first term $(\overline{\mathbf{X}}_m - \overline{\mathbf{X}}_n)\hat{\boldsymbol{\beta}}^*_{m,n}$ measures differences in $RPIAs$ that result from differences in the control variables across creditor groups. For instance, higher arrears to bank creditors relative to bondholders as the result of more intense borrowing from banks are captured by this term.

- The second term $\overline{\mathbf{X}}_m(\hat{\boldsymbol{\beta}}_m - \hat{\boldsymbol{\beta}}^*_{m,n}) + \overline{\mathbf{X}}_n(\hat{\boldsymbol{\beta}}^*_{m,n} - \hat{\boldsymbol{\beta}}_n)$ is the difference in $RPIAs$ that results from differences in the estimated factor sensitivities $\hat{\boldsymbol{\beta}}_k$ across creditors. For instance, this term captures the higher inclination of sovereigns to accumulate arrears toward bank creditors rather than bondholders for a given amount of borrowing. This term constitutes discrimination since these differences would prevail even if creditor groups had equal characteristics.

As explained, decomposition (6) can only be used for pair-wise comparisons. We therefore show results for each pair of creditor groups separately.

To select **control variables**, we follow earlier work on the determinants of default and debt arrears, in particular Detragiache and Spilimbergo (2001) and Manasse and Roubini (2009), and consider a broad set of macroeconomic and financial variables that are potential drivers of arrears and creditor discrimination. We first account for the scale and composition of sovereign debt by including the debt-to-GNI ratio toward each creditor group (adjusted for arrears). This is our only group-specific set of control variables. Since our discrimination measure is already adjusted for creditor-specific debt stocks, including this variable will capture potential overproportional effects of debts on arrears. Moreover, we include the ratio of total external debt to GNI. We also account for the general level of development, which is important for the default behavior of countries, as indicated by Figure 4. Specifically, we include real GDP per capita as well as current and lagged real GDP growth as reported in the World Bank's WDI dataset. Moreover, we account for financial crises by including a dummy variable for systemic banking crises and for currency crises from Laeven and Valencia (2012), and we control for political turmoil by including a dummy for ongoing external or civil wars obtained from the Correlates of War dataset. The ability of countries to borrow in international capital markets is another potential determinant of arrears. We control for this by including a dummy variable that indicates whether a country is eligible for the IMF's Poverty Reduction and Growth Facility as proposed by IMF staff (Allen, 2008).

We consider additional control variables, although adding these comes at the cost of a smaller sample, so they are only included as a robustness check (in the specifications with the "Full Set of Controls"). Specifically, to account for the level of financial development, we include the share of private debt in total external debt and a proxy of financial open-

ness using Lane and Milesi-Ferretti (2007) (assets plus liabilities, in percentage of GNI). We control for macroeconomic fundamentals by including trade openness (exports plus imports, in percentage of GNI), gross investments to GNI and CPI inflation. Moreover, we include three liquidity proxies, namely, the ratio of short-term external debt to GNI, foreign reserves as a fraction of total external debt, and debt service on PPG and IMF debt as a fraction of annual exports. The data for these variables are obtained from the WDI.

Table C.2 in Appendix C provides an overview of the variables and their sources, differentiating by basic control variables that are always included and additional controls that are only added in some specifications. To mitigate concerns of endogeneity, we lag all explanatory variables by one period; only real GDP growth enters in both contemporary and lagged form.

Table 1 shows the **pooled OLS results** focusing on the creditor-specific dummies, while the full regression results are shown in Table C.3 in Appendix C. The pecking order described in the last section is confirmed by these results. All creditor dummies have the expected sign and are statistically significant at the 1% level except for bonds. The coefficients for multilateral creditors, the IMF, and bondholders are negative, indicating that these groups face significantly lower arrears per unit of debt and a lower $RPIA$ than the benchmark category (bilateral creditors). In contrast, banks and trade creditors face significantly higher arrears per unit of lending and a higher $RPIA$. In columns 2-4 we add country-fixed effects and time-fixed effects, as well as a richer set of control variables, respectively. Adding these explanatory variables improves the fit of our regression but barely changes the results for the creditor dummies.

As a robustness check, we account for the fact that arrears ($RPIAs$) are highly persistent over time, by adding a one-period lag of the dependent variable as an additional regressor in column 5. This considerably improves the fit of the regression and decreases the size of the creditor dummies. However, the dummies remain statistically significant and imply the same seniority structure. We also estimate equation (4) using the arrears-to-debt ratios as the dependent variable. Column 6 shows results for the pooled OLS estimation (with country and year dummies), while column 7 shows coefficients from a Tobit regression, to account for the truncated nature of the data as arrears and $ATDs$ cannot be negative. These estimates are qualitatively similar to those using the $RPIA$ measure. Only the Tobit coefficients for IMF and bondholder creditors change, reflecting the fact that arrears to these creditors generally occur less often than to other groups. Bondholders are significantly favored relative to bilateral creditors once we take into account that arrears occur far less frequently.

Table 1: Determinants of arrears: OLS with creditor dummies

Dependent Variable	(1) RPIA	(2) RPIA	(3) RPIA	(4) RPIA	(5) RPIA	(6) ATD	(7) ATD
Multilateral	-8.09***	-8.08***	-8.08***	-8.34***	-1.42***	-8.09***	-14.45***
	[1.03]	[1.03]	[1.04]	[1.20]	[0.20]	[1.04]	[0.78]
IMF	-10.39***	-10.56***	-10.70***	-10.92***	-1.68***	-10.74***	-54.70***
	[1.24]	[1.26]	[1.28]	[1.46]	[0.25]	[1.24]	[1.40]
Bondholders	0.07	0.35	0.54	-0.02	0.57	0.42	-11.91***
	[2.11]	[2.07]	[2.10]	[2.21]	[0.43]	[2.05]	[1.38]
Banks	7.17***	7.48***	7.59***	5.94***	1.50***	7.59***	5.76***
	[1.46]	[1.47]	[1.48]	[1.56]	[0.32]	[1.48]	[0.86]
Trade Creditors	10.70***	10.89***	10.98***	9.00***	1.93***	10.83***	12.04***
	[1.70]	[1.70]	[1.71]	[1.76]	[0.31]	[1.70]	[0.82]
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	Yes	Yes	Yes	Yes	Yes
Full Set of Controls	No	No	No	Yes	No	No	No
Lagged RPIA	No	No	No	No	Yes	No	No
Adjusted R^2	0.195	0.242	0.249	0.249	0.786	0.437	0.133
Observations	11931	11931	11931	9176	11790	11931	11931

Note: Benchmark category: bilateral official loans. The table shows regressions on the determinants of arrears as in equation (4). Columns 1-5 use the RPIA as the dependent variable, while columns 6-7 use arrears-to-debt ratios. All regressions are estimated with pooled OLS except for column 7, which shows results for Tobit regressions of the ATD. All regressions include the set of basic controls listed in Table C.2 of Appendix C. Column 1 shows the most parsimonious specification, column 2 adds country fixed effects, and column 3 also includes time fixed effects. This specification (column 3) is our benchmark and is also used in columns 6 and 7 with ATDs as the dependent variable. Column 4 adds the full set of controls to our benchmark regression, while column 5 adds a lagged dependent variable. Standard errors are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 2 summarizes the **Oaxaca-Blinder decomposition results**. We always include the set of basic control variables listed above and in Table C.2 of Appendix C as well as country- and year-fixed effects.

The first column shows mean differences in $RPIAs$ for each creditor pair. A negative sign indicates that the scope of arrears ($RPIAs$) of the first creditor group is lower than that of the second group; that is, the first creditor of the pairing is senior in the raw data. Accordingly, a positive sign is an indication of seniority for the second creditor.

The difference in $RPIAs$ is then decomposed into differences that are attributable to differences in fundamentals (column 2) and differences that are unexplained, indicating discrimination (column 3). The last column shows the share of the $RPIA$ difference that cannot be explained by the control variables, which can be interpreted as the intensity of discrimination. Consider, for example, the aforementioned comparisons of bank creditors and bondholders, which are illustrated in the third row from the bottom in Table 2. On

Table 2: Determinants of arrears: Oaxaca-Blinder decomposition

	Difference in RPIA	Explained (fundamental)	Unexplained (discrimination)	Discrimination (in Percent)
IMF - Multilateral	- 1.11	- 1.11	0.00	-0.54
IMF - Bilateral	- 9.10	- 3.00	- 6.10	67.07
IMF - Bondholders	- 8.24	- 3.50	- 4.74	57.55
IMF - Banks	-16.77	-1.26	-15.51	92.49
IMF - Trade Creditors	-20.69	- 0.13	-20.55	99.37
Multilateral - Bilateral	- 7.99	- 0.08	- 7.91	99.00
Multilateral - Bondholders	-7.13	-3.07	-4.06	56.94
Multilateral - Banks	-15.66	-4.10	-11.57	73.84
Multilateral - Trade Creditors	- 19.58	-3.99	-15.59	79.62
Bilateral - Banks	-7.68	-2.52	-5.16	67.22
Bilateral - Trade Creditors	-11.59	-3.31	-8.28	71.45
Bondholders - Bilateral	- 0.86	- 1.47	0.62	- 71.63
Bondholders - Banks	-8.53	-5.16	-3.38	39.58
Bondholders - Trade Creditors	-12.45	-8.34	-4.10	32.96
Banks - Trade Creditors	-3.91	-1.92	-2.00	50.99

Note: The table shows the Oaxaca-Blinder decomposition for the mean difference in RPIAs across creditor groups. The mean difference is listed in the first column. The second and third columns show the part of the difference that is fundamentally justified and the part of the difference that is unexplained and thus reflects active creditor discrimination. The last column states the fraction of the mean difference that reflects discrimination in percent. Note that mean differences vary from the sample statistics because of data availability with respect to the explanatory variables.

average, bondholders face an $RPIA$ that is 8.5 percentage points lower than banks (i.e., they appear to be favored). Around 60% of this difference (5.2 pp) can be attributed to differences in observable characteristics. This might be because bondholders prefer lending to richer countries or during economic booms and hence face lower arrears. However, roughly 40% of the difference (3.4 pp) cannot be attributed to these factors and hence represents discriminatory treatment of banks or favoritism toward bondholders.

The average unexplained component is large, accounting for about 60% of the mean difference in $RPIAs$ across creditor groups. This is a strong indication of creditor discrimination. Fundamentals can only explain a sizable part of the arrears difference for three pairings: multilaterals versus the IMF, bondholders versus banks, and bondholders versus trade creditors.

As a robustness check, we again account for serial correlation by adding the lagged dependent variable as an additional regressor. Table C.4 in Appendix C shows the correspond-

ing Oaxaca-Blinder decomposition. The discriminatory component averages around 12%, which is substantially lower than before although still sizable.

To summarize, the results in this section confirm the stylized facts above. There is a clear and robust pecking order of sovereign debt during defaults that holds even when controlling for a wide variety of macroeconomic and political factors that might affect the discriminatory behavior of sovereigns.

4   Creditor seniority in sovereign debt restructurings

In this section, we turn to the outcome of sovereign debt restructurings by comparing the implied size of creditor losses (haircuts) on private and official debt.

We use the haircut estimates by Cruces and Trebesch (2013) for haircuts on private external creditors, which cover 187 restructurings of bank loans and bond debt since the late 1970s. For haircuts on official external creditors, we build on data by Tolvaisaite (2010) and Reinhart and Trebesch (2019), which provides haircut estimates for more than 400 Paris Club restructurings. As explained, the Paris Club of large creditor country governments has been the main forum for renegotiating official debt over the past decades.[22] Cheng et al. (2017) provide an overview of the history and operations of the Paris Club.

4.1   Haircut estimation approach

To measure creditor losses (haircuts) in sovereign debt restructurings, we follow the literature, in particular, Sturzenegger and Zettelmeyer (2008), Benjamin and Wright (2009), and Cruces and Trebesch (2013). Specifically, we apply the following formula to all restructurings since 1978 for which sufficient data are available:

$$\text{Haircut} = 1 - \frac{\text{Present Value of New Debt}}{\text{Face Value of Old Debt}}. \tag{7}$$

We thus compare the face value of the old debt to the present value of the new debt received in the wake of the restructuring. Using face values of the old outstanding debt

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[22]There are also a number of debt restructurings with official creditors outside the Paris Club forum. However, systematic information and data availability on these deals are even more limited than on the Paris Club. Hence, we choose to focus on the Paris Club, which accounts for a large majority of all official debt renegotiations.

is more simplistic than the approach by Sturzenegger and Zettelmeyer (2008) and Cruces and Trebesch (2013), who use present values for both the old and new debts, but this shortcut is helpful for the context of this paper. This formula is also widely used by market participants and by credit rating agencies.[23] The main advantage of using face value amounts of the old debt here is that this approach requires fewer assumptions and no data on the characteristics of the old debt, which is not always available for official loans.

Whichever method, we are ultimately interested in the *relative* performance of private and official creditors during restructurings so that the choice of the haircut estimation methodology should not be decisive as long as it is consistent across groups.

4.2 Haircuts on official debt - dataset and assumptions

The haircut estimates on bilateral government-to-government debts are based on a number of assumptions regarding interest rates, debt payment profiles, and discounting. Due to the limited transparency of the Paris Club, we lack detailed loan-level data and do not always have the full restructuring terms. The estimated haircuts should therefore be taken with care. This is particularly true for restructurings in the 1980s since the Paris Club provides only limited data for this period.

With these limitations in mind, the estimates allow us to compare haircuts borne by private versus official creditors for the first time, thus complementing our analysis of arrears patterns. We present our assumptions and the resulting limitations as transparently as possible. Moreover, we check the robustness of our estimates in various ways and explore how each of our main assumptions affects the results. Future research may provide more accurate estimates on haircuts in official debt restructurings, although this result will require better data and more transparency on the part of official creditors and the Paris Club.

At the center of each Paris Club debt restructuring is the final agreement, also called the "Agreed Minutes." The Agreed Minutes are agreed by all members and provide a guide-line for the bilateral agreements with each creditor government, which legally formalize the debt relief (see Appendix B for details).[24] The terms of the Agreed Minutes are for

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[23]For a detailed discussion on the different approaches to estimate haircuts, see Sturzenegger and Zettelmeyer (2008), Cruces and Trebesch (2013), and Meyer et al. (2019).

[24]Unfortunately, the specific bilateral agreements that actually provide debt relief are not publicly available. Hence, we trust that the Agreed Minutes are a sufficiently reliable indicator for the bilateral terms.

the most part standardized and have evolved over time. The 1980s mainly saw short- and medium-term reschedulings in the form of maturity extensions, but over the course of the 1990s and 2000s, the terms became increasingly concessionary, with more comprehensive debt relief and debt stock cancellations.[25] The Agreed Minutes contain details on the consolidation period, the cutoff date, the grace and maturity periods of the new debt, and the amounts of restructured debt as well as potential write-offs. This information is the main input for the estimation of haircuts on Paris Club restructurings. We compare and complement the information from the Paris Club website with details from other sources. These include a survey of debt restructurings with official creditors from the Institute of International Finance (2001), information from the Global Development Finance reports, as well as the IMF's Annual Reports on Official Financing for Developing Countries.[26] In case of inconsistencies, we use the Paris Club data.

Our final sample includes 414 Paris Club debt restructurings between 1978 and 2015.[27] Restructurings were particularly frequent during the developing country debt crisis that started in the early 1980s and continued well into the 1990s. Since the mid-2000s, the number of agreements has declined substantially.

Since face value data are provided by the Paris Club, most assumptions concern the calculation of present values in (7). These are calculated as follows:

$$\text{Present Value of the New Debt} = \sum_{j=t_0}^{T} \frac{\text{Debt Service}_j(r_{ds})}{(1 + r_{discount})^j}, \tag{8}$$

where t_0 is the date in which the first interest or principal payment is due (after a potential grace period), T is the maturity of the new debt, r_{ds} is the interest rate charged on the new debt, and $r_{discount}$ is the relevant discount rate. In the following we will discuss our main assumptions regarding the interest rate r_{ds}, the discount rate $r_{discount}$, the debt repayment profile (including any potential write-offs), and the composition of restructured debt. Some of the assumptions depend on the type of debt. Indeed, since the late 1980s, the Paris Club allows for differential treatment of official development aid (ODA) and other types of debt (non-ODA). In case of ODA debt the grace and maturity periods

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[25]Martin and Vilanova (2001), Gueye et al. (2007), and Cheng et al. (2016, 2017) provide a more detailed overview of the different terms. See also Appendix B for a summary.

[26]In particular, we refer to the appendices of the 2002, 2003, and 2006 Global Development Finance reports.

[27]There are a small number of Paris Club deals before 1978, starting with Argentina in 1956. We do not include these deals because of limited data availability and also because we lack the counterfactual haircut estimates for private creditors. For an overview of early Paris Club deals, see Das et al. (2012).

are more generous, while non-ODA debt can receive partial write-offs, particularly for low-income countries.

Interest rate: The interest rate on restructured Paris Club debt is called the moratorium interest rate. According to the terms of the Paris Club, moratorium interest rates are based on the original interest rate of the loan for ODA debt, the "appropriate market rate" (non-ODA debt, option A), or reduced interest rates (non-ODA debt, option B).[28] Unfortunately, the rates actually agreed on bilaterally are not publicly available, and we do not know what share of the debt falls under each of these options. The Paris Club only provides a vague definition of the "appropriate market rate" from which reduced rates are derived. Importantly, none of these rates contains a country-risk premium.[29] Hence, we need to make assumptions with respect to the interest rate in our calculations. We assume that each rescheduling is based on the appropriate market rate. We proxy this rate by the average terms of borrowing (ATB) by official creditors from the World Bank's GDF dataset. This rate is representative for the average interest rate set by official creditors for a particular debtor.[30] Data coverage is almost comprehensive since the ATB is available for all but 6 restructurings. In addition, Reinhart and Trebesch (2016a) also use this rate to calculate debt service payments in their baseline estimates.[31]

Discount rate: To discount debt payment streams, we consider two alternative rates:

- The baseline estimates rely on the Paris Club's own discounting approach, using the commercial interest reference rate (CIRR) for the US dollar prevailing in the year and month of the restructuring (see Mandeng, 2004). CIRR is essentially a risk-free rate that represents the funding cost of advanced countries. More specifically, CIRRs are currency-specific interest rates for major advanced countries defined as "minimum interest rates that shall apply to official financing support under the Arrangement on Officially Supported Export Credits" (see OECD website). Besides the Paris Club, the World Bank and the IMF also calculate official debt relief based on a weighted average of CIRRs for different currencies (see IMF, 2014). In addition,

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[28]For an overview, see, for example, Martin and Vilanova (2001) or the website of the Paris Club.

[29]The Paris Club defines the "appropriate market rate" as the "interest rate defined in bilateral agreements implementing the Paris Club Agreed Minutes, based upon standard interest rates of the currency considered, plus a management fee. This rate may be fixed or variable and does not include a country-risk premium."

[30]This rate is defined as follows: "Average terms of borrowing on public and publicly guaranteed debt are given for all new loans contracted during the year and separately for loans from official and private creditors. Annual average interest rate is obtained by weighting by the amounts of the loans."

[31]An alternative proxy is the six-month USD-based Libor that prevailed in the year and month of the restructuring deal, using data from the IMF. Yet, unlike the average terms of borrowing, the Libor rate is not specific to the debtor country. As a robustness check, we also conduct the analysis with the Libor as an interest rate proxy. The results do not change qualitatively.

CIRR data are widely available, allowing us to compute haircuts for 397 out of 414 Paris Club deals. However, this rate is not country-specific and does not reflect the market assessment of country risks. We take the resulting haircut estimates as a lower bound.

- Alternatively, we use a market-based discounting approach, which allows to compare haircuts on private and official creditors based on the same discount rates. The idea is to run a fair horse race between the two types of estimates and to view official debt through the lens of a risk-averse taxpayer who discounts future repayments with a commercial rate. Specifically, we follow the discounting approach by Cruces and Trebesch (2013) for private debt restructurings and use their computed "exit yields" that vary by country and month to compute haircuts for Paris Club restructurings. This is possible for 323 out of the 414 deals.[32] The exit yield is the interest rate that would have been used by the market participants at the exit of each restructuring if the holder of the restructured instrument wanted to sell it. Put differently, the exit yield is a proxy for future default risk right after the restructuring has been implemented. The resulting haircut estimates are taken as an upper bound.

Restructuring options, amortization schedules, and write-offs:

- We distinguish between ODA and non-ODA debt whenever information on the distribution is provided by the Paris Club. This is the case for most restructurings since the late 1990s, namely 75 Paris Club deals. In addition, for 178 restructurings under Classic Terms (see Appendix B for definitions), we know that the Paris Club creditors made no distinction between ODA and non-ODA debts. For all other cases (around 40% of the sample), we assume that all debts are non-ODA debt when terms of middle-income countries apply (34 restructurings under Houston Terms) and ODA debt when terms of low-income countries apply (112 restructurings under Toronto, London, Naples, Lyons, and Cologne Terms).

- Debtor countries can often choose between two rescheduling options for non-ODA debt. Under option A, debtors receive a partial debt stock cancellation and the new debt is issued with market interest rates. Alternatively, they can choose option B without debt stock cancellation but at a below-market interest rate and longer grace and maturity periods. We know the option chosen for the majority of restructurings, but lack this information for around one-fourth of the cases (112 out of 414). Since most restructurings in this subset are by low-income debtors, we treat all debts as

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[32]We lack imputed market rates for about 20% of the sample, mostly mostly because the poorest countries have little to no market information such as credit ratings. Indeed, 77 of the 91 missing cases are Heavily Indebted Poor Countries (HIPCs). The smaller sample will result in a downward bias, since average haircuts are likely to be higher if these poorest countries were included.

Figure 6: Haircuts on official debt (<u>risk-free rate</u>)
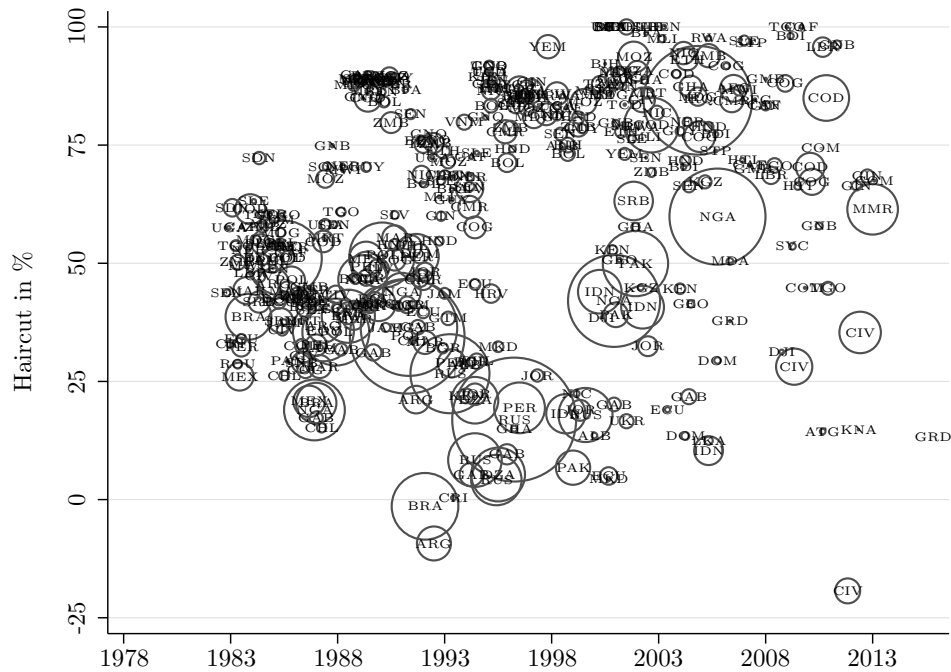
Note: The discount rate used is the risk-free rate (CIRR). The circles represent the amount of restructured debt in real terms (deflated to 2015 US dollars).

Figure 7: Haircuts on official debt (<u>market rate</u>)
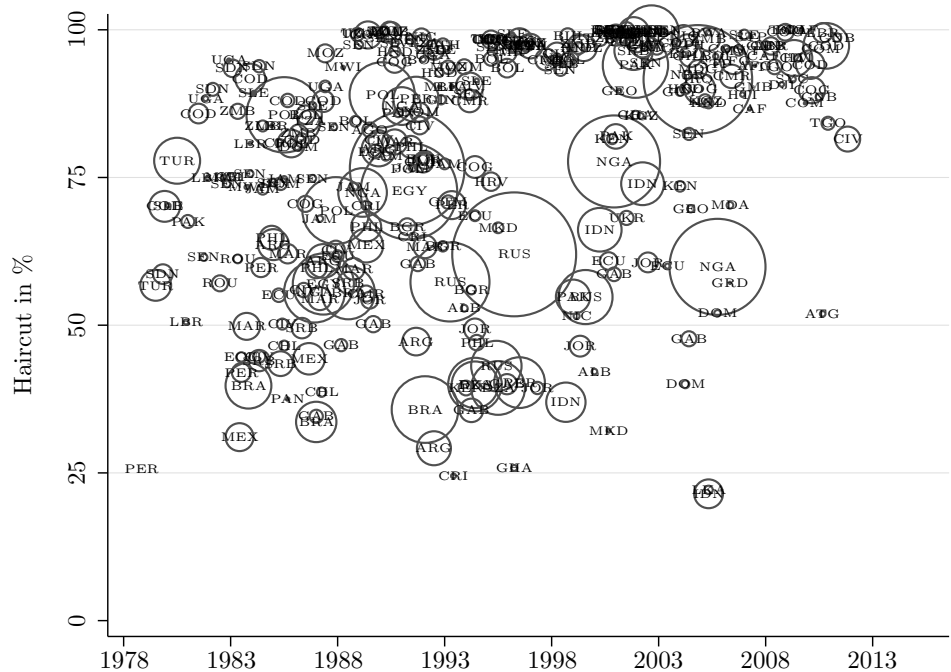
Note: The discount rate used is the market rate ("exit yield" as imputed by Cruces and Trebesch, 2013). The circles represent the amount of restructured debt in real terms (deflated to 2015 US dollars).

Figure 8: Haircuts on private debt

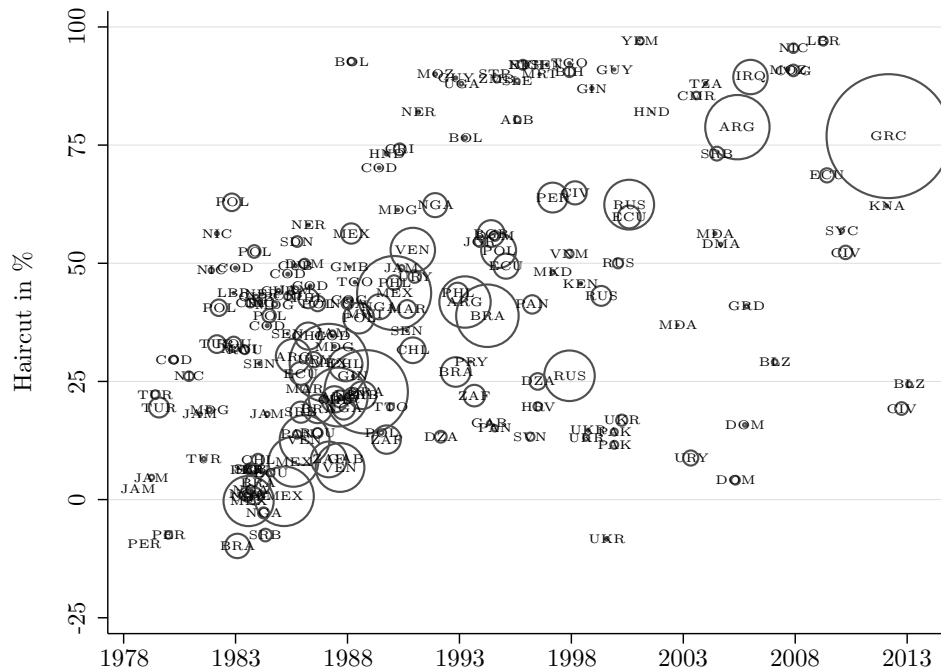Note: The discount rate used is the market rate ("exit yield" as imputed by Cruces and Trebesch, 2013). The circles represent the amount of restructured debt in real terms (deflated to 2015 US dollars).

ODA debt, which imply no stock cancellation, so that the available data on grace periods and maturity extensions allow us to calculate case-specific haircuts.

- We apply the amortization schedule outlined in the Paris Club terms whenever available (about 40% of all cases).[33] Otherwise, a linear amortization schedule is assumed, meaning that the principal is redeemed in equal amounts in each year between the end of the grace period and maturity. Furthermore, we assume that the rescheduling date equals the date when the Agreed Minutes were signed and that the grace and maturity period start at the midpoint of the consolidation period. The latter assumption is in line with the methodology of the secretariat of the Paris Club, as argued by Martin and Vilanova (2001).

- Because of the lack of data, we ignore additional bilateral debt relief by creditor governments that is sometimes provided on top of Paris Club agreements.[34]

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[33]Standardized repayment schedules are available for restructurings under London, Naples, Lyons, and Cologne Terms as well as for a small number of recent restructurings under Classic Terms, such as Gabon in 2000 or the Dominican Republic in 2005. These account for more than 40% of all Paris Club restructurings. All of them have an increasing amortization schedule, as the fraction of the principal due for repayment increases over time.

[34]These cases of "top-up" relief have become more common over the past two decades, in particular, during the HIPC Initiative when some governments granted debt relief beyond their commitments.

Figure 6 shows a plot of haircuts on official loans based on the risk-free CIRR discount rate, while Figure 7 shows the same plot when using market-based rates. In both figures, the circles represent the amount of restructured debt in real terms (inflation-adjusted USD). Figure 8 shows the equivalent haircut plot for private debt restructurings (involving foreign banks and bondholders) from Cruces and Trebesch (2013). In addition, Table C.5 in Appendix C shows haircut statistics for the full sample and across decades.

Our estimates depend strongly on the discount rate assumption. In general, haircuts are lower when we use the CIRR as the discount rate instead of the market exit rates. Specifically, the average Paris Club haircut is 59.9% with CIRR discounting and 78.6% with market exit rates.[35] This result is to be expected since the CIRR serves as a lower bound on the range of possible discount rates, while market rates represent an upper bound. However, the correlation between the resulting sets of estimates is very high, with a correlation coefficient of 0.87.

4.3 Restructurings with private and official creditors: stylized facts

This section compares haircuts on private and official sovereign debt. The merged dataset covers 601 restructurings in 97 countries over the years 1978 to 2015, including 414 Paris Club restructurings, 165 restructurings of bank loans, and 22 restructurings of sovereign bonds. As explained above, our Paris Club haircut estimates should be treated with caution. In particular, the estimates are not ideally suited to drill into individual crisis cases and compare haircuts on official and private debt for specific restructurings (such as those in Argentina for the period 2001-2010). A rigorous case-by-case and country-by-country test of the Paris Club's "comparability of treatment" principle would require loan-level data on the terms of government-to-government debt and how each of the loans is restructured (i.e., more transparency and better data provision by the Paris Club and/or by government creditors). The main strength of the data we have assembled is that it allows making the first aggregate comparison of the size and variation of haircuts on official versus private debt. We take advantage of this strength to shed light on the seniority structure of sovereign debt over the past 40 years.

We start with stylized facts on the occurrence and size of debt restructurings:

One instance is the resulting full cancellation of Afghan debt in 2010. Since these cases are not well documented, our estimated haircuts for HIPC restructurings should be regarded as a lower bound.

[35]The respective values are 52.9% for CIRR rates and 76.1% for market exit rates when using the Libor instead of the ATB as the interest rate.

- There have been more than twice as many Paris Club restructurings (414) as restructurings with private creditors (187) since 1978. Figure 9 shows the frequency of restructurings. In total, 88 different countries have implemented at least one Paris Club deal, whereas private debt obligations were restructured with a total of 71 different countries.

- While debt restructurings with private creditors occur less frequently, they are larger in terms of average debt amounts involved (see Figure C.1 in Appendix C). The size difference owes to the fact that richer countries borrow more, and do so mostly from private creditors. As a result, the average restructuring of bond and bank debt is larger in absolute terms. However, once we scale by debtor country GNI, the size of restructurings is similar, with the average Paris Club deal affecting 11.9% of GNI and the average private debt restructuring affecting 12.8% of GNI.

- The number of private and official debt restructurings within a country is correlated, but there is considerable variation in the type of restructurings across countries. Countries with a higher income per capita are more likely to implement private debt restructurings, while countries with low income and no capital market access are more likely to restructure with the Paris Club.

- Serial restructurings are a characteristic feature of sovereign debt markets. The countries with the most restructurings include Senegal, which experienced 15 Paris Club deals, while Poland featured 8 restructurings with commercial creditors.

Moreover, we can summarize the following facts on the relative size of credit losses (haircuts) during these restructurings:

- Average haircuts on official creditors are substantially higher than those on commercial creditors. Panel (a) of Figure 10 compares the conservative Paris Club haircuts (lower-bound estimates with CIRR discount rates) and the haircuts for private creditors of Cruces and Trebesch (2013) (using market discount rates) over all restructurings in our sample. The difference is more than 20 percentage points on average, with Paris Club deals showing a mean haircut of 59.9%, compared to 40.4% and 40.5%, for bond and bank loan haircuts, respectively.

- The difference is even larger when we use the same discounting approach for both official and private restructurings, as shown in panel (b) of Figure 10. The average haircut for Paris Club deals then increases to 78.6%, again compared to 40% for private creditors. These differences are very large and statistically significant.

- The average haircut size difference between official and private creditors is largest for poor countries. Haircuts generally show a negative correlation with country income,

Figure 9: Frequency of restructurings by creditor group
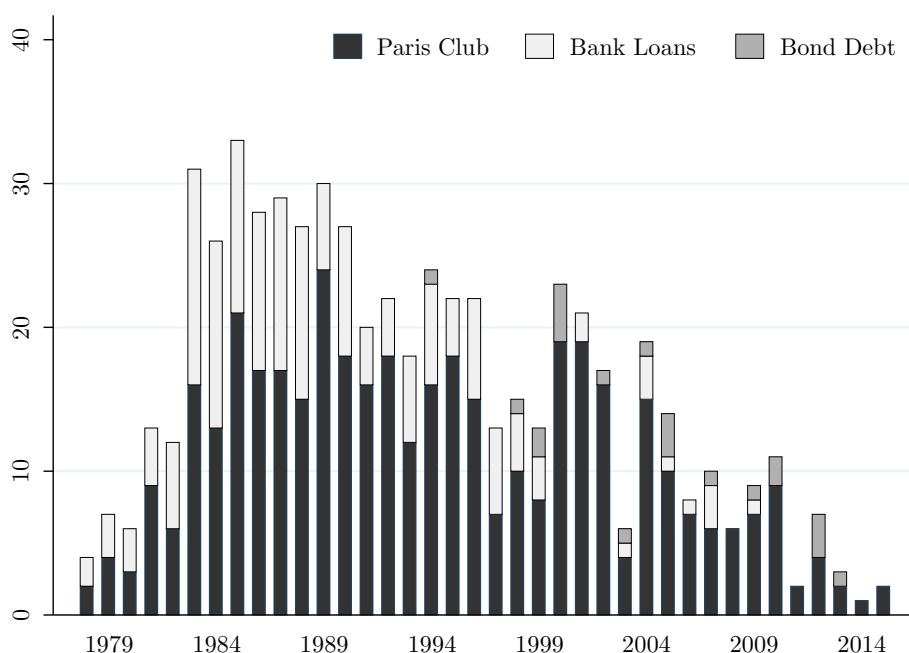
Note: This figure shows the number of finalized restructurings per year for the Paris Club and for private creditors for the period 1978-2015.

for both official and private creditors. But Figure 11 shows that haircuts by the Paris Club are particularly high for lower- and low-income countries. The average Paris Club haircut for low-income countries is 74.9% (using CIRR discounting), compared to 58.8% for private debt restructurings in this income group.

4.4 Comparing haircuts: accounting for fundamentals and fixed effects

The descriptives above suggest that private creditors fare better than official creditors during restructurings. However, these differences might reflect debtor country characteristics rather than creditor discrimination. In this section, we address this concern by controlling for macroeconomic fundamentals and country and time fixed effects, which could drive the observed differences in haircut size. For example, we know that many countries restructuring with the Paris Club are poor and have no or limited access to private capital markets. Also time effects might play a role, as debt relief operations such as the HIPC Initiative resulted in dozens of high-haircut restructurings in the 1990s and early 2000s.

Figure 10: Comparison of Haircuts for Different Discount Rates

(a) Lower-bound Paris Club haircuts

(b) Upper-bound Paris Club haircuts
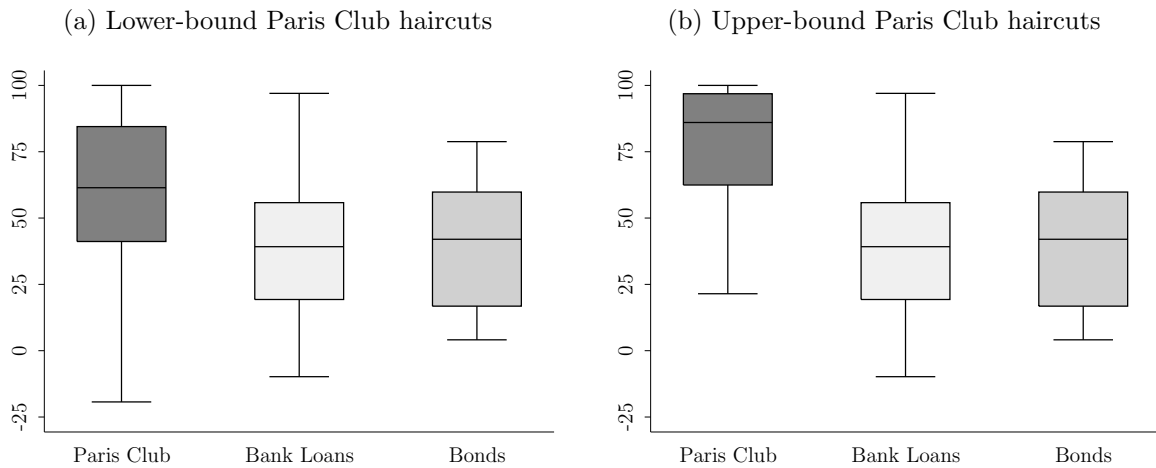
Note: The figure shows haircuts for official and private creditors in percent. The left panel shows lower-bound estimates for the Paris Club, based on the risk-free (CIRR) discount rate. The right panel shows upper-bound estimates using the same market discount rates (imputed exit yields) as in Cruces and Trebesch (2013). In both panels, the haircuts for bonds and banks are those of Cruces and Trebesch (2013).

Figure 11: Comparison of haircuts by income group
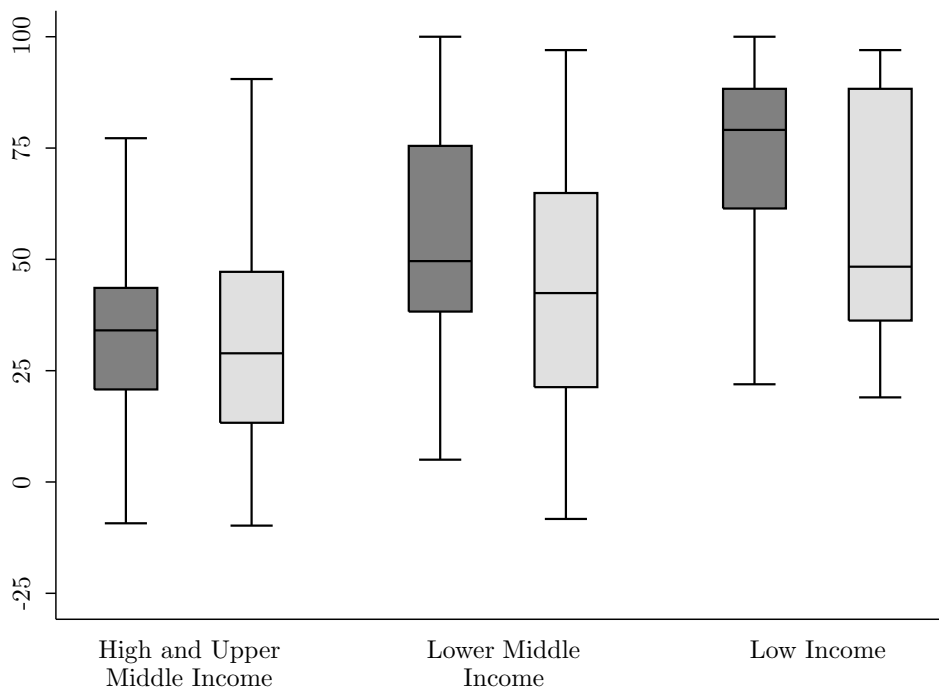
Note: The left bars show Paris Club haircuts based on CIRR discount rates, while the right bars show haircuts for private creditors from Cruces and Trebesch (2013). Income groups are defined by the World Bank, as discussed in Figure 4 of the previous section.

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We apply a standard OLS regression framework. Specifically, we pool the haircut estimates on private and official creditors (with CIRR discounting) and regress these on dummy variables that capture the creditor type (private versus official) as well as a broad range of controls. This approach is conceptually the same as our approach in Section 3, where we include creditor dummies to study arrears in an OLS framework. The resulting regression can be written as follows:

$$HC_{i,t,k} = \boldsymbol{X}_{i,t,k}\boldsymbol{\beta} + \alpha_P I_P + u_{i,t,k}, \tag{9}$$

where $HC_{i,t,k}$ the haircut on creditor group k in a restructuring with country i at time t, $\boldsymbol{X}_{i,t,k}$ is a vector of controls, I_P is an indicator variable for restructurings with private creditors, and α_P is the associated coefficient of interest. Paris Club restructurings are the benchmark. The sign, significance, and size of α_P indicate the ranking of creditors in restructurings after controlling for fundamentals. The variables $u_{i,t,k}$ are standard errors clustered at the country level.

As controls, we start with the same set of variables used in Section 3, with some changes to account for the nature of restructurings as a onetime event. First, we replace the amount of debt outstanding to each creditor group with a measure of debt restructured in each deal (relative to total external debt). In addition, we use the three-year moving average GDP growth rate prior to the restructuring instead of the contemporaneous and lagged GDP growth. Furthermore, we construct dummies for wars, banking, and currency crises that take the value of one in case a crisis or war occurred in the three years before a restructuring. All other controls remain the same. As before, we start with this set of basic controls and subsequently add time fixed effects as well as further control variables with less data coverage. The latter are measures of trade and financial openness, the debt composition of a country, variables related to liquidity needs, in particular, foreign reserves and debt service, as well as further macroeconomic controls.

Table 3 shows our main results on correlates of haircuts. In columns 1-3, we use the lower-bound estimates for the Paris Club haircuts (CIRR discounting), while columns 4-6 use market discount rates for Paris Club deals and thus the upper-bound estimates. The full results, including the large set of control variables, are shown in Table C.6 in Appendix C.

The main variable of interest is the dummy for private creditors. The results confirm the descriptive findings. Haircuts on private debt tend to be significantly lower even when controlling for country fundamentals and time effects. As before, the difference is most pronounced when using the same discount rate for both Paris Club and private

Table 3: Determinants of haircuts: OLS with creditor dummy

	Lower-Bound Estimates			Upper-Bound Estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Private Creditors	-8.83***	-5.30**	-5.21*	-29.41***	-26.67***	-26.51***
	[2.46]	[2.42]	[2.88]	[2.34]	[2.25]	[2.65]
Restructured Debt	0.24**	0.14*	0.10	0.21**	0.13	0.12
(Share of External Debt)	[0.09]	[0.08]	[0.09]	[0.09]	[0.08]	[0.08]
External Debt to GNI	0.03***	0.03***	0.10***	0.05***	0.04***	0.08**
	[0.01]	[0.01]	[0.04]	[0.01]	[0.01]	[0.03]
Real GDP per Capita	-3.70***	-3.60***	-3.27***	-3.50***	-3.27***	-2.71***
(in 1000 constant 2005 US$)	[0.88]	[1.07]	[1.14]	[0.74]	[0.81]	[0.88]
GDP Growth (3-year MA)	1.51***	0.88***	0.78***	1.09***	0.61*	0.59
	[0.27]	[0.28]	[0.26]	[0.31]	[0.33]	[0.37]
External or Civil War	1.49	0.10	-0.21	0.73	-1.14	-1.26
	[3.39]	[3.44]	[3.94]	[3.06]	[2.85]	[3.28]
Banking Crisis	0.35	-1.32	-0.85	-0.71	-3.81	-2.03
	[2.79]	[2.56]	[3.39]	[2.95]	[2.86]	[3.72]
Currency Crisis	-4.10	-2.82	-3.27	-2.67	-0.59	-1.22
	[2.64]	[2.33]	[2.82]	[2.43]	[2.37]	[2.78]
Lack of Market Access	23.54***	21.37***	17.94***	17.70***	16.94***	15.11***
	[3.89]	[4.56]	[4.92]	[3.88]	[4.24]	[4.89]
Time Fixed Effects	No	Yes	Yes	No	Yes	Yes
Full Set of Controls	No	No	Yes	No	No	Yes
Adjusted R^2	0.484	0.578	0.576	0.607	0.680	0.673
Observations	442	442	359	389	389	314

Note: Columns 1-3 use lower-bound haircut estimates with the risk-free (CIRR) discount rate as the dependent variable, and columns 4-6 use upper-bound haircut estimates with market rates. All regressions are estimated with pooled OLS and include a set of basic controls. We subsequently add time fixed effects and a richer set of controls. The variables are defined in Table C.2 in Appendix C and in the text. Clustered standard errors (at the country level) are in parentheses. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

deals (columns 4-6), but the result also holds when we use the lower-bound Paris Club estimates. The size of the coefficients is large, with differences ranging between -5 and -30 percentage points depending on the specification.

The results in columns 1 and 3 are robust to a number of checks and extensions. First, we add time fixed effects. This does not change the overall picture, although the private restructurings dummy shows a smaller coefficient, probably because bond restructurings only occur after 1998 (the 1980s and 1990s were dominated by bank debt restructurings). Second, we add additional controls, as discussed, with no major effects on the coefficient. Standard errors increase slightly, mainly because the number of observations decreases by almost one-fifth. We also estimated equation (9) with two separate dummies for bank

and bond restructurings instead of the more general "private restructurings" dummy. For the case of market rates, both dummies are negative and significant at the 1% level in all specifications. When using risk-free discount rates, the dummies are also negative and statistically significant, but only in the first two specifications and not when adding the full set of controls.

Furthermore, we check whether and how our main assumptions drive the results. In particular, we use Libor instead of ATBs to compute debt service and make different assumptions on the debt type and restructuring choices for the Paris Club deals for which this information is not known. Specifically, we assume that haircuts for all restructurings with partial debt stock cancellation equal the cancellation rate in the Paris Club terms.[36] In each case, the overall finding is little affected. Private creditors continue to show significantly lower haircuts compared to official creditors, especially when using market discount rates. Moreover, we exclude all restructurings associated with the HIPC Initiative for both private and official creditors, in particular, to avoid double counting associated with our assumption that there is no topping up. The results are again not affected.

We also use alternative estimation procedures. First, we run fractional response models to account for the fact that the dependent variable is a share that is bounded between 0 and 1. Second, we run a Tobit regression that allows us to simultaneously study the restructuring choice (determinants of restructuring) and the size of the haircut in that restructuring. Our main result is robust to the method applied. Finally, we differentiate between final and intermediate restructurings since several countries implement multiple restructurings within the same debt crisis spell (see Reinhart and Trebesch, 2016a, for a discussion). Our main results are unaffected if we compare "final" restructurings only (those not followed by another restructuring within four years).

4.5   Synthesis of debt restructurings and arrears

So far, we have analyzed the patterns of restructurings and arrears separately. We now extend the analysis to provide a synthesis of these interrelated events. Specifically, we investigate the patterns of arrears before and after restructurings of private and official debt and how the behavior of arrears differs among them.

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[36]Since this cancellation rate applies to the net present value of the debt stock, we cannot apply it directly to the haircut estimates.

Figure 12 shows arrears on private creditors as a fraction of GNI around events of private debt restructurings, while Figure 13 shows the dynamics of arrears around official debt restructurings with the Paris Club. Because some restructurings involve no arrears at all, we only include episodes with an initial level of arrears exceeding 1% of GNI.[37] We show separate graphs using averages and quartiles, since the averages are strongly driven by cases with heavy arrears.

Arrears on private debt exhibit a clear pattern. They are large pre-restructuring, with an average of around 10% of GNI, but fall substantially to around 3% of GNI after the restructuring is implemented. This drop is driven by countries with very high arrears, as illustrated by the 75th percentile line in the right panel. In contrast, arrears on official debt fall much less after a restructuring is implemented, with large amounts of arrears remaining after the settlement. This finding further suggests that official creditors are discriminated against when compared to private creditors.

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[37]Note that our dataset on arrears is from 1979 to 2007, which implies that the analysis excludes the more recent restructurings. Specifically, we include 368 official and 165 private debt restructurings.

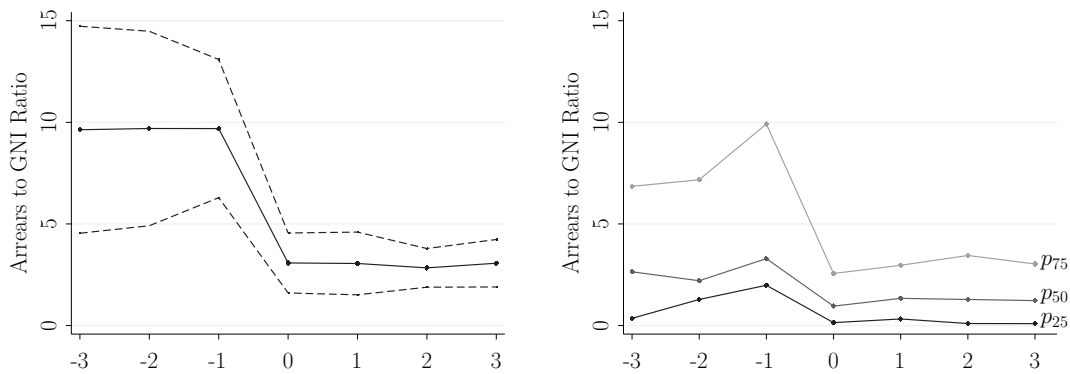Figure 12: Arrears on private debt and private debt restructurings

Figure 13: Arrears on official debt and Paris Club restructurings
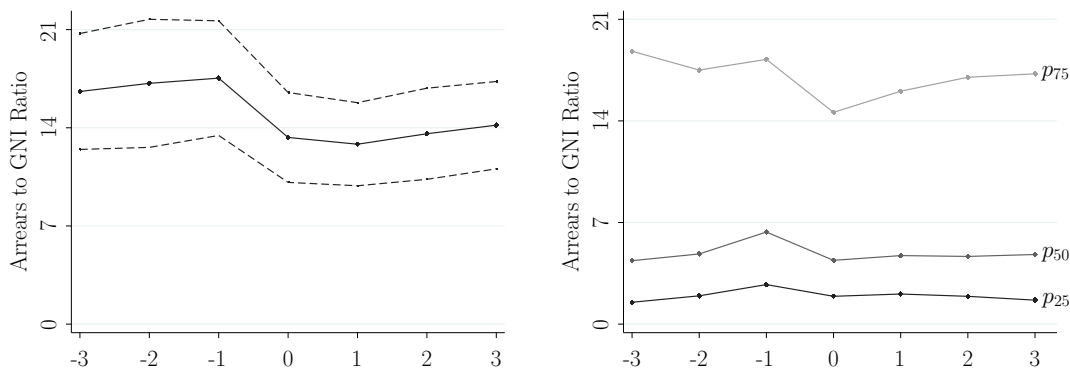
Note: The panels of each figure show the behavior for all restructurings for which arrears exceeded 1% of GNI one year prior to the restructuring, which takes place at time zero. This implies a total number of 74 private debt and 225 Paris Club deals. The panels on the left show the mean values and the 95% confidence intervals (two standard errors), and the panels on the right side illustrate the median as well as the 25th and 75th percentiles.

5 Conclusion

This paper analyzed the implicit seniority structure in sovereign debt markets using a new dataset on the extent of missed payments (arrears) and the size of creditor losses (haircuts) toward private and official creditors. We find a clear pecking order that is robust to controlling for a range of country-specific variables: multilateral official creditors and bondholders are senior lenders, whereas bilateral official creditors, banks, and trade creditors are junior. The fact that bilateral official creditors tend to be junior to private creditors, and that this ranking has become more pronounced over time, is surprising given official creditors' historical insistence on preferable treatment.

The results pose a challenge for the theoretical literature on sovereign debt, which has typically ignored both the heterogeneity of sovereign debts as well as the heterogeneous treatment of creditors in the event of default. Perhaps most importantly, by examining the decisions of sovereigns to default and restructure debts differentially across creditors, our findings can shed light on the fundamental question of sovereign debt: what, precisely, are the costs of default to a sovereign country? Future research should explain the discriminatory patterns documented here and thereby improve our understanding of the specific incentives constraining borrowing and default.

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Appendix A: Creditor seniority during S&P defaults

The existing empirical literature typically focuses on one particular type of sovereign default: that toward private banks and bondholders. This section matches our arrears data across creditors with the widely used default indicator by Standard & Poor's, which captures missed payments and/or restructuring events by sovereigns toward external banks and bondholders. The measure strongly correlates with other main databases of sovereign defaults on private creditors, such as Reinhart and Rogoff (2009), but it is not designed to capture default toward official creditors (Reinhart and Trebesch, 2016a).

Figure A.1 shows the average arrears-to-debt ratio for each creditor group during S&P default episodes compared to normal times. Arrears-to-debt ratios increase substantially for each creditor group during default episodes, with the total ATD increasing from 4.9% in normal times to 10.7% during defaults. Unsurprisingly, the increase in arrears is particularly large for those creditors for which S&P measures defaults: banks and bondholders. Figure A.2 shows the same statistics for the $RPIA$, our preferred measure of creditor seniority. In both figures, the pecking order is rather similar to our baseline results.

The takeaway is that the seniority structure of sovereign debt that we have documented remains intact even if we focus only on default episodes as defined by conventional measures. Moreover, the picture is consistent with the interpretation of the S&P dummy as a measure of default toward private creditors.

Figure A.1: Arrears-to-debt ratios during S&P defaults
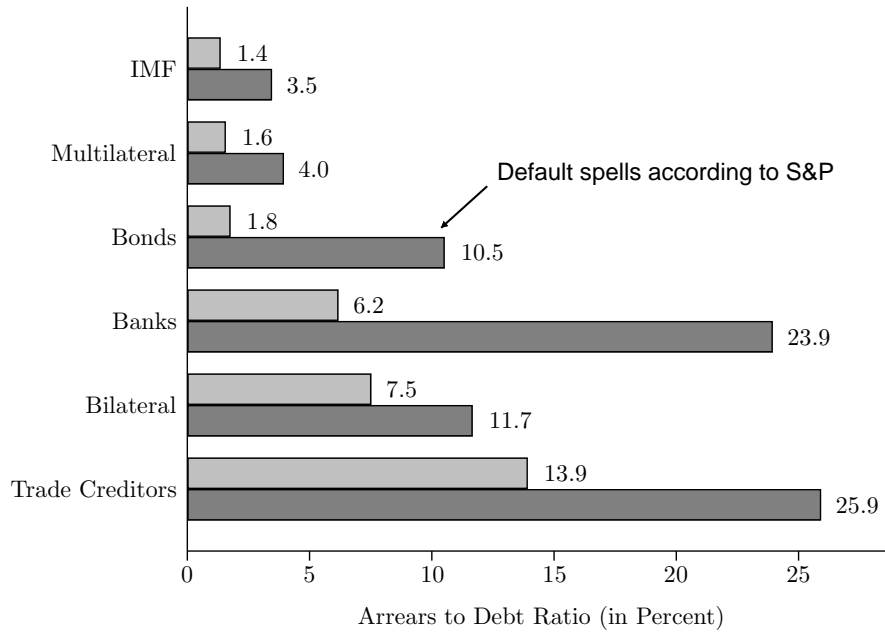
Note: This figure shows average creditor-specific ATDs during default episodes according to S&P (dark grey bars) and compares it to the average ATDs in nondefault spells ("normal times," lighter gray bars). S&P considers defaults toward external bank and bond creditors only. The averages are unweighted means over all nondefault and default years, respectively.

Figure A.2: Relative percentage in arrears during S&P defaults
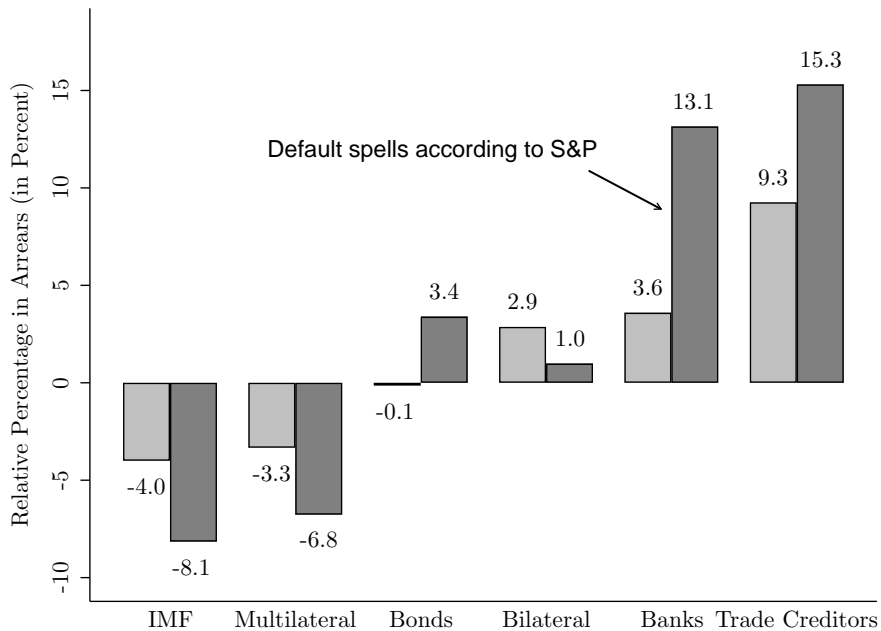
Note: This figure shows average creditor-specific RPIAs during default episodes according to S&P (dark grey bars) and compares it to the average RPIAs in nondefault spells ("normal times," lighter gray bars). S&P considers defaults toward external bank and bond creditors only. The averages are unweighted means over all nondefault and default years, respectively.

Appendix B: Background on the Paris Club

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. It first met in 1956. Restructurings with the Paris Club became particularly relevant during the heyday of the debt crises in the 1980s and 1990s. Since then, the number of agreements has declined. By 2015, the Paris Club had completed 433 debt relief agreements with 90 debtor countries, thereby restructuring over 580 billion US dollars.

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, restructurings became increasingly standardized and increasingly concessional, including debt stock cancellations to tackle problems of long-term debt sustainability in low-income countries.

The Paris Club is guided by a number of so-called principles, in particular, those of unanimity and equal burden sharing among its members. In addition, the comparability of treatment clause requires countries to seek comparable debt relief from their bilateral and private creditors.

A debtor country that wants to restructure its debts with the Paris Club has to demonstrate its inability to service its obligations and hence the need for debt relief. In addition, countries are expected to implement a structural adjustment program with the IMF. Once these criteria are met, negotiations with the group of creditor countries take place in Paris.[38] These negotiations result in a final agreement on the broad terms of restructurings - the "Agreed Minutes."

The Agreed Minutes are based on general terms that have evolved over time toward more comprehensive debt relief and concessional treatment, particularly for low-income countries.[39] These general terms can be distinguished as follows:

- *Classic Terms* were the standard terms applied to restructurings with debtor countries until the late 1980s. Negotiations were on a case-by-case basis, and the terms applied to both official development aid (ODA) and market-related debt such as

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[38]In addition, several noncreditor representatives participate as observers, as do representatives from various international organizations such as the World Bank or the International Monetary Fund.

[39]Martin and Vilanova (2001), Gueye et al. (2007), and Cheng et al. (2016, 2017) provide a detailed overview of the different terms.

export credits (non-ODA).[40] The terms were modified in 2003 to provide more comprehensive and flexible treatment of unsustainable debt levels in non-HIPCs including the possibility of debt stock cancellations ("Evian Approach").[41]

- Restructuring terms for highly indebted middle-income countries were enhanced in the *Houston Terms* of 1990. These terms allow for a differential treatment of non-ODA and ODA debt with a substantial extension of maturities and grace periods. Yet, there is no debt stock cancellation.

- Restructuring terms for highly indebted low-income countries became increasingly concessional over time. In particular, 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 the wake of the Heavily Indebted Poor Country (HIPC) Initiative, cancellation rates increased further to 80% in 1996 (*Lyons Terms*) and 90% in 1999 (*Cologne Terms*). Finally, debt relief at completion point under the HIPC Initiative is provided within the *HIPC Exit Terms*. All these terms allow for a differential treatment of ODA and non-ODA debt and give countries two options for how debt relief on non-ODA debt is delivered. In addition, maturity and grace periods are substantially extended, particularly for ODA debt.

Our estimated haircuts for official creditors vary considerably over Paris Club terms of agreement. Haircuts are in general lower for middle-income countries that reschedule under Classic Terms (average haircut of 40.4%) or Houston Terms (38.5%) than for low-income countries. For the latter, haircuts increase as Paris Club terms become increasingly concessional. Specifically, average haircuts increase from 75.7% under Toronto Terms to 85.3% under HIPC Exit Terms (not taking into account additional bilateral debt relief).

The Agreed Minutes are not legally binding but serve as a benchmark for subsequent bilateral negotiations. The resulting bilateral agreements are not publicly available. The Agreed Minutes include guidelines for the agreed consolidation period, the cutoff date, the total amount of debt relief including the restructured debt stock and potential cancellation, as well as the grace and maturity periods.

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[40]Specifically, the Classic Terms are defined as follows: "Credits (whether ODA or non-ODA) are rescheduled at the appropriate market rate with a repayment profile negotiated on a case-by-case basis."

[41]Restructurings under the Evian Approach are also made on a case-by-case basis against the specific background of the debtor. Hence, we do not differentiate between these two approaches within the set of classic terms. Examples for the Evian Approach include Iraq (2004), Kenya (2004), Grenada (2006), and the Seychelles (2009).

Appendix C: Additional Tables and Figures

The following tables and figures are included in this appendix:

- Tables: Table C.1 summarizes descriptive statistics of the $RPIA$ measure of creditor seniority for different subsamples. Table C.2 provides an overview of the control variables used in the regressions. Table C.3 shows the full regression results associated with Table 1 in the main text. Table C.4 shows the Oaxaca-Blinder results when the lagged dependent variable is included in the regression. Table C.5 summarizes descriptive statistics of haircuts for different subsamples. Table C.6 shows the full regression results associated with Table 3 in the main text.
- Figures: Figure C.1 shows the amounts of debt restructured by creditor type. Figures C.2 to C.7 show the behavior of arrears during restructurings for selected countries.

Table C.1: Sample statistics: Relative percentage in arrears

	Bilateral	Multilateral	IMF	Bonds	Banks	Trade Creditors
Total Sample	2.31	-5.01	-6.20	0.95	7.76	12.64
High Income	0.46	-3.99	-4.32	-0.11	2.21	5.98
Medium Income	1.20	-4.58	-6.38	-0.13	7.36	10.25
Low Income	5.99	-6.84	-7.90	6.68	16.35	23.77
East Asia	1.24	-4.06	-2.28	-2.27	-0.75	6.89
Europe	0.76	-2.80	-3.63	-0.58	2.26	5.77
Latin America	0.51	-4.54	-5.45	2.31	9.54	12.10
Middle East	-0.79	-5.44	-10.01	-1.62	2.35	2.73
South Asia	0.13	-0.25	-0.24	-0.81	0.25	1.78
Sub-Saharan Africa	5.58	-7.16	-8.93	2.30	13.88	21.58
BLEND Countries	2.31	-2.82	-1.65	0.08	4.57	7.45
IBRD Countries	0.09	-4.13	-5.67	-0.72	2.44	5.77
IDA Countries	4.60	-6.68	-7.75	5.68	15.08	21.04
Autocracy	2.86	-6.92	-8.36	-1.07	8.09	13.69
Intermediate	2.87	-6.14	-6.76	4.61	11.13	17.21
Democracy	0.59	-2.44	-3.43	1.16	4.54	4.82

Note: Shown are unweighted means of country averages for the relative percentage in arrears (RPIA) in percent. The definition of income groups (rows 2-4) is based on the classification of the World Bank and described in Figure 3 of the main text. Regions (rows 5-10) and lending categories (rows 11-13) also follow the definition of the World Bank as of 2015. Political regimes (rows 14-16) are based on the Polity II index, which ranks countries from -9 to +9. Countries are defined as democracies (autocracies) if they have a score above 3 (below -3).

Table C.2: Overview of control variables

Basic Controls

Debt-to-GNI Ratio (creditor-specific): Public and publicly guaranteed long-term debt of each creditor group as a fraction of GNI in percent. Source: WDI

External Debt to GNI: Total external debt is debt owed to nonresidents repayable in foreign currency, goods, or services. It is the sum of public, publicly guaranteed, and private nonguaranteed long-term debt, short-term debt, and use of IMF credit. Source: WDI

GDP per Capita: GDP per capita is gross domestic product (in real US dollars) divided by midyear population. Source: WDI

GDP Growth: GDP growth is the growth rate (in percent) of real GDP (measured in constant US dollars). Source: WDI

War Dummy: The war dummy equals 1 if the country is engaged in an external or civil war as indicated by the interstate and intrastate war datasets by Sarkees and Wayman (2010). Source: Correlates of War dataset, Sarkees and Wayman (2010)

Capital Market Access Dummy: The market access dummy equals 1 if the country is eligible for the IMF's Poverty Reduction and Growth Facility (PRGF). Source: IMF, Allen (2008)

Dummy for Systemic Banking Crises: A banking crisis is defined as systemic if two conditions are met: (1) significant signs of financial distress in the banking system (as indicated by significant bank runs, losses in the banking system, and/or bank liquidations) and (2) significant banking policy intervention measures in response to significant losses in the banking system. Source: Laeven and Valencia (2012)

Dummy for Currency Crises: A currency crisis is defined as a nominal depreciation of the currency relative to the US dollar of at least 30% that is also at least 10 percentage points higher than the rate of depreciation in the year before. Source: Laeven and Valencia (2012)

Additional Controls

Private-debt-to-external-debt ratio: Private nonguaranteed external debt comprises long-term external obligations of private debtors that are not guaranteed for repayment by a public entity. Source: WDI

Financial openness: Financial openness is defined as the sum of external financial assets and liabilities as a fraction of GNI in percent. Source: Lane and Milesi-Ferretti (2007)

Trade openness: Trade openness is defined as the sum of a country's exports and imports as a fraction of GNI in percent. Source: WDI

Gross domestic investment to GNI: Gross domestic investment consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories. Fixed assets include land improvements; plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings. Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and "work in progress." Net acquisitions of valuables are also considered capital formation. Source: WDI

CPI inflation: Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used. Source: WDI

Short-term external debt to GNI: Short-term external debt is defined as debt that has an original maturity of one year or less. Available data permit no distinction between public and private nonguaranteed short-term debt. Source: WDI

Foreign-reserves-to-external-debt ratio: The ratio of a country's international reserves to total external debt stocks. Source: WDI

Debt service (PPG debt and IMF) to exports: Debt service is the sum of principal repayments and interest actually paid in foreign currency, goods, or services. This variable covers long-term public and publicly guaranteed debt and repayments (repurchases and charges) to the IMF. Source: WDI

Table C.3: Determinants of arrears (OLS, full results)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dependent Variable	RPIA	RPIA	RPIA	RPIA	RPIA	ATD	ATD
Multilateral	-8.09***	-8.08***	-8.08***	-8.34***	-1.42***	-8.09***	-14.45***
	[1.03]	[1.03]	[1.04]	[1.20]	[0.20]	[1.04]	[0.78]
IMF	-10.39***	-10.56***	-10.70***	-10.92***	-1.68***	-10.74***	-54.70***
	[1.24]	[1.26]	[1.28]	[1.46]	[0.25]	[1.24]	[1.40]
Bondholders	0.07	0.35	0.54	-0.02	0.57	0.42	-11.91***
	[2.11]	[2.07]	[2.10]	[2.21]	[0.43]	[2.05]	[1.38]
Banks	7.17***	7.48***	7.59***	5.94***	1.50***	7.59***	5.76***
	[1.46]	[1.47]	[1.48]	[1.56]	[0.32]	[1.48]	[0.86]
Trade Creditors	10.70***	10.89***	10.98***	9.00***	1.93***	10.83***	12.04***
	[1.70]	[1.70]	[1.71]	[1.76]	[0.31]	[1.70]	[0.82]
Debt to GNI	0.04**	0.04**	0.04**	0.05*	0.00	-0.04***	-0.03***
	[0.02]	[0.02]	[0.02]	[0.03]	[0.00]	[0.02]	[0.01]
Real GDP per Capita	0.00	-0.00	0.00	0.00**	0.00	-0.00***	-0.01***
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
Real GDP Growth	-0.23	-4.80	-2.52	-6.66*	-1.00	-10.56**	-17.56***
	[3.14]	[3.41]	[2.84]	[3.98]	[1.71]	[4.50]	[4.67]
Lagged Growth	-0.08	-2.92	-1.26	-1.24	1.60	1.46	-0.81
	[2.76]	[2.57]	[2.48]	[4.46]	[1.58]	[6.92]	[4.47]
External or Civil War	1.62	-0.48	-0.67	-0.35	-0.23	1.24	2.28**
	[1.16]	[0.95]	[0.94]	[1.03]	[0.27]	[1.85]	[0.97]
Banking Crisis	-1.25	-1.06	-1.18	-0.48	-0.34	1.91**	4.18***
	[0.79]	[0.71]	[0.72]	[0.92]	[0.45]	[0.92]	[1.41]
Currency Crisis	-0.62	-0.63	-0.95*	-1.47**	0.12	1.83***	2.71**
	[0.60]	[0.52]	[0.51]	[0.59]	[0.30]	[0.70]	[1.17]
No Market Access	-5.12***	-6.76	-4.31	-0.14	-0.76	4.51	9.61***
	[1.11]	[4.19]	[4.43]	[4.47]	[0.87]	[5.98]	[2.68]
External Debt to GNI	-0.01**	-0.01*	-0.01	-0.04*	0.00	0.04***	0.04***
	[0.01]	[0.01]	[0.01]	[0.02]	[0.00]	[0.01]	[0.00]
Trade Openness				0.09***			
				[0.03]			
Debt Service to Exports				-0.03			
				[0.06]			
Reserves to Debt				0.00			
				[0.00]			
Short-term Debt to GNI				0.10*			
				[0.05]			
Share of Private Debt				-0.01			
				[0.04]			
CPI Inflation				-0.00			
				[0.00]			
Investment to GDP				-0.01			
				[0.05]			
Financial Openness				-0.01**			
				[0.00]			
Lagged RPIA					0.88***		
					[0.01]		
Constant	-0.27	1.08	1.55	-7.18**	0.47	2.64	13.63***
	[1.03]	[1.75]	[2.15]	[2.74]	[0.55]	[4.96]	[3.18]
Country Fixed Effects	No	Yes	Yes	Yes	Yes	Yes	Yes
Time Fixed Effects	No	No	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.195	0.242	0.249	0.249	0.786	0.437	0.133
Observations	11931	11931	11931	9176	11790	11931	11931

Benchmark category: bilateral official loans; standard errors in brackets; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table C.4: Oaxaca-Blinder decomposition with lagged dependent variable

	Difference in RPIA	Explained (fundamental)	Unexplained (discrimination)	Discrimination (in Percent)
IMF - Multilateral	- 1.09	- 1.18	0.09	-8.49
IMF - Bilateral	- 9.08	- 8.20	- 0.88	9.70
IMF - Bondholders	-8.00	-6.95	-1.05	13.12
IMF - Banks	-16.73	-13.82	-2.91	17.38
IMF - Trade Creditors	-20.77	-18.45	-2.32	11.18
Multilateral - Bilateral	- 7.99	-6.87	- 1.12	14.07
Multilateral - Bondholders	-6.91	-6.03	-0.88	12.77
Multilateral - Banks	-15.64	-13.19	-2.45	15.65
Multilateral - Trade Creditors	-19.68	-17.60	-2.08	10.57
Bilateral - Banks	-7.65	-6.11	-1.54	20.17
Bilateral - Trade Creditors	-11.69	-10.19	-1.51	12.84
Bondholders - Bilateral	- 1.08	- 1.45	0.37	-34.22
Bondholders - Banks	-8.73	-8.13	-0.59	6.83
Bondholders - Trade Creditors	-12.77	-12.29	-0.48	3.76
Banks - Trade Creditors	-4.04	-3.55	-0.49	11.96

Note: The table shows the Oaxaca-Blinder decomposition for the mean difference in RPIAs across creditor groups. The mean difference is listed in the first column. The second and third columns show the part of the difference that is fundamentally justified and the part of the difference that is unexplained and thus reflects active creditor discrimination. The last column states the fraction of the mean difference that reflects discrimination in percent. Note that mean differences vary from the sample statistics because of data availability with respect to the explanatory variables.

Table C.5: Sample statistics: Haircuts

	Paris Club (Lower Bound)	Paris Club (Upper Bound)	Private Creditors (Market Rate)
Mean	59.9	78.6	40.5
Std. Deviation	25.8	20.8	27.7
Minimum	-19.3	21.5	-9.8
25th Percentile	41.2	62.5	19.2
50th Percentile	61.4	86.0	40.3
75th Percentile	84.5	96.9	56.3
Maximum	100	100	97.0
Observations	387	320	187
1978-1989			
Mean	51.0	68.7	27.8
Std. Deviation	18.6	17.8	19.9
Minimum	15.2	25.7	-9.8
25th Percentile	39.1	55.6	12.6
50th Percentile	47.6	70.4	28.8
75th Percentile	58.8	83.5	42.3
Maximum	89.8	99.5	92.7
Observations	124	102	99
1990-1999			
Mean	60.1	78.9	52.6
Std. Deviation	27.2	22.1	28.1
Minimum	-9.3	24.5	-8.3
25th Percentile	38.3	63.4	29.2
50th Percentile	68.7	89.1	49.2
75th Percentile	84.0	97.1	82.0
Maximum	95.8	99.9	92.3
Observations	137	109	58
2000-2014			
Mean	68.4	87.5	58.8
Std. Deviation	27.7	17.8	28.8
Minimum	-19.3	21.5	4.1
25th Percentile	50.4	85.6	36.9
50th Percentile	77.1	95.2	61.0
75th Percentile	88.7	99.1	85.5
Maximum	100	100	97.0
Observations	126	109	30

Table C.6: Determinants of haircuts: OLS with creditor dummy

|	Lower-Bound Estimates			Upper-Bound Estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Private Creditors	-8.83***	-5.30**	-5.21*	-29.41***	-26.67***	-26.51***
	[2.46]	[2.42]	[2.88]	[2.34]	[2.25]	[2.65]
Restructured Debt	0.24**	0.14*	0.10	0.21**	0.13	0.12
(Share of External Debt)	[0.09]	[0.08]	[0.09]	[0.09]	[0.08]	[0.08]
External Debt to GNI	0.03***	0.03***	0.10***	0.05***	0.04***	0.08**
	[0.01]	[0.01]	[0.04]	[0.01]	[0.01]	[0.03]
Real GDP per Capita	-3.70***	-3.60***	-3.27***	-3.50***	-3.27***	-2.71***
(in 1000 constant 2005 US$)	[0.88]	[1.07]	[1.14]	[0.74]	[0.81]	[0.88]
GDP Growth (3-year MA)	1.51***	0.88***	0.78***	1.09***	0.61*	0.59
	[0.27]	[0.28]	[0.26]	[0.31]	[0.33]	[0.37]
External or Civil War	1.49	0.10	-0.21	0.73	-1.14	-1.26
	[3.39]	[3.44]	[3.94]	[3.06]	[2.85]	[3.28]
Banking Crisis	0.35	-1.32	-0.85	-0.71	-3.81	-2.03
	[2.79]	[2.56]	[3.39]	[2.95]	[2.86]	[3.72]
Currency Crisis	-4.10	-2.82	-3.27	-2.67	-0.59	-1.22
	[2.64]	[2.33]	[2.82]	[2.43]	[2.37]	[2.78]
Lack of Market Access	23.54***	21.37***	17.94***	17.70***	16.94***	15.11***
	[3.89]	[4.56]	[4.92]	[3.88]	[4.24]	[4.89]
Trade Openness			-0.07			-0.02
			[0.05]			[0.05]
Debt Service to Exports			-0.11			0.05
			[0.11]			[0.12]
Reserves to Debt			0.09			-0.02
			[0.12]			[0.15]
Short-Term Debt to GNI			-0.35**			-0.16
			[0.16]			[0.15]
Share of Private Debt			-0.25			-0.29
			[0.26]			[0.23]
Inflation (CPI)			0.00			0.01**
			[0.00]			[0.00]
Investment to GNI			0.01			-0.09
			[0.20]			[0.20]
Financial Openness			0.00			-0.01
			[0.01]			[0.01]
Constant	39.14***	33.92***	39.30***	61.52***	52.85***	55.61**
	[3.45]	[4.45]	[10.10]	[3.70]	[6.38]	[23.56]
Time Fixed Effects	No	Yes	Yes	No	Yes	Yes
Adjusted R^2	0.484	0.578	0.576	0.607	0.680	0.673
Observations	442	442	359	389	389	314

Clustered standard errors (at country level) in parentheses; * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Figure C.1: Amount of restructured debt by creditor group
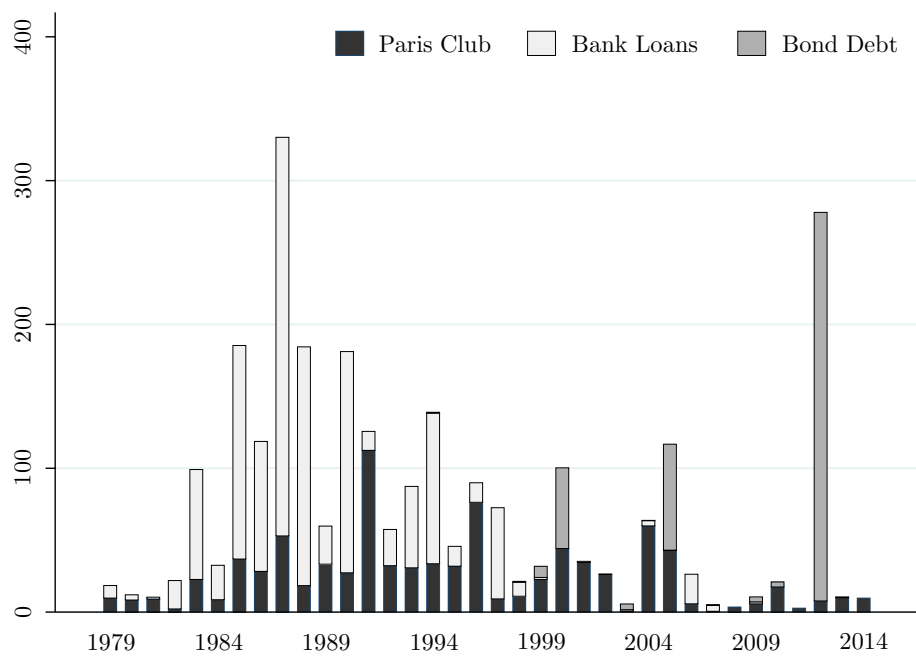
Note: This figure shows the amount of restructured debt in real US dollars (billions) by year and creditor group for the period 1978-2015. Values are inflated to 2014 USD using US CPI inflation.

Figure C.2: Case study: Argentina
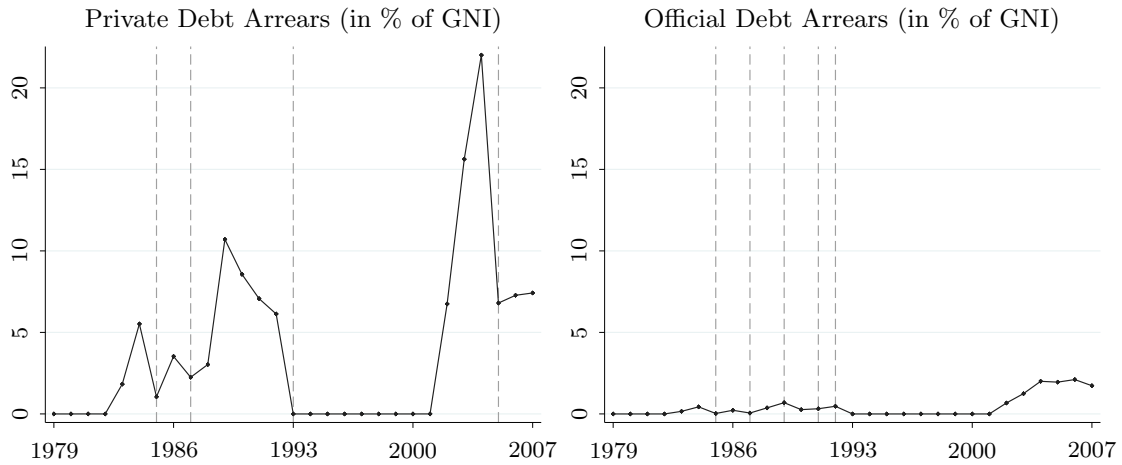
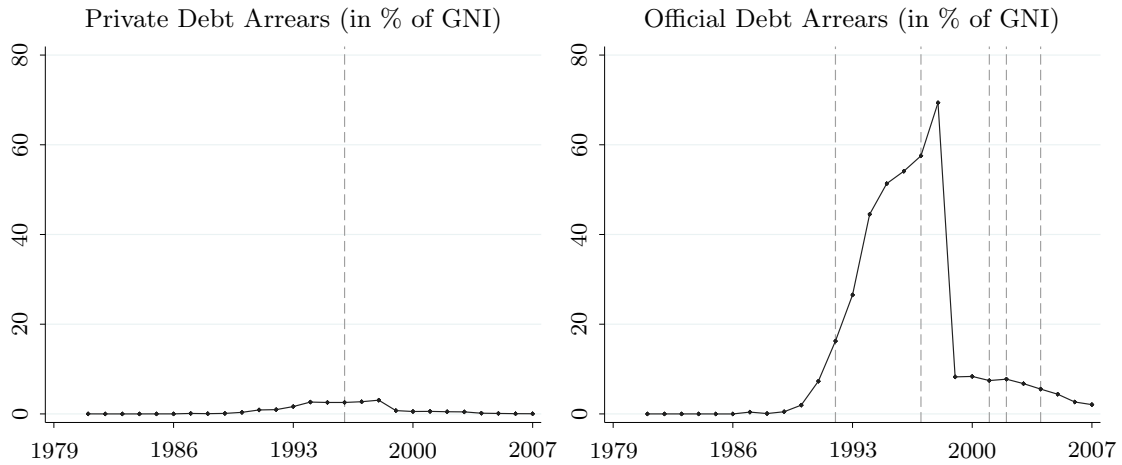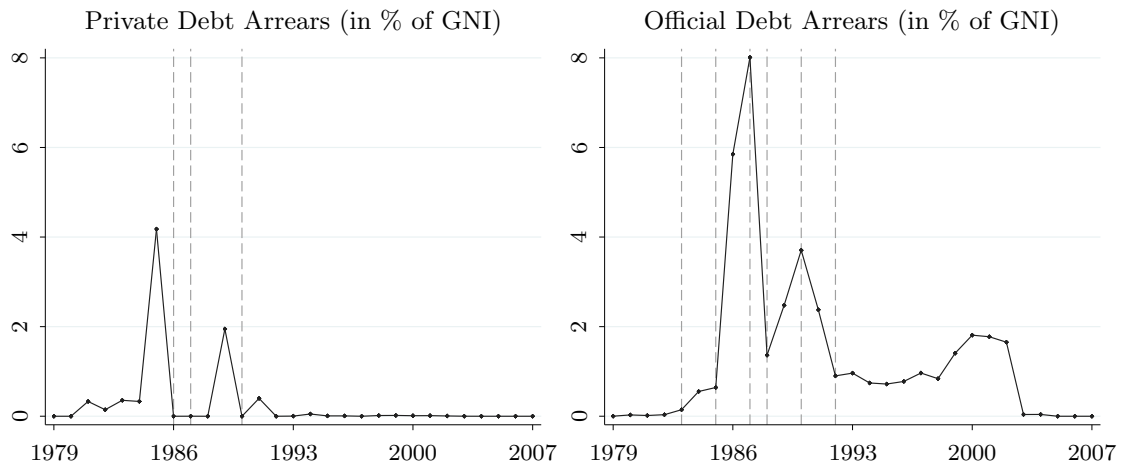Private Debt Arrears (in % of GNI) Official Debt Arrears (in % of GNI)

Note: This figure shows official and private arrears as a fraction of GNI. The vertical bars indicate restructurings of official (left panel) and private (right panel) debt.

Figure C.3: Case study: Ecuador
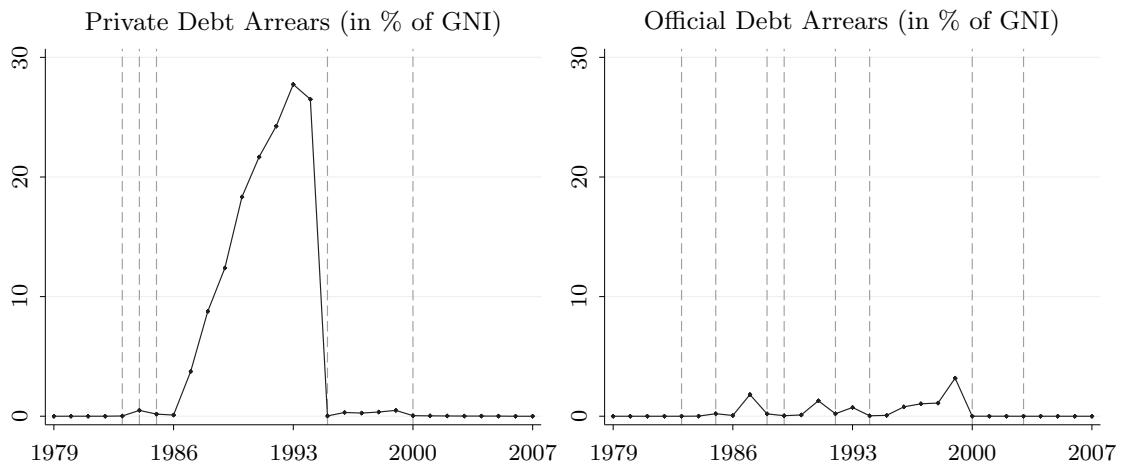
Private Debt Arrears (in % of GNI) Official Debt Arrears (in % of GNI)

Note: This figure shows official and private arrears as a fraction of GNI. The vertical bars indicate restructurings of official (left panel) and private (right panel) debt.

Figure C.4: Case study: Ethiopia

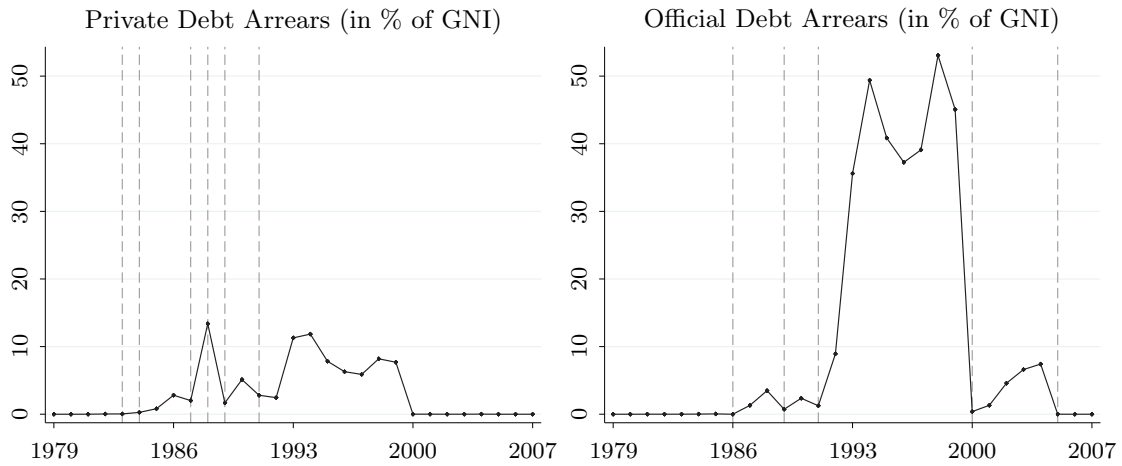Private Debt Arrears (in % of GNI)   Official Debt Arrears (in % of GNI)

Note: This figure shows official and private arrears as a fraction of GNI. The vertical bars indicate restructurings of official (left panel) and private (right panel) debt.

Figure C.5: Case study: Morocco

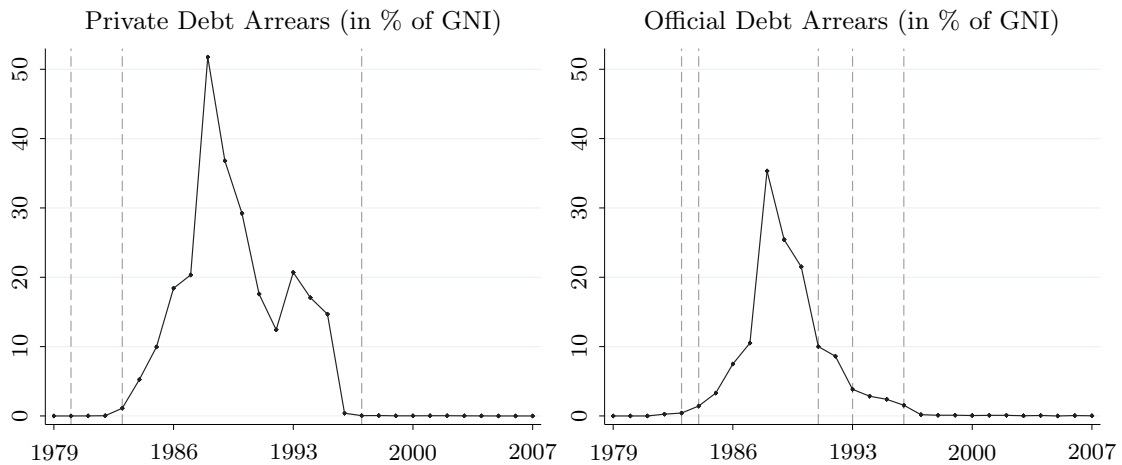Private Debt Arrears (in % of GNI)   Official Debt Arrears (in % of GNI)

Note: This figure shows official and private arrears as a fraction of GNI. The vertical bars indicate restructurings of official (left panel) and private (right panel) debt.

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Figure C.6: Case study: Nigeria

Private Debt Arrears (in % of GNI) Official Debt Arrears (in % of GNI)

Note: This figure shows official and private arrears as a fraction of GNI. The vertical bars indicate
restructurings of official (left panel) and private (right panel) debt. GNI data are 1999 is missing
and replaced by the average of the 1998 and 2000 values for illustrative purposes.

Figure C.7: Case study: Peru

Private Debt Arrears (in % of GNI) Official Debt Arrears (in % of GNI)

Note: This figure shows official and private arrears as a fraction of GNI. The vertical bars indicate
restructurings of official (left panel) and private (right panel) debt.

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