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Restructuring sovereign bonds: holdouts, haircuts and the effectiveness of CACs

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Abstract

Sovereign debt crises are difficult to solve. This paper studies the "holdout problem", meaning the risk that creditors refuse to participate in a debt restructuring. We document a large variation in holdout rates, based on a comprehensive new dataset of 23 bond restructurings with external creditors since 1994. We then study the determinants of holdouts and find that the size of creditor losses (haircuts) is among the best predictors at the bond level. In a restructuring, bonds with higher haircuts see higher holdout rates, and the same is true for small bonds and those issued under foreign law. Collective action clauses (CACs) are effective in reducing holdout risks. However, classic CACs, with bond-by-bond voting, are not sufficient to assure high participation rates. Only the strongest form of CACs, with single-limb aggregate voting, minimizes the holdout problem according to our simulations. The results help to inform theory as well as current policy initiatives on reforming sovereign bond markets.

Keywords: Sovereign default, debt restructuring, international financial architecture, creditor coordination

JEL codes: F34, G15, H63, K22

Non-technical summary

Sovereign defaults are a recurrent feature of international capital markets, but the resolution of such crises is challenging. A major obstacle to resolving debt crises is the coordination problem among bondholders. If debt relief is required to restore debt sustainability, debtor governments need to convince a sufficiently large share of creditors to participate in a debt exchange at a loss (or haircut). While a smooth resolution of a crisis situation may also be in the interest of creditors, each individual investor has an incentive to free-ride, by rejecting the haircut suffered by other creditors and insist on full repayment instead. Holdout creditors could even go to court to enforce their claims in full, resulting in less debt relief and the risk of disruptive litigation. This well-known "holdout problem" has become evident in recent sovereign restructurings, most notably in Argentina 2005.

Thus far, the main policy response to solve this type of creditor coordination problem has been the introduction of Collective Action Clauses (CACs) in sovereign bond contracts. CACs can bind minority holdouts to accept the terms of a debt restructuring if a sufficiently large super-majority accepts the offer. While there is a large literature on the potential pricing implications of including CACs in bond contracts *ex ante*, there is little empirical evidence on the question of how effectively CACs can achieving their intended purpose of reducing holdout rates *ex post*.

This paper analyses if CACs effectively reduce holdout rates in sovereign debt restructurings. To shed light on this question, we build a comprehensive new dataset on bond-level creditor participation rates in 23 bond restructurings with external creditors since 1994. The granular new data reveals a large variation in holdout rates across and within restructuring events. The paper then analyses the bond-level outcome of the restructuring attempts to explore the drivers of creditor holdout rates and the efficacy of CACs.

The results show that the size of creditor losses (haircuts) is among the best predictors of participation rates at the bond level: the higher the losses suffered by investors on a given bond, the higher the share of holdouts in that bond. This result is driven by the variation of haircuts *within* a restructuring, while the aggregate haircut (the size of debt relief) is not a good predictor of holdout risks. We also find that smaller bonds, as well as bonds issued under foreign law (such as English law), bonds with high coupons, and more actively traded bonds see higher average holdouts.

Most importantly, the data show that CACs help to reduce holdout rates, especially for bonds with high haircuts. However, first-generation CACs (with bond-by-bond voting) are not sufficient to assure high participation rates. Simulations show that only the strongest form of CACs, with single-limb aggregate voting, minimizes the holdout problem. These results help to inform theory as well as current policy initiatives on reforming sovereign bond markets, in particular on introducing single-limb CACs in newly issued bonds.

1 Introduction

Sovereign defaults are a recurrent feature of international capital markets, but their resolution is challenging. A major obstacle to resolving debt crises is the coordination problem among a large and dispersed group of bondholders, as debtor governments need to convince a sufficiently large share of creditors to participate in a debt exchange at a loss (or haircut). At the same time, each individual investor has an incentive to free-ride, reject the haircut suffered by other creditors, and possibly go to court, resulting in less debt relief and the risk of disruptive litigation. This well-known "holdout problem" became evident in recent restructurings in Argentina 2005 and Greece 2012, which both resulted in large-scale holdout rates and, in the case of Argentina, a messy and protracted legal dispute with these creditors. Thus far, the main policy response to solve this type of creditor coordination problems has been the introduction of *Collective Action Clauses* (CACs) in sovereign bond contracts, which can bind in minority holdouts via majority voting. This paper compiles a new dataset on sovereign debt restructurings and bond exchange outcomes to explore the drivers of creditor holdouts and the efficacy of CACs for the first time.

Our analysis is motivated by an ongoing debate on how to reform sovereign debt markets and their legal framework. The IMF, the European Union, and the United Nations have all recognized that the risk of strategic holdout behavior and litigation by specialized distressed debt funds has increased in recent years.[1] To react to this development and protect the interest of both debtor countries and the majority of creditors, the International Capital Market Association (ICMA) recommended the introduction of a new generation of CACs with aggregation features, an initiative that was supported by the IMF and the US Treasury (for a detailed discussion see Gelpern et al., 2016; International Monetary Fund, 2017). These "single-limb" CACs no longer require bond-by-bond voting and have since been adopted in new bond issues by many emerging economies, and are also planned to be used in the euro area as of 2022. The debate has been accompanied by a large theory literature, reviewed below, with contradicting results on whether CACs help to solve creditor coordination problems or not. This body of theoretical work has not been brought to the data so far.

[1] The policy debate is summarized in Krueger (2002); United Nations (2012, 2016); International Monetary Fund (2013, 2014, 2016); Buchheit et al. (2013a,b). Relatedly, Schumacher et al. (2015, 2018) show that more than half of recent sovereign debt restructurings involved creditor litigation.

Despite the policy relevance of these issues, empirical evidence on the holdout problem and the effectiveness of CACs is scarce. One reason has been a lack of data on the characteristics and outcomes of bond exchanges. In particular, we are not aware of previous work collecting participation rates for a broad sample of restructured bonds. With a view to CACs, there is now a large and influential literature that explores pricing effects, meaning their impact on sovereign bond yields and borrowing costs.[2] However, thus far, no empirical paper has actually tested whether and how CACs work in practice, i.e. whether they succeed in raising participation rates in sovereign debt restructurings and whether the type of CACs matters for the outcome.[3]

This paper aims to fill this gap in the literature by studying the holdout problem with a comprehensive bond-level dataset covering 418 instruments in 23 debt exchange deals with external bondholders since 1994, when Panama became the first country to default on modern-era sovereign bonds. The dataset builds on a large number of sources, including dozens of exchange prospectuses, policy documents, news archives as well as financial market databases. From these sources we gather detailed data on bond features, participation rates, and also compute haircuts on the instrument level. The result is a new empirical resource on modern-era sovereign bond exchanges.

The data reveal a large variation in restructuring outcomes. In the cross-section of bonds, the share of holdouts varies from 0 to 100%, with a standard deviation of 24.7 percentage points. There is also a large heterogeneity within restructuring events. In cases like Uruguay 2003, Argentina 2005, and Greece 2012, a considerable share of bonds did not reach 75%, which is the common participation threshold in classic bond-by-bond CACs. The data also reveal a large variation in haircuts: the average range of haircuts within the same deal is 17.7 percentage points, indicating considerable discrimination across bondholders.

What explains the large observed variation in holdouts? Why do some bond exchanges fail due to low participation? And what are the characteristics that make a bond more prone to holdout patterns? Our estimates show that the size of haircut is an important predictor of holdouts at the bond level. According to our baseline estimate, a one-standard-deviation increase in haircut

[2] See, for example, Becker et al. (2003); Eichengreen and Mody (2004); Bardozzetti and Dottori (2014); Bradley and Gulati (2013); Carletti et al. (2017); Picarelli and Erce (2018).

[3] Schumacher et al. (2015) examine the determinants of sovereign debt litigation, but do not explore the role of CACs or the size of holdouts due to a lack of data on these.

size (25 percentage points) is associated with a 9 percentage point higher holdout rate, after controlling for bond and deal characteristics. Importantly, this result is driven by the variation of haircuts within the same restructuring, rather than by the variation in aggregate haircuts (size of debt relief) across deals. In addition, we find that smaller bonds (low outstanding amount), bonds issued under foreign-law (such as New York or English law), bonds with high coupons, and more actively traded bonds (those with regular prices on Bloomberg) see lower participation rates. These results are relevant for distressed governments who want to know which bonds could become a target of strategic holdout investors in a sovereign debt restructuring.

Our results further suggest that CACs help reduce final holdout rates, on average. According to our baseline result with deal-fixed effects and controls, bonds with CACs see final holdout rates that are between 10 and 20 percentage points lower than those without. We also find an interaction effect of CACs and haircuts, meaning that CACs can help to reduce the impact of haircuts on the likelihood that investors hold out. More specifically, CACs significantly reduce holdout rates for haircuts of about 30% or higher, but there are barely any effects for low-haircut bonds.

These average results mask a large heterogeneity. The data show that "classic" CACs are not sufficient to achieve high participation, since they typically require a 66 2/3% or 75% majority in each individual series irrespective of the aggregate acceptance rate. In Greece 2012, in particular, more than half of the foreign-law bonds that had this type of bond-by-bond clauses did not reach the necessary voting threshold, resulting in large-scale holdouts despite CACs (€6.4 billion in total). In comparison, Greece achieved full participation for the 75 local-law sovereign bonds that had retrofitted CACs with aggregation features. In other words, the Greek-law bonds had "single-limb" voting, so that a 66 2/3% overall majority across bonds sufficed to bind in all holdouts.

On the other hand, CACs are not a good predictor for initial holdout rates (ex-ante participation). Bonds with CACs are associated with slightly lower pre-CACs holdout rates, but the difference is not statistically significant with deal-fixed effects and controls.

To explore the efficacy of CACs further, we conduct a simple simulation exercise for three of the largest restructuring deals in our sample – Argentina, Uruguay, and Greece – which all had a substantial variation in holdout rates across bonds. We focus on three types of CACs that are in the center of the ongoing policy debate and estimate counterfactual participation rates for each type, respectively:

- *Classic CACs* with a bond-by-bond voting process and 75% voting threshold (like those that have become widespread under New York law since 2003)
- *Euro-CACs (two-limb)* with a bond-by-bond voting threshold of 50% provided that there is an aggregate majority of 66 2/3% (like those used in the euro area since 2013).[4]
- *Single-limb CACs* that require only a single vote across all bonds and have an aggregate threshold of 66 2/3% (Greece 2012) or 75% (ICMA).

We find that only the latter type of strong CACs would have assured full participation, in particular for the high haircut bonds that saw large-scale holdout rates in the data.

In sum, our findings indicate that the recent proliferation of bonds with single-limb CACs with aggregation will make the implementation of future sovereign bond restructurings easier. However, CACs are no panacea to resolve coordination problems in sovereign debt restructurings under all circumstances. Their specific contractual design, especially the strength of the aggregation features, plays a crucial role for the outcome. Hence, our results are consistent with theoretical papers that raise doubts about the unambiguous effectiveness of CACs.

Related Literature: Only few theoretical papers study the effect of CACs on participation rates. Bi et al. (2016) consider a continuum of small creditors and show that CACs can induce full participation. However, the effect is not necessarily stronger compared to other restructuring features such as minimum participation thresholds or exit consents. In contrast, Engelen and Lambsdorff (2009) find that CACs can aggravate the holdout problem. In their model, CACs increase the payoff of unilateral litigation, and therefore result in more incentives to hold out. Similarly, Pitchford and Wright (2012) show that CACs create incentives to free-ride on others' negotiation efforts and therefore lead to longer settlement delay. In the data, such delay often goes hand in hand with higher holdout rates.

[4] These majority thresholds apply if the issuer seeks consent by creditors by means of a "written resolution." Alternatively, a physical bondholder meeting can be called, at which the majority thresholds are higher (75% on aggregate and 66 2/3% at the bond level), and attendance at the meeting needs to reach a quorum of 66 2/3%.

In other theory papers, the effectiveness of CACs in reducing holdouts is an assumption, e.g. in Haldane et al. (2005), who study the optimal CACs threshold, in Bolton and Jeanne (2007, 2009), who explore the ex-ante effects of CACs, or in Ghosal and Miller (2003), who focus on debtor moral hazard and compare CACs to a statutory bankruptcy regime.

On the empirical side, a comprehensive instrument-level study on holdouts is missing, despite improved data availability on sovereign bond restructurings. Sturzenegger and Zettelmeyer (2006, 2008) provide detailed narratives of restructurings in the 1990s and early 2000s and study haircuts in detail. The investor reports by Moody's (2013a,b) show estimates on haircuts and holdouts, but only at the aggregate deal-level. Cruces and Trebesch (2013) also focus on the deal-level and study the link between haircut size and subsequent bond yields and the time to re-access international capital markets. Asonuma et al. (2017) compile instrument-level data on haircuts and study the dynamics of sovereign yield curves in 28 sovereign bond restructurings (domestic and foreign-currency bonds). Finally, the International Monetary Fund (2003), Schumacher (2014), and Zettelmeyer et al. (2013) provide detailed instrument-level case studies on the restructurings in Uruguay 2003, Argentina 2005, and Greece 2013, respectively. We integrate their data into our own data collection on 23 sovereign bond restructuring deals.

2 The Dataset: Restructured Sovereign Bonds, 1994-2015

2.1 Sample, Sources and Variables Used

Sample: We reviewed all sovereign debt restructurings with foreign bondholders of the past four decades and until 2015, using Cruces and Trebesch (2013) as a starting point.[5] During the 1970s and 1980s most developing countries borrowed from major commercial banks in the form of syndicated bank loans, while the rise of bond financing only started in earnest with the Brady deals of the early 1990s and the subsequent issuance of so-called "Brady Bonds."[6] The modern history of sovereign bond defaults and restructurings is therefore rather short. More precisely, it

[5] We exclude restructurings of bonds that went into default in the interwar years (some bond defaults of Communist countries were settled only decades afterwards). See Meyer et al. (2019) for an overview of historical sovereign debt restructurings.

[6] Brady of the U.S. Treasury advocated the exchange of bonds for insolvent bank loans. These bonds are typically collateralized by U.S. Treasury bonds. See e.g. Cruces and Trebesch (2013) for more details on the Brady deals.

begins in the late 1990s, when Ecuador became the first country to default on the Brady bonds, as well as with the defaults of Russia and Ukraine in 1998/1999. The only earlier known case of a modern-era bond restructuring occurred in Panama 1994, but this was a minor side-deal to the much bigger Brady deal of 1996.[7]

We do not include purely domestic bond restructurings in our sample, in particular the restructurings by Paraguay 2006, Jamaica 2010 & 2013, and Cyprus 2013. This reflects the fact that the data quality on entirely domestic deals is significantly less reliable and that governments can more easily use means of financial repression to engineer high participation rates. We make an exception for Russia's exchange of MinFin III and the 2012 exchange by St. Kitts and Nevis, where the bondholders are mostly foreign. In addition, we exclude Russia's restructuring of GKOs in 1999, Ukraine's restructuring of OVDPs in 1999, and Ukraine's restructuring of Gazprom bonds in 2000 where series-level information (in particular outstanding amount for each maturity) was not available.

Due to our focus on bonds and bondholder coordination problems, we also decided to drop loans as well as loan-like bonds. This applies to the Chase-Manhattan Bonds and the ING Barings Bond in Ukraine 1999-2000, the SB Debt Claims and the Sphynx Debt Claims in Cote d'Ivoire 2012, and the $3 Billion Bonds owned entirely by the government of Russia in Ukraine 2015. Moreover, there are 55 bonds with unusual features that we deem as outliers. 23 are strip bonds that were part of the restructuring in Argentina 2005 and Belize 2006. These zero-coupon securities derive from the payments of their original underlying bonds and were treated in different ways.[8] Argentina 2005 has two outliers including a perpetuity bond and the Floating Rate Accrual Notes (FRANs), which had their coupon rate indexed to the yield to maturity of another government bond (the Global Benchmark Bond) and hence a pre-exchange coupon rate of 101%.[9] Greece 2012 exchanged three CPI-indexed bonds with very long maturities, for which we did not find a credible CPI projection at the time of exchange to compute their present values. Finally, the five Brady bonds in Uruguay 2003 were held almost exclusively by banks,

[7]Panama's 1994 bond exchange restructured only USD 452 million compared to the USD 3,936 million in sovereign bank loans that were restructured in the 1996 Brady agreement.

[8]Argentina 2005 allowed some strip bonds to be tendered just like stand-alone bonds, but others had to be tendered together with the remaining parts of the original bonds. Belize 2006 allowed all strip bonds to be tendered separately but only reported participation outcome on the original bond level.

[9]This was because the last fixing of the yield to maturity on the benchmark bonds to which the coupon rate was indexed spiked after the default. For more information on these FRANs, see Levine (2016).

which had kept these bonds on their books after the Brady restructuring of 1990 and refused to take part in the debt exchange offer (see International Monetary Fund (2003)). We drop these 55 special cases in our main analysis, but show robustness checks with all bonds included.

The final sample includes 23 sovereign debt restructurings of 418 bonds issued by 16 countries. We could gather holdout information on almost all of these cases, except for Panama 1994 and Dominica 2004, for which we miss bond-by-bond participation results. For Grenada 2005 and Greece 2012 we could only find post-CACs participation rates but not the initial share of holdouts before CACs voting took place. For all cases we could compute haircuts on the bond-level (as described below) and gather financial characteristics of each bond, in particular issued and outstanding amount, currency denomination, maturity, coupon size and interest rate structure, and legal characteristics such as the type of collective action clauses (if any) and the bond's governing law.

Sources: The dataset is coded on the basis of a large number of sources. The bond-level information is collected from official sources and press releases, financial data providers including Bloomberg and Thomson Reuters, bond prospectuses, news archives, IMF country reports and academic papers. See Appendix for details on the sources for each restructuring. We put particular emphasis on collecting complete data on the three largest bond restructurings, namely Argentina 2005, Uruguay 2003 and Greece 2012.[10] We cross-check between data sources to ensure data integrity. Particularly useful academic references include Sturzenegger and Zettelmeyer (2006, 2008), Cruces and Trebesch (2013) and Zettelmeyer et al. (2013).

Measuring Holdouts: Our main variable of interest is the holdout rate (1 minus participation rate) at the instrument level. As a baseline, we focus on final participation rates as of the final settlement date *after* the application of CACs (if any). More specifically, the holdout rate ($Holdout$) is defined as

$$Holdout = 1 - \frac{\text{Tendered Principal Amount}}{\text{Outstanding Principal Amount}}.$$

[10] For Uruguay 2003, International Monetary Fund (2003) has a detailed anatomy on bond-level participation and Sturzenegger and Zettelmeyer (2006, 2008) offers additional details on the domestic bonds. For Argentina 2005, we derived bond-level holdout rates from the difference in eligible amounts between the 2005 exchange offer and the 2010 exchange offer (Schumacher, 2014) and cross-checked our haircut and other calculations with Sturzenegger and Zettelmeyer (2006, 2008) and Cruces and Samples (2016). For Greece, we use the holdout information from Zettelmeyer et al. (2013) and cross-checked our haircut and other calculations with it.

For robustness, we also check results by looking at holdout rate pre-CACs, meaning *before* the activation of CACs (if any).

Measuring Creditor Losses: Our measure of creditor losses builds on earlier literature, in particular Sturzenegger and Zettelmeyer (2006, 2008), Cruces and Trebesch (2013) and Zettelmeyer et al. (2013). In a typical bond restructuring, the old bond is swapped with a new bond or a portfolio of new bonds.[11] For each old bond, the creditor loss ($Haircut$) is defined as

$$Haircut = 1 - \frac{\text{Present Value of New Bond(s)}}{\text{Present Value of Old Bond + Arrears}},$$

where present value is calculated as the sum of future cash flows discounted based on the "exit yields, i.e., yields on the new bonds immediately at the exit of restructuring.[12] For the new bond, the discount rate is simply its own yield, and the present value equals its market trading price. For the old bonds, there are usually multiple exit yields to consider.[13] As our main specification, the discount rate is chosen as the average of all exit yields, so the discount rate is the same for all old bonds in a restructuring. We call the resulting haircut measure the "Uniform Rate Haircut". For robustness, we also use bond-specific discount rates, which are interpolated from exit yields based on average maturity, currency denomination, and governing law. The approach is similar to Sturzenegger and Zettelmeyer (2006, 2008) and Zettelmeyer et al. (2013), and we call this resulting haircut measure the "Yield Curve Haircut".[14] For restructurings where no exit yield was observable, e.g. St. Kitts and Nevis, we use the imputed discount rates from Cruces and Trebesch (2013).

As discussed in more detail in Cruces and Trebesch (2013), this haircut measure is best suitable to capture the wealth loss suffered by investors participating in the exchange. For intuition, imagine 99% of creditors agree while 1% hold out and continue to be paid. The formula above

[11] Cash payments can be generalized as zero-coupon bonds with zero time to maturity.

[12] We focus on a window of seven days from the settlement day and take the earliest available price and yield for the new bond(s) using either Bloomberg or JP Morgans database of bonds underlying the EMBI. When there are multiple new bond series, we use the same pricing source for all of the new bonds in each restructuring. The only exception is Argentina 2005, where no single source covers all new bonds and we use a combination of Bloomberg and EMBI as well as prices and yields in Sturzenegger and Zettelmeyer (2006, 2008). These three sources are consistent with each other for the bonds in overlap.

[13] For example, Argentina 2005 had nine series of new bonds, each with a different exit yield, ranging from 9.353% to 10.602%. Moreover, following Sturzenegger and Zettelmeyer (2006, 2008), we look at exit yields on not only the new bonds but also the existing bonds that are serviced throughout and excluded from the restructuring.

[14] For restructurings where only one exit yield is observed, we follow Sturzenegger and Zettelmeyer (2006, 2008) and adjust the discount rate by maturity using the U.S. Treasury yield curve.

compares the present value loss by the 99% compared to the 1% holdouts that avoided a haircut but still face the risk of a renewed default. The measure is preferable to what is often called the "market haircut," which compares the present value of the new bonds to the face value (principal) of the old bonds, thus disregarding changes in the maturity or coupon structure of the debt.

We account for past due interests based on remaining principal at the time of default. For bonds that mature prior to the maturity date, we follow Meyer et al. (2019) and calculate post-maturity interests using the coupon rates on the matured debt in default. Specifically, we continue adding up interest arrears for bonds in default that have already matured up to the point in time when settlement occurs. This is in line with Cruces and Samples (2016), who make clear that New York law recognizes post-maturity interests. For robustness, however, we also compute a haircut measure that only accounts for interest arrears until the maturity date but not thereafter.

For instruments with unusual contractual features we need to make additional assumptions, as explained in more detail in the Appendix (Section 1). In case of multiple exchange options ("exchange menu"), we use issuance amounts of the new securities to infer creditor choices.

Comparing our Dataset to Previous Work: We compare our results on holdouts and haircuts to those of earlier work in the Appendix (Sections 2 and 3). In particular, we benchmark against the results reported in Sturzenegger and Zettelmeyer (2006, 2008), Das et al. (2012), Cruces and Trebesch (2013) and Moody's (2013a,b). The comparisons are made at the deal-by-deal level, because previous research does not measure holdouts or haircuts at the bond-level. One exception is the bond-level haircut dataset of Sturzenegger and Zettelmeyer (2008), which we use to make more granular comparisons. The main take away from this comparison is that our haircut estimates are very similar to Sturzenegger and Zettelmeyer (2008), who rely on the same methodological approach. The haircut differences are larger when compared to Cruces and Trebesch (2013), who also include loans, and largest when comparing to Moody's (2013a), who estimate losses at the entry into default. Regarding holdouts, the comparison shows that the aggregate rates are almost identical, which suggests that our bond-level data are accurate.

Collective Action Clauses: For each bond, we gather information on whether collective action clauses were included and, if so, whether they were used. Except for the two-limb CACs retrofitted in the local-law bonds in Greece 2012, all other CACs in our sample are bond-by-bond with majority thresholds varying from 66% (e.g. the Samurai Bond in Uruguay 2003) to 98% (IANs in Russia 1999).

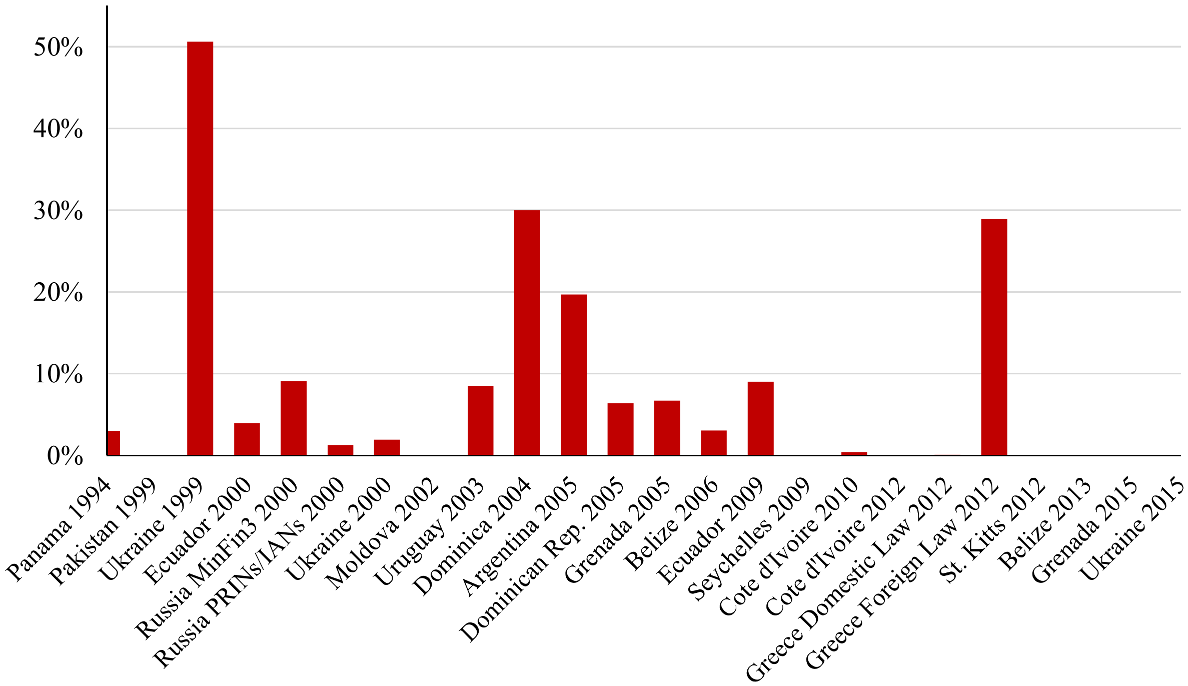
2.2 Holdouts and Haircuts: A Large Variation

Table 1 gives an overview of the 23 sovereign bond restructurings in our sample. At the aggregate level, most bond restructurings were successful in the sense that initial participation rates generally exceeded 90%, i.e. less than 10% holdouts.

Only four restructuring operations achieved a final participation rate of below 90%, as illustrated in Figure 1. Argentina's messy restructuring achieved only about 80% participation, with many of the holdout creditors filing suit in New York. The other cases are Ukraine's add-on deal of Merrill Lynch bonds (participation of 50%), Dominica in 2004, as well as the restructuring of foreign-law bonds in Greece which resulted in an initial holdout rate (pre-CACs) of 60% and a final holdout rate (post-CACs) of 29%. For illustrative purposes the exchange of foreign-law bonds in Greece is shown as a separate deal in Figure 1.

In three other cases the initial (pre-CACs) holdout rate was above 10%, but the application of CACs achieved full participation (Seychelles 2009, Cote d'Ivoire 2012 and Belize 2013).

Figure 1: Aggregate Holdout Rate by Restructuring (final, post-CACs, in %)



Note: The aggregate holdout rate is calculated using bond-level holdout rates except for Panama 1994 and Dominica 2004, for which no bond-level data is available.

Table 1: Sovereign Bond Restructurings 1994-2015 – Main Characteristics

Restructuring	Number of Old Bonds	Number of New Bonds	First Missed Payments	Launch Date	Settlement Date	Average Principal Amount (bn US$)	Holdout Rate (final, in %)	Average Haircut	Average Maturity (Before)	Average Maturity (After)	Average Coupon Rate (Before)	Average Coupon Rate (After)	Average Exit Yield	Share of Foreign Law Bonds
1994 Panama	7	2	01/23/88	01/31/94	05/10/94	0.43	no data	56.48	0.00	5.00	6.75	6.03	12.70	100%
1999 Pakistan	3	1	preemptive	11/15/99	12/13/99	0.61	0.04	32.82	0.25	4.50	8.88	10.00	14.60	100%
1999 Ukraine	1	1	preemptive	07/16/99	08/20/99	0.50	50.61	62.09	1.08	1.50	0.00	16.00	14.20	100%
2000 Ecuador	6	2	10/25/99	07/27/00	08/23/00	6.09	3.95	34.51	16.71	23.72	6.50	10.15	17.30	100%
2000 Russia MinFin3	1	2	05/14/99	02/01/00	11/30/00	1.30	9.10	55.16	0.00	6.50	3.00	3.00	14.80	0%
2000 Russia PRINs/IANs	2	2	12/02/98	07/18/00	08/25/00	29.00	1.28	59.72	10.48	15.60	6.93	7.02	12.50	100%
2000 Ukraine	4	2	01/01/00	02/14/00	04/14/00	1.54	1.92	36.57	0.49	4.42	13.01	10.51	16.30	100%
2002 Moldova	1	1	preemptive	01/01/02	10/15/02	0.04	0.00	40.50	0.00	4.36	9.88	8.78	19.30	100%
2003 Uruguay	65	34	preemptive	04/10/03	05/29/03	5.56	8.53	14.48	7.03	15.00	6.15	7.08	13.55	29%
2004 Dominica	2	3	07/16/03	04/06/04	08/01/06	0.05	no data	68.04	11.47	18.00	9.00	3.50	9.20	100%
2005 Argentina	145	9	12/01/01	01/14/05	06/10/05	77.21	19.70	74.81	6.87	28.84	9.27	4.53	10.40	74%
2005 Dominican Rep.	2	2	preemptive	04/20/05	05/11/05	1.10	6.36	1.25	4.79	7.57	9.25	9.25	9.50	100%
2005 Grenada	16	2	01/01/98	09/09/05	11/15/05	0.23	6.68	37.52	6.63	19.83	8.36	5.95	9.70	6%
2006 Belize	7	1	preemptive	12/18/06	02/20/07	0.35	3.04	15.83	4.70	17.25	9.65	7.69	9.60	29%
2009 Ecuador (buy-back)	2	none	12/12/08	04/20/09	06/01/09	3.21	7.82	57.52	18.21	buy-back	10.32	buy-back	13.00	100%
2009 Seychelles	2	2	07/01/08	12/07/09	02/11/10	0.30	0.00	70.54	1.38	11.17	6.88	6.63	10.70	100%
2010 Cote d'Ivoire	6	1	preemptive	03/15/10	04/16/10	2.30	0.38	22.12	5.18	15.72	3.53	5.38	9.90	100%
2012 Cote d'Ivoire	1	1	12/31/10	10/18/12	11/06/12	2.33	0.00	0.29	13.13	13.13	3.75	5.89	7.70	100%
2012 Greece	117	24	preemptive	02/24/12	03/12/12	276.52	3.12	55.22	8.15	20.20	4.37	1.75	15.30	36%
2012 St. Kitts and Nevis	12	2	preemptive	02/27/12	04/18/12	0.20	0.00	43.64	2.59	20.92	6.18	2.95	7.88	0%
2013 Belize	1	1	08/20/12	02/15/13	03/20/13	0.55	0.00	39.86	11.17	15.67	8.50	6.45	8.13	100%
2015 Grenada	2	2	03/15/13	10/05/15	11/12/15	0.26	0.00	43.16	9.83	8.55	6.00	6.95	13.00	50%
2015 Ukraine	13	10	preemptive	09/23/15	11/12/15	15.00	0.00	14.48	3.44	10.96	7.67	6.21	8.80	100%

Note: All averages are weighted by principal amounts of the bonds. For Argentina 2005, we only include the bonds where financial terms and governing law are not missing.

We also observe a wide variation in holdout rates at the bond level within the same restructuring deal, as illustrated in Table 2 and Figure 2. More than 133 bonds had non-participation rates higher than 10% and in 33 bonds holdouts exceeded 50%. Uruguay 2003, Argentina 2005 and Greece 2012 saw the largest within-deal variation, with holdouts ranging from 0 to 100%.

Uruguay 2003 involved 18 international bonds, 28 domestic bonds, and one Japanese-law bond which were offered three separate restructuring deals. Four of the five Brady bonds and both of the two EUR-denominated bonds mostly held by retail investors had holdouts exceeding 25%. The Brady New Money Notes had a holdout rate of 75%. All other bonds had less than 10% holdouts.

Argentina 2005 is probably the most well-known sovereign bond restructuring that suffered from large-scale holdouts (Cruces and Samples, 2016). Of the 145 bonds for which we could obtain bond-level participation information, 17 were completely tendered, 63 had more than 25% holdouts and 9 bonds had more than 50% holdouts. Most of these high-holdout bonds were heavily litigated (Weidemaier and Gelpern, 2014; Schumacher, 2014).

Greece 2012 involved a total of 117 eligible securities, of which 75 were local-law, 35 English-law, five Japanese-law, one Swiss-law and one Italian-law. The 53 government-issued local-law bonds were retrofitted with the single-limb CACs that increased the participation from initially 82.5% to full. The participation rate across 22 government-guaranteed local-law instruments was very high (95%) even without the retrofitted CACs. In contrast, foreign-law bonds became a magnet for holdouts (Gelpern et al., 2016; Zettelmeyer et al., 2013). Half of all (21 of the 42) foreign-law bonds saw holdouts above 50% and 9 bonds had 100% holdouts, meaning that not a single holder of the bonds agreed to participate. In aggregate, the final (post-CACs) participation rate for Greece's foreign-law bonds was 71%.

Figure 2 also reveals that some of the bonds with large-scale holdouts had CACs. This is true not only in Greece but also in Grenada and Ukraine. This suggests that CACs alone do not assure full participation, also because investors can buy blocking minorities in individual series, as happened in Greece.

Equally striking is the variation in haircuts, as shown in Table 2 and Figure 3. On the instrument level, haircuts go from negative (meaning the present value of the new bonds exceeds the present

Table 2: Variation in Holdouts and Haircuts - Summary Statistics

Restructuring	Number of Bonds	**Holdouts** (post-CACs)				**Haircuts**			
		Mean	SD	Min	Max	Mean	SD	Min	Max
1994 Panama	7	no data				25.4	9.9	16.7	45.4
1999 Pakistan	3	0.0	0.1	0.0	0.1	31.3	3.1	27.8	33.6
1999 Ukraine	1	50.6		50.6	50.6	37.7		37.7	37.7
2000 Ecuador	6	4.6	1.8	2.3	7.9	30.4	12.6	17.7	50.0
2000 Russia MinFin3	1	9.1		9.1	9.1	54.9		54.9	54.9
2000 Russia PRINs/IANs	2	1.4	0.3	1.2	1.6	53.5	0.1	53.4	53.6
2000 Ukraine	4	1.0	2.0	0.0	4.0	34.6	2.9	30.4	36.8
2002 Moldova	1	0.0		0.0	0.0	39.5		39.5	39.5
2003 Uruguay	65	7.0	14.2	0.0	74.5	17.9	7.2	0.3	34.4
2004 Dominica	2	no data				63.3	0.9	62.7	64.0
2005 Argentina	145	22.4	18.9	0.0	82.1	72.6	7.8	36.0	90.2
2005 Dominican Republic	2	6.6	3.1	4.3	8.8	0.7	3.7	-1.9	3.3
2005 Grenada	16	6.9	18.1	0.0	69.6	38.4	7.5	24.6	57.5
2006 Belize	7	1.2	3.2	0.0	8.5	17.5	5.1	10.0	24.0
2009 Ecuador	2	10.0	4.5	6.8	13.2	60.8	0.1	60.8	60.9
2009 Seychelles	2	0.0	0.0	0.0	0.0	67.8	4.7	64.5	71.1
2010 Cote d'Ivoire	6	0.3	0.3	0.0	0.7	39.3	5.6	32.8	46.4
2012 Cote d'Ivoire	1	0.0		0.0	0.0	0.3		0.3	0.3
2012 Greece	117	17.1	34.7	0.0	100.0	59.0	18.5	-28.6	76.1
2012 St. Kitts and Nevis	12	0.0	0.0	0.0	0.0	49.1	18.1	10.5	60.1
2013 Belize	1	0.0		0.0	0.0	31.9		31.9	31.9
2015 Grenada	2	0.0	0.0	0.0	0.0	41.8	3.9	39.1	44.5
2015 Ukraine	13	0.0	0.0	0.0	0.0	13.1	3.1	7.5	18.2

Note: For Argentina 2005, we only include the bonds where financial terms and governing law are not missing.

value of the old bonds) up to a present value loss of 90% for the FRAN bond in Argentina 2005. Within the same deal, the range between the maximum and minimum haircuts across bonds averages 17 percentage points, but in some cases the haircut distribution has been much more dispersed and was highest in Argentina 2005 with a difference of 56 percentage points between the bond with the lowest and highest haircuts. These numbers show that inter-creditor equity is often violated *ex post*. One explanation is that bond exchanges are often conducted as one-size-fits-all offers. As a result, bonds with shorter maturity and higher coupon rates usually suffer from higher present value haircuts (for a similar finding see Asonuma et al., 2017).

Figure 2: Distribution of Holdout Rates (in %)

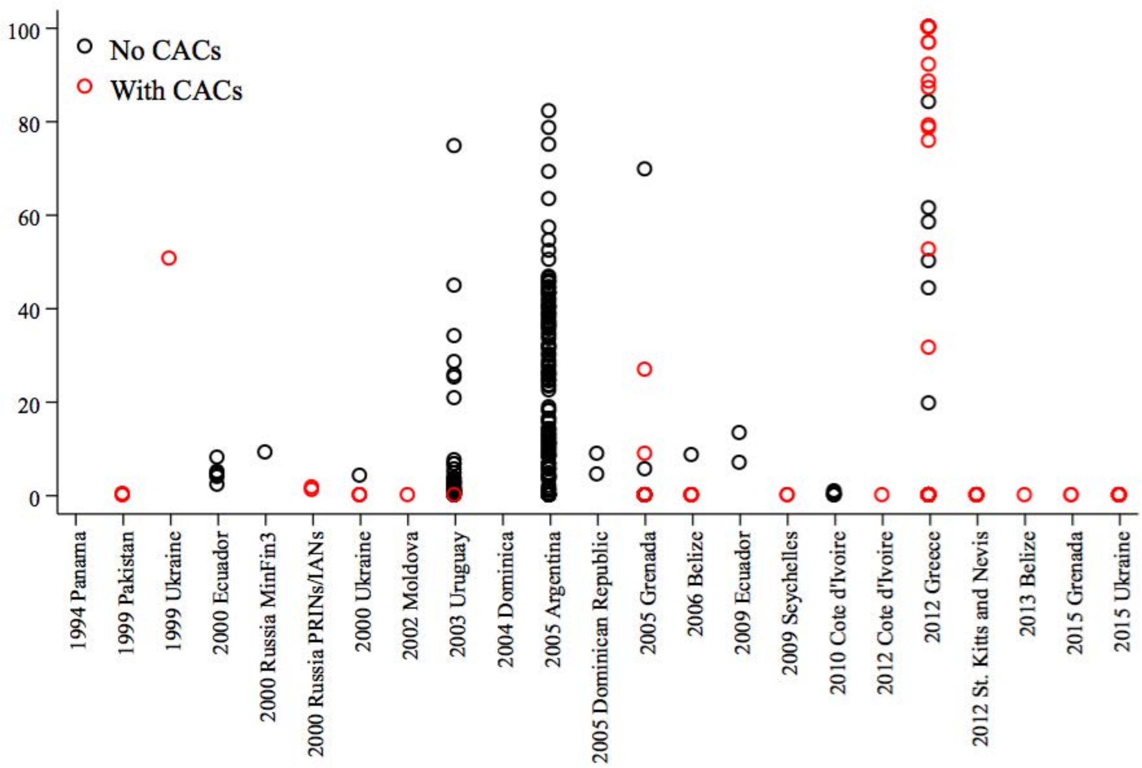
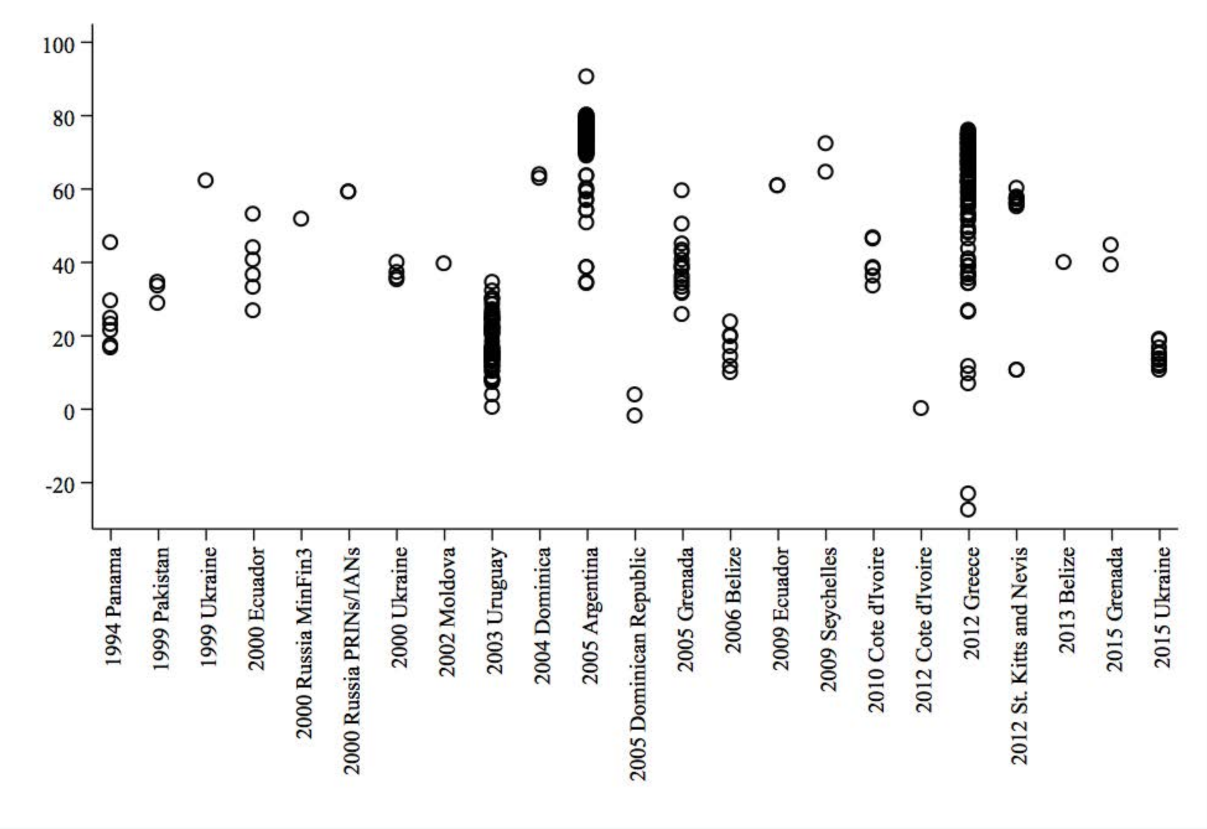


Figure 3: Distribution of Haircuts (in %)



3 Determinants of Holdouts

3.1 Empirical Approach

To better understand the large variation in participation in sovereign debt restructurings, this section studies the determinants of holdout rates using the bond-level dataset we assembled and building on existing theory work on creditor coordination problems. Bi et al. (2016), for example, show that holdout tactics will be driven, to a large extent, by the value of holding out, and this value is largely determined by the size of the haircut, which is the cost of agreeing to a restructuring offer. If losses are large, ceteris paribus, then the share of non-participating creditors will be high. A similar argument is made by Schumacher et al. (2015) who argue that high haircuts increase the incentives to hold out and litigate.

Motivated by theory, we first focus on the size of haircuts, also because this is an outcome variable that governments can choose by discretion. The legal or financial characteristics of the outstanding bonds are largely predetermined, but governments decide on the design of the exchange offer, which determines both the overall haircut size (aggregate losses) as well as the treatment of each bond compared to other eligible instruments (bond-specific losses).

Second, we focus on the legal characteristics of each bond, in particular, the existence and characteristics of CACs. Our prior is that CACs will reduce the size of holdouts and the scope of creditor coordination problems. However, in the theoretical literature, there is disagreement on whether CACs help or hurt (see, in particular, Haldane et al. (2005), Weinschelbaum and Wynne (2005), Engelen and Lambsdorff (2009), and Pitchford and Wright (2012)).

We also consider the bond's governing law (foreign versus domestic law). Chamon et al. (2018) show that foreign-law bonds trade at a premium since they are harder to restructure. In Greece, for example, the terms of local-law bonds were altered via a bill passed in parliament that retrofitted the single-limb aggregation CACs. In contrast, foreign-law bonds are protected by the rule of law abroad, so that debtor governments have no possibility to enact ad hoc legislation, while creditors keep the option to file suit in a foreign court in the respective jurisdiction (see Schumacher et al. (2018)). Moreover, Zettelmeyer et al. (2013) suggest that local-law bonds are more susceptible to "moral suasion," meaning regulatory pressure from their home government.

For these reasons, we expect foreign-law bonds to be more at risk of holdout tactics.

Third, we focus on the financial characteristics of each bond. Buchheit (1999), for example, argues that liquid secondary markets make it easier for specialized investors to buy defaulted bonds and then hold out and litigate for full repayment. In contrast, Pitchford and Wright (2012) show that the effects of secondary markets on debt renegotiation are ambiguous. The impact of secondary market trading is therefore an empirical question. Here, we capture liquidity effects by including a binary indicator of whether the bond had active bid and quote prices during the launch of the restructuring.[15]

Furthermore, it is possible that the maturity of a bond, the amount outstanding, and its coupon size matter. Longer maturity bonds can be attractive to buy-and-hold investors who are more susceptible to government pressure. Small bonds could be more vulnerable to holdout tactics because individual investors and hedge funds can more easily buy a blocking minority in a small issue (e.g. 25% of a $500m bond) as opposed to a large benchmark issue with a large principal outstanding (say, $5bn). In addition, Levine (2016) suggests that higher coupon rate make a bond more attractive to hold out and litigate, since high coupon bonds imply higher recovery rates due to the recognition of post-default interest arrears and potential compounding of interest penalties.

There could also be restructuring- or country-specific effects, such as the duration of the debt renegotiation process, the government's overall negotiation stance, or macroeconomic and financial conditions at the time of exchange. To account for these macro-level effects we control for deal fixed effects in most regressions, so that identification rests on the within-restructuring variation in haircuts, CACs, and other bond-specific variables.

Formally, we estimate the following regression by OLS:

$$Holdout_{i,j} = \alpha_i + \beta_1 Haircut_{i,j} + \beta_2 CAC_{i,j} + \beta_3 ForeignLaw + X_{i,j}\gamma + \epsilon_{i,j}.$$

where i denotes the restructuring deal and j denotes the individual restructured bonds, $Haircut$ captures the size of creditor losses, $CACs$ is a dummy variable of whether the bond contract con-

[15] More specifically, we observe a window of seven days immediately following the launch day and see if the bond had any active bids and quotes on Bloomberg during that week.

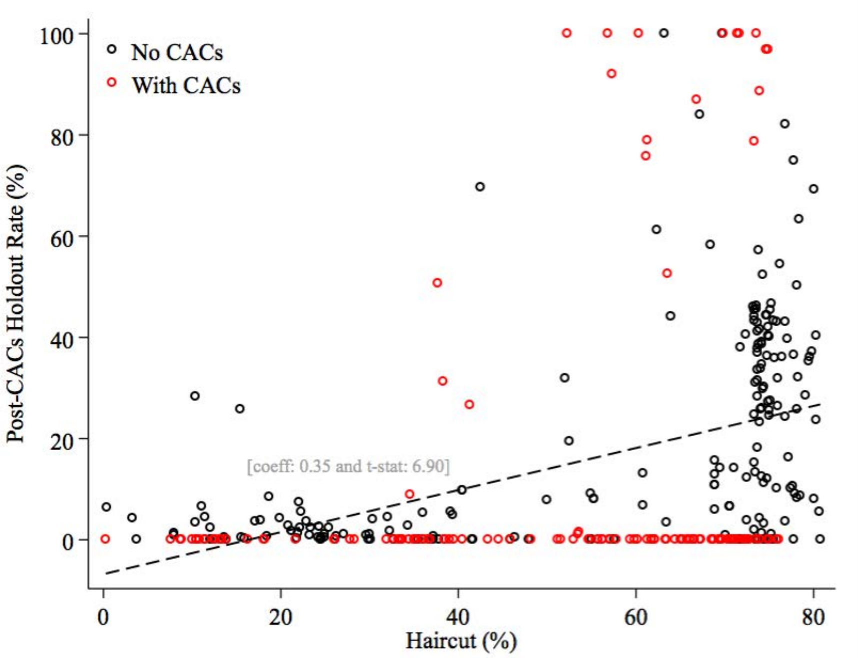
tains collective action clauses, $ForeignLaw$ is an indicator of whether the bond was issued under a foreign jurisdiction and X is the set of bond characteristics mentioned before. We measure financial characteristics by *Years To Maturity* - the remaining years to maturity, *USD Denominated* - an indicator of denomination in U.S. Dollar, *Coupon Rate* - the last available coupon rate immediately before the settlement date, and *Log Principal Amount* - the log outstanding principal amount (in million US$).

For robustness, we also estimate a generalized linear model with a probit link function, a method well suited for fractional dependent variables that vary between 0 and 1, as is the case here (we follow Papke and Wooldridge, 2008).

3.2 Results

We start with a preliminary look at the data. Figure 4 shows the correlation between haircuts and holdouts on a bond level, which turns out to be positive and significant. Bonds with high haircuts are those with the highest final holdout rates, and that is true also for more than a dozen bonds that contained CACs in the bond contract.

Figure 4: Holdouts vs. Haircuts – Scatter Plot



Note: This figure plots the bond-level holdout rate against the size of haircut rates for all restructuring deals in our sample.

Table 3 shows our main regression results. The results confirm the descriptive finding: higher haircuts are correlated with higher holdout rates at the bond level, both before (Column 1 in Panel A) and after the application of CACs (Column 3 and 4 in Panel B). Panel A uses initial (pre-CACs) holdout rates as dependent variable, meaning the share of holdouts in each bond before any CACs could be voted upon. In contrast, Panel B shows our main results using final, post-CACs holdout rates at the closure of the restructuring. The result also holds after adding deal fixed effects (Columns 2 and 5) to purge out any restructuring-specific differences from the estimated coefficients. Indeed, when comparing the results with and without deal fixed effects it is evident that our findings on haircuts and on the other main variables of interest are driven by the variation within restructurings rather than by aggregate difference at the deal level (such as differences in the average haircut across restructurings). Note that in Panel B we start with a restricted sample (Column 3) and then add Greece 2012 and Grenada 2005 (Column 4), for which we have final, post-CAC participation rates but no pre-CACs data.

Table 3: Determinants of Holdouts – Regression Results

	Panel A		Panel B						
	***Pre*-CACs Holdout Rate**		***Post*-CACs Holdout Rate**						
	(1) OLS (Cross-Section)	(2) With Deal Fixed Effects	(3) OLS (without Greece)	(4) OLS (with Greece)	(5) Baseline (with FE & Greece)	(6) CAC Types	(7) Interaction (CACs x Haircut)	(8) With Market Haircut	(9) Fractional Response Model
Haircut Size	0.249***	0.335***	0.229***	0.347***	0.631**	0.774***	0.850**	0.429***	0.043*
	(0.030)	(0.059)	(0.026)	(0.104)	(0.250)	(0.257)	(0.321)	(0.148)	(0.023)
CACs Included	-5.139*	1.485	-9.147***	-0.840	-19.395***		-4.954	-20.754***	-0.562**
	(2.872)	(4.160)	(2.188)	(4.863)	(3.798)		(9.199)	(3.854)	(0.257)
Bond-by-Bond CACs						-9.218***			
						(3.120)			
Single Limb CACs (Greece)						-54.110***			
						(4.254)			
CACs x Haircut							-0.279**		
							(0.132)		
Foreign Law Bonds	7.129**	8.324**	7.650***	23.141**	32.412**	11.313***	32.365**	29.495***	1.978**
	(2.582)	(3.267)	(2.648)	(10.444)	(11.705)	(1.980)	(11.661)	(9.725)	(0.812)
Years To Maturity	0.002	0.025	-0.006	-0.017	0.083	0.260	0.107	-0.571	0.001
	(0.071)	(0.077)	(0.067)	(0.133)	(0.277)	(0.270)	(0.274)	(0.408)	(0.010)
Principal Amount (log)	-1.260***	-1.240***	-1.253***	-1.046***	-1.458***	-0.951**	-1.385***	-1.781***	-0.046***
	(0.204)	(0.133)	(0.175)	(0.343)	(0.374)	(0.380)	(0.384)	(0.281)	(0.004)
Coupon Rate	0.597	0.823***	0.506	-0.102	0.219	0.352	0.135	1.026**	0.007
	(0.417)	(0.220)	(0.465)	(0.536)	(0.485)	(0.260)	(0.422)	(0.456)	(0.020)
Traded (Liquid Bonds)	9.485***	9.194***	9.577***	-1.527	0.697	7.651***	0.811	1.435	0.086
	(1.414)	(1.369)	(1.349)	(6.476)	(4.377)	(2.290)	(4.352)	(4.026)	(0.145)
US$ Denominated	-5.649***	-6.260***	-5.627***	-7.211***	0.975	-5.907***	0.920	2.919	-0.022
	(0.984)	(0.838)	(1.148)	(1.396)	(3.235)	(0.861)	(3.172)	(4.691)	(0.040)
Deal Fixed Effects	No	Yes	No	No	Yes	Yes	Yes	Yes	Yes
Obs (Nr. of Bonds)	233	233	228	320	320	320	320	320	320
Nr. of Restructurings	20	20	20	21	21	21	21	21	21
R2	0.507		0.550	0.360					0.303
R2 (within)		0.367			0.401	0.499	0.405	0.359	
R2 (oveall)		0.491			0.280	0.301	0.272	0.240	

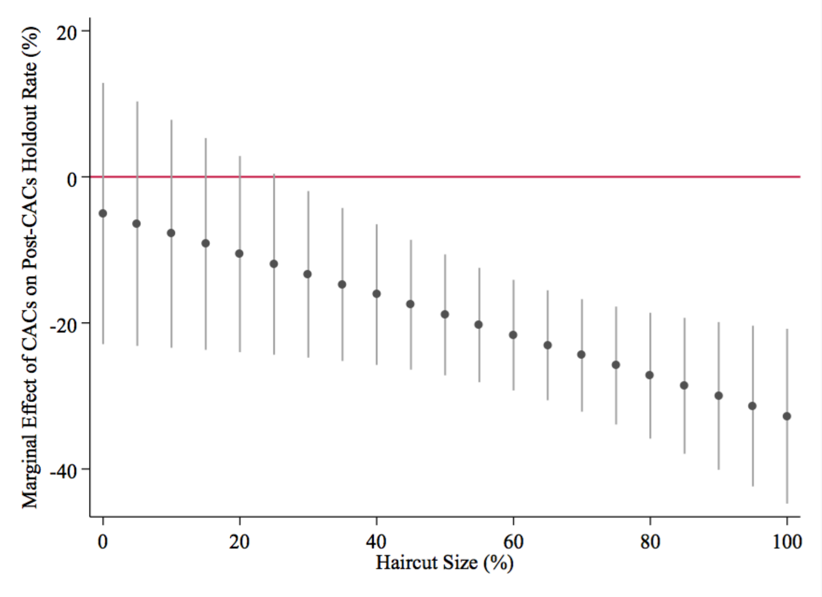
Note: The dependent variable in Panel A is the initial (pre-CACs) holdout rate, while the dependent variable in Panel B is the final (post-CACs) holdout rate. The post-CACs results include the case of Greece 2012, for which we miss pre-CACs particpation rates. Columns (1), (3) and (4) use plain OLS, which assumes that $\alpha i = \alpha$ for all restructurings i. In Column (2) and Columns (5)-(9), we introduce deal fixed effects and hence purge out any deal-specific effects differences. Column (7) adds the interaction between haircuts and CACs, which allows differential response to CACs depending on the size of haircuts. As robustness checks of our baseline results in Column (5), we use use market haircuts (Column 8) and estimate a generalized linear model with a probit link function as suited for fractional response variables that vary between 0 and 1 (Column 9, see Papke and Wooldridge 2008; the R2 in this case refers to pseudo R2). Deal-clustered standard errors are shown in parenthesis. *, **, and *** denote significance on the 1, 5 and 10 percent level, respectively.

The first main finding from Table 3 is that haircut size is significantly correlated with the holdout rate at the bond-level. This finding is robust to different model specifications, measures of haircuts, sample restrictions, and estimation procedures. The haircut coefficient is also large. In the cross-sectional OLS model without Greece (Column 3), a one-standard-deviation increase of haircuts (24.6 percentage points) is associated with a 6 percentage point increase in holdouts. In the fixed effects model with Greece (Column 5) holdouts increase by 15.5 percentage points.

With a view to legal characteristics, we confirm that the jurisdiction of a bond plays an important role. The foreign law dummy shows a significant, large and positive coefficient throughout.

Regarding CACs, we find no significant correlation with holdout rates in the pre-CACs specifi-

Figure 5: Interaction: Marginal Effect of CACs Depending on Haircut Size



cations of Columns 1 and 2 (or only small coefficients that are barely significant). This suggests that investors do not behave strategically, i.e. that they appear not to change their participation behavior ex ante, depending on the legal characteristics of the debt.

To explore the effectiveness of CACs, it is more informative to study final (post-CACs) holdout rates, as done in Panel B. Here, the CACs dummy is significant throughout, expect for the OLS specification in Column (4), which shows that adding Greece makes the CAC dummy turn insignificant in the cross-section (i.e. when moving from Column 3 to Column 4). This result is due to the fact that most of the foreign-law bonds in Greece's 2012 restructuring saw large holdouts, regardless of whether they contained CACs. These deal-specific effects are an important reason to include fixed effects in all remaining specifications.

Regarding magnitudes, the results suggest that CACs reduce bond-specific holdout rates by between 9% (OLS result without Greece) and 20% (baseline result in Column 5). This is a very large impact given that the average final bond-level holdout rate is less than 6%. Column (6) further distinguishes by type of CACs and provides evidence that single-limb CACs (which in our sample were only used in Greece 2012) are much more effective in reducing holdout rates than bond-by-bond CACs, with a coefficient more than five times larger.

Moreover, we find evidence that CACs are particularly efficient in reducing holdout rates in bonds with high haircuts (Column5 and 7). Figure 5 illustrates this, by plotting the marginal effect of CACs on holdout rates at different levels of haircut, based on the estimation results of Column (7). At a low haircut of 10 or 20%, the CACs dummy is not significantly different from zero (red line), but for high haircuts of around 30% or higher, CACs are associated with a significant reduction in holdouts - of 20 to 40 percentage points.

Apart from haircuts and legal characteristics, the regression results show that smaller bonds and bonds that are actively traded on secondary markets are more likely to see holdouts. Higher coupons are also associated with lower participation rates, possibly because these bonds are more attractive to distressed debt investors interested in filing a lawsuit. Furthermore, participation has been higher in bonds denominated in USD. One reason for this could be that U.S. based investors are often targeted more actively in the wake of restructuring offers.

Our results on haircuts and CACs are robust to different model specifications, haircut measures, sample restrictions, and estimation procedures. Specifically, we check results with haircut estimates using bond-specific discount rates, as well as when using the so called market haircut, which considers the face value of the old bonds instead of the present value. We also check results when dropping both Argentina 2005 and Greece 2012 and when including the outlier bonds described in Section 2. Furthermore, we checked results with and without fixed effects, using a fractional response model with a probit link function, and we implemented a jack-knife procedure where we drop one deal at a time and compute the average of the coefficients.

4 The Effectiveness of CACs

This section zooms further into the use and effectiveness of CACs, drawing on the data collected in developing country sovereign debt restructurings plus Greece.

4.1 The Impact of CACs on Holdout Rates – Descriptive Evidence

To set the stage, Table 4 identifies the number of restructured bonds that contained CACs in our sample of restructurings, as well as details on the respective voting thresholds and procedure. We also show whether the new bonds issued as a result of the exchange contained CACs.

We find that 16 restructurings involved bonds with some types of CACs. In total, 143 of the 418 bonds that were restructured contained CACs. Most of the CACs were of the classic type, i.e. with bond-by-bond voting. This includes 62 English-law bonds (with mostly a 66.67% threshold), four New-York-law bonds (all with a 75% threshold and issued after 2003), one Japanese-law bond, one Swiss-law bond, and 23 local-law bonds. In Greece, the only advanced-country default in our sample, CACs were retroactively added to the contracts of 53 outstanding government-issued local-law bonds, in the form of single-limb CACs with an aggregate threshold of 66.67%.

In terms of usage, 112 of the 143 bonds triggered their CACs in the restructuring process. CACs were used for the first time during Ukraine's exchange of Eurobonds in 2000. Then in Moldova 2002, CACs were used to amend the payment terms after an agreement was reached with the single largest bondholder, which held 78% of the outstanding bonds against a required 75% threshold. In Uruguay 2003, CACs were used in the Samurai bonds – the first use of CACs under Japanese law. In 2006, Belize used the CACs in one of its New-York-law bonds to bind the 12.5% holdouts to accept the terms of the exchange – this was the first usage of CACs under New York law in more than 70 years (Moody's, 2013b). Since then, CACs have been triggered in the Seychelles 2009, Cote d'Ivoire 2012, Greece 2012, St. Kitts and Nevis 2012, Belize 2013, and most recently Grenada 2015 and Ukraine 2015.[16]

[16]We could not find information on whether CACs were triggered in Dominica 2004 or Grenada 2005.

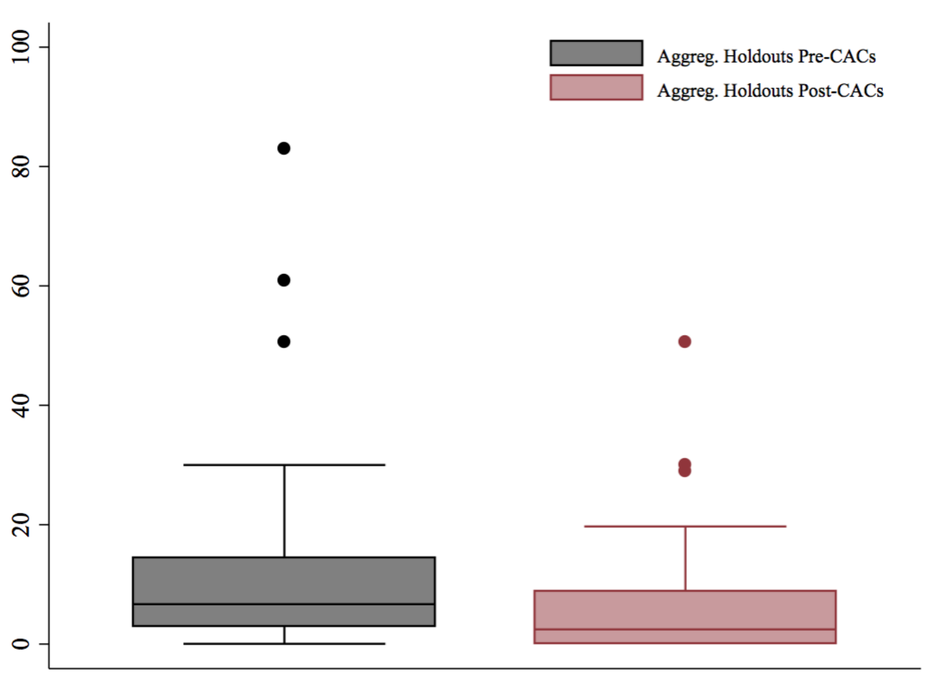
Table 4: CACs in Sovereign Bond Restructurings

Restructuring	CACs in Outstanding Bonds?				Voting Threshold of Old CACs	New CACs
	Total Nr. Old Bonds	With CACs	Voting attempted	Threshold **not** reached		
1994 Panama	9	0	0	0	n.a.	No CACs
1999 Ukraine	1	1	1	1	75%	Bond-by-Bond
1999 Pakistan	3	3	0	0	unknown	Bond-by-Bond
2000 Russia MinFin3	1	0	0	0	n.a.	No CACs
2000 Russia PRINs/IANs	2	2	0	0	95% and 98%	Bond-by-Bond
2000 Ukraine	4	3	3	0	75%	Bond-by-Bond
2000 Ecuador	6	0	0	0	n.a.	Bond-by-Bond
2002 Moldova	1	1	1	0	75%	n.a.
2003 Uruguay	65	1	1	0	66%	Two-Limb
2004 Dominica	3	3	unknown	unknown	unknown	unknown
2005 Argentina	145	0	0	0	n.a.	Two-Limb
2005 Dominican Republic	2	0	0	0	n.a.	Two-Limb
2005 Grenada	16	6	unknown	unknown	unknown	Bond-by-Bond
2006 Belize	5	5	5	0	85%	Bond-by-Bond
2009 Seychelles	2	2	2	0	75%	Bond-by-Bond
2009 Ecuador	2	0	0	0	n.a.	n.a.
2010 Cote d'Ivoire	6	0	0	0	n.a.	Bond-by-Bond
2012 Cote d'Ivoire	1	1	1	0	75%	n.a.
2012 St. Kitts and Nevis	12	11	11	0	75%	Bond-by-Bond
2012 Greece (Foreign Law)	42	35	35	18	75% for 14 bonds 66% for 20 bonds	Two-Limb
2012 Greece (Local Law)	75	53	Retrofitted Single-Limb	0	Retrofitted Single-Limb	Two-Limb
2013 Belize	1	1	1	0	75%	Bond-by-Bond
2015 Grenada	2	2	2	0	75%	Single-Limb
2015 Ukraine	13	13	13	0	75%	Single-Limb

As already indicated by the regression results, the overall track record of CACs in reducing holdouts appears positive, except for the important case of Greece 2012. This can be seen in the box plot in Figure 6, which compares the initial aggregate holdout rates (pre-CACs), i.e. after the participation deadline closed, with the final holdout rate after CACs were voted upon, if at all (post-CACs). The coloured boxes summarize the median, upper and lower quartile, respectively.

When looking at averages, across all restructurings in our sample, CACs reduced the holdout rate by half, from about 15% holdouts pre-CACs to an average final holdout rate of 7.6% post-CACs. We get a similar result once we consider only bonds that contained CACs and for which we have both pre-CACs and post-CACs holdout data on the bond-level. On average, for bonds with CACs, holdout rates were reduced by half, from 4% pre-CACs to 2% post-CACs (note that this result excludes Greece for which no pre-CACs bond-level data is available).

Figure 6: Holdout Rates across Restructurings - Pre-CACs vs. Post-CACs



CACs were most successful in Seychelles 2009, Cote d'Ivoire 2012 and Belize 2013, which had pre-CACs holdout rates of 12%, 15% and 14%, respectively, and ended up with zero holdouts post-CACs (100% participation).

Table 4 shows that there are only two restructurings in which CACs failed, in the sense that the voting threshold was not reached and holdouts were not bound in. One example is Ukraine 1999 which failed to reach the 75% CACs threshold in the Merrill Lynch bonds in 1999 and never convened a bondholder meeting. More importantly, Greece failed to restructure half of the foreign-law bonds with CACs in 2012, as 18 out of 35 bonds with CACs missed the voting threshold (either 66.67% or 75%). This case clearly illustrates the weaknesses of classic bond-by-bond CACs. Distressed debt funds focused heavily on the Greek foreign-law bonds, building blocking majorities and refusing to accept the large haircut shared by the majority of bondholders. The end result was that holders of €6.4 billion in face value held out in Greece (more than 3% of Greek GDP, see Zettelmeyer et al. (2013)). These holdouts have since been paid in full and on time.

There are other cases in which CACs were present but were not used deliberately. This is true for Russia's 2000 restructuring of PRINs and IANs and Pakistan's 1999 restructuring of three Eurobonds. In both cases the necessary thresholds to bind in minority holdouts could have been met but the authorities chose not to make use of CACs to keep the restructuring "voluntary."[17] Also, Grenada 2005 looks like a case in which CACs were not used despite reaching the required voting threshold, although we lack a reliable source to confirm this.

4.2 Preventing Holdouts via CACs – A Simulation Exercise

In this section we conduct a simple simulation exercise to evaluate the efficacy of different types of CACs. For this purpose, we focus on the three largest restructurings in our sample, which also had a large variation in holdout rates across bonds: Uruguay 2003, Argentina 2005, and Greece 2012. For Greece, we focus particularly on the foreign-law bonds, since the local-law bonds all achieved 100% participation.

In this simulation exercise, we use pre-CACs bondholder participation rates as observed in the data and then simulate what the participation rates would have been if the bonds had contained different types of CACs. The simulation is naive in that we assume pre-CACs participation is unchanged, i.e., we assume that there is no strategic response to CACs ex-ante. This assumption can be justified with a view to the results in the regression analysis: the difference in initial holdout rate between bonds with CACs and bonds without is statistically insignificant.

Following Gelpern et al. (2016), we examine three types of CACs for this exercise:

- *Bond-by-Bond CACs*, which allow a supermajority of typically either 66.2/3% or 75% to amend the financial terms of individual bond series. They are traditionally included in most English-law bonds (mostly with a 66.2/3% threshold) and starting in 2003 in most New-York-law bonds (mostly with a 75% threshold). However, bond-by-bond voting can be ineffective to overcome coordination problems, because in a restructuring with many series, holdouts can concentrate their capital and still manage to block a few series. In contrast, recent model CACs emphasize aggregate participation across series.

[17] In Pakistan 1999, despite the legal advisors' suggestion to use CACs, the government was concerned that a bondholder meeting would vocalize opposition and decided to keep the exchange voluntary. See International Monetary Fund (2001, p.30-31).

- *Two-Limb CACs*, which were included in the new bonds of Uruguay 2003, Argentina 2005 and Dominican Republic 2005 and more recently in all euro area sovereign securities issued since 2013, lower the bond-by-bond threshold to typically 50% if a supermajority (typically 66.2/3%) is reached across all series.[18] The two-limb CACs seemed to be strike a balance between mitigating the holdout problem and limiting the risk of abuse by governments imposing excessively harsh terms. However, the bond exchanges in Argentina (2005) and Greece (2012) exemplified that holdouts can build significant blocking positions in specific individual bonds even in large-scale debt restructurings. This showed that the effective application of two-limb CACs could still be strategically blocked.

- *Single-Limb CACs*, which allow an aggregate supermajority across all series to restructure the entire stock of debt. Single-limb CACs were used by Greece in its 2012 restructuring with a majority requirement of 66 2/3%. Following a proposal by the industry body ICMA to use single-limb CACs with a majority threshold of 75% (ICMA 2014) and a recommendation by the IMF (IMF 2014), they have been quickly adopted by market issuers (Gelpern et al., 2016).

Specifically, we start with initial participation rates without the use of any CACs. Then, we calculate participation rates assuming that every bond contained the weak-form CACs with a bond-by-bond threshold at 75%. Next, we simulate participation results assuming that every bond had two-limb CACs with a bond-by-bond threshold at 50% if the aggregate participation across all bonds reaches 66 2/3%. Finally, we compute participation results assuming that all bonds contained single-limb CACs with only an aggregate threshold at 66 2/3%. Figure 7 shows the results for aggregate participation rates for different scenarios, while Figure 8 shows results on the bond-level. The findings can be summarized as follows:

- **Uruguay 2003** had an aggregate participation rate of 91.3% with a majority of bonds surpassing 90%. If we assume that all bonds had contained traditional New York CACs with 75% threshold, participation would have improved only slightly, namely by 2 percentage points to an aggregate rate of 93.8%. When we assume two-limb CACs we find that

[18] The 50% and 66.2/3% combination is also the version recommended by ICMA and the one applied in written resolutions in the euro area version, even though higher thresholds apply in case of physical bondholder meetings, see footnote 6.

many of the high-holdout bonds would have been bound into the restructuring, bringing total participation close to 100%. In a last step, we find that single-limb CACs would have done little to the aggregate participation rates, when comparing to two-limb CACs. However, they would have brought the Brady New Money Notes, which had a meager 25% participation rate, to full participation, resulting in a 100% rate overall.

- **Argentina 2005** had an aggregate participation rate of 80.3% based on the bonds in our sample, but this aggregate figure hides a large variation at the bond-level.[19] Most of the small issues, accounting for half of the bonds, had less than 75% initial participation. As a result, classic New York law CACs would have only improved the participation by 5 percentage points, bringing the aggregate to a rate of 85.2%. Two-limb CACs would have been much more effective, since all but 9 bonds had at least 50% participation, bringing the total participation to 98.1%. Nevertheless, even the two-limb CACs could not have prevented holdout tactics and litigation on a subset of bonds largely held by distressed-debt investors. Only the single-limb CACs would have brought participation to 100%, i.e. forced all bondholders into the exchange. In other words, only the strongest type of CACs would have shielded Argentina from the dozens of holdout lawsuits and the subsequent legal drama.

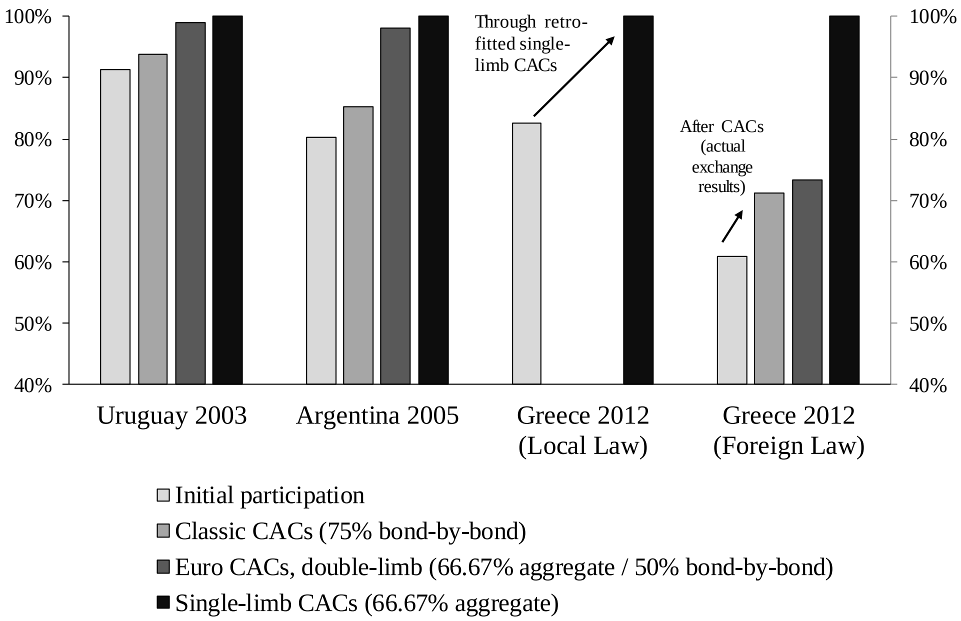
- **In Greece**, the initial aggregate participation rate without the use of any CACs was 82.5% for the domestic-law bonds and a mere 59% for the foreign-law bonds.[20] In the actual exchange, 18 of 35 foreign-law bonds with CACs failed to reach their respective bond-by-bond voting thresholds. It is no surprise then that our first simulation, which assumes classic CACs, does little to the result. When assuming that all 42 foreign-law issues had 75% thresholds, only 21 would have reached 100% participation, while 23 would have failed this threshold. The resulting aggregate participation rate is 71% for the foreign-law bonds, almost identical to the actual foreign-law post-CACs rate. Two-limb CACs would not have made much of a difference either, since the majority of foreign-law bonds had

[19] The aggregate participation rate at 80.3% in our sample is slightly higher than what is reported in other sources such as Sturzenegger and Zettelmeyer (2006, 2008), and Moody's (2013). The reason is that, as mentioned in Section 2, we exclude coupon and principal strips for which crucial contractual information (such as governing law) is missing. We cover 145 of the 315 eligible securities listed in the exchange offer, and the coverage is comparable to Schumacher (2014) and Cruces and Samples (2016) and twice as large as Sturzenegger and Zettelmeyer (2006, 2008).

[20] Unfortunately, despite our best efforts, we could not find initial (pre-CACs) bond-level participation rates for Greece's domestic-law bonds.

large-scale holdouts, achieving less than 50% participation. The hypothetical participation rate with two-limb CACs would have increased by only two percentage points, to 73.3%. Only single-limb CACs with aggregation across *all* securities – including foreign-law and local-law bonds – would have achieved full participation. One could argue, however, that a single-limb CAC may not have been applicable to both local-law and foreign-law bonds, since these are two very distinct asset classes. In that case, even single-limb CACs with an aggregate 75% threshold would not have sufficed to increase participation in the Greek foreign-law bonds.

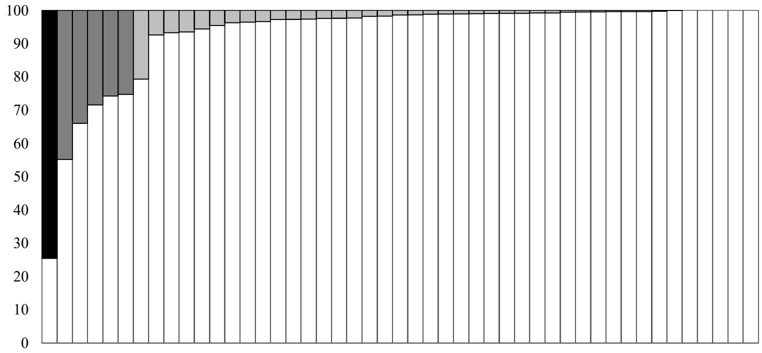
Figure 7: Participation Rates with Different CAC Types – Simulation Results



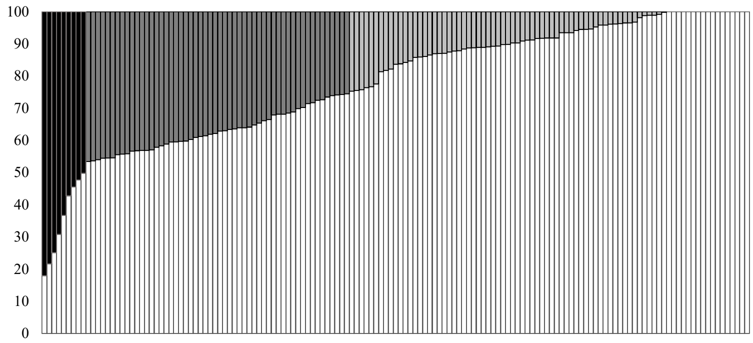
Note: We use pre-CACs bondholder participation rates as observed in the data and then simulate what the participation rates would have been if the bonds had contained different types of CACs. An important assumption underlying this exercise is that pre-CACs participation are not driven by CACs, which is in line with our regression results on ex-ante holdout rates in Section 3

Figure 8: Bond-by-Bond Participation Rates – Simulation Results

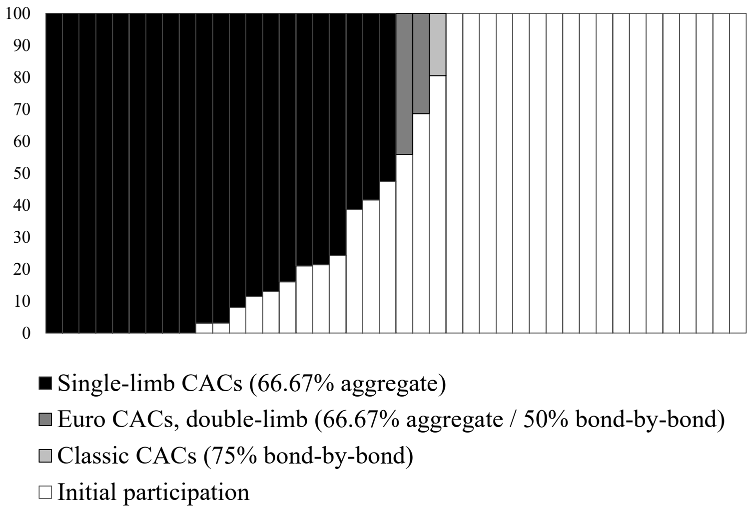
(a) Uruguay 2003



(b) Argentina 2005



(c) Greece 2012 (Foreign-Law Bonds Only)



Note: This Figure shows initial (pre-CACs) participation rates as observed in the data (white areas) and compares these to the final participation rates assuming different types of CACs and focusing on Argentina, Uruguay and Greece. We thus ask: what would final participation rates have been for bonds with classic, double-limb, or single-limb CACs, respectively? An important assumption underlying this simulation exercise is that pre-CACs participation are not driven by CACs, which is in line with our regression results on ex-ante holdout rates in Section 3.

5 Conclusion

Creditor coordination problems are a main challenge for the resolution of sovereign debt crises. This paper studies holdout behavior using an instrument-level dataset of sovereign restructurings with foreign bondholders since 1994. We find that CACs and the size of haircuts are among the most important determinants of holdout rates.

The data also reveal that classic CACs, with bond by bond voting, often fail to achieve high participation rates. According to our simulations, only the strongest form of CACs, with single-limb aggregate voting, would have eliminated holdout and litigation risks. These results help to inform theory as well as current policy initiatives on reforming the legal framework of sovereign bond markets, in particular via the dissemination of single-limb CACs.

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1 Haircuts and holdouts - additional details

Our approach to calculate haircuts closely follows the one by Sturzenegger and Zettelmeyer (2006, 2008):

$$\text{Haircut} := 1 - \frac{\text{Present Value of } \textit{New} \text{ Debt}}{\text{Present Value of } \textit{Old} \text{ Debt} + \text{Arrears}}.$$

Present value is calculated as the sum of future cash flows discounted by the appropriate exit yield, that is, yield on outstanding debt as of the end of the restructuring. There are usually multiple exit yields when there are more than one outstanding debt at the end of a restructuring – for example, Argentina 2005 had nine series of new bonds and two series of existing bonds, each with a different yield at the end of restructuring.[1] For the new debt, exit yield is simply its own yield, and present value is simply its market trading price. For the old debt, as a baseline measure, we use the average of all exit yields, so that all old bonds involved in an exchange are discounted with the same rate. For robustness, we also use bond-specific exit yields, adjusted by the bond's average maturity, currency denomination, and governing law, similar to the approach in Sturzenegger and Zettelmeyer (2006, 2008) and Zettelmeyer et al. (2013).[2] In the rare cases where no exit yields are observable (such as in St. Kitts and Nevis 2012), we use the implied secondary market yields from Cruces and Trebesch (2013), which are derived by mapping the debtor countrys Institutional Investor credit rating score on the rating scale by Moodys, and then taking the yield to maturity of an index of high-yield corporate bonds in that rating category.

Arrears are calculated as the sum of all past due interest and compounded principal payments. Past due principal payments are compounded by their original coupon rates to reflect the opportunity cost to the creditors. For robustness, we also compound all arrears using concurrent one-year U.S. Treasury yields.

[1] Following Sturzenegger and Zettelmeyer (2006, 2008), we look at not only new bonds but also existing bonds that are serviced throughout and excluded from the restructuring.

[2] Due to lack of observations, we categorize governing law simply by foreign vs local law.

Many exchanges offer more than one exchange option ("restructuring menu"). On the bond level, we do not observe which or how much of each exchange option was chosen. Therefore, we calculate the *de facto* ratio among exchange options for each old bond by aggregate restructuring-level proxies such as issuance amounts of the new bonds. More details for each restructuring are in Section 4 of the Appendix.

We calculate additional haircut estimates building on earlier work. According to Sturzenegger and Zettelmeyer (2006, 2008) and Cruces and Trebesch (2013), investors and practitioners have sometimes relied on the market haircut:

$$\text{Market Haircut} := 1 - \frac{\text{Present Value of New Debt}}{\text{Face Value of Old Debt} + \text{Arrears}},$$

and the face value reduction:

$$\text{Face Value Reduction} := 1 - \frac{\text{Face Value of New Debt}}{\text{Face Value of Old Debt} + \text{Arrears}}.$$

Special cases and further assumptions:

- If the old bond is guaranteed or collateralized, we use the discount rates associated with the guaranty – for example, for Brady bonds that were collateralized with US Treasury bonds we use U.S. Treasury yields of the same maturities for discounting.
- For floating-rate bonds indexed to benchmarks such as LIBOR and EURIBOR, we calculate their future cash flows based on forward estimates of the underlying indices available from Bloomberg. For floating-rate bonds indexed to local benchmarks where no forward estimate is available (such as local savings rate in Argentina), we use the vintage value just before the conclusion of the exchange. Floating rates are determined on the coupon accrual dates, which generally coincide with the previous coupon payment dates.
- In case of goodwill payments, e.g. in Seychelles 2009 and St. Kitts and Nevis 2012, sovereigns promised "cash sweeteners" to be paid out participating bondholders some time after the settlement date. These goodwill payments are tied to the new bonds and therefore are reflected in the prices of the new bonds and should not be counted separately in the new portfolio. We count these payments when calculating exit yields from prices of

the new bonds.

- If different currencies are involved in the same restructuring, the exchange rate on the settlement date of the exchange from Bloomberg is used.
- For bonds with put options, we follow Sturzenegger and Zettelmeyer (2006, 2008) and assume that the put options are triggered on their exercise dates.

2 Haircuts - comparison with earlier work

This section compares our haircut estimates to those of earlier work. A main contribution is that we provide bond-by-bond haircuts for more than 20 sovereign bond restructurings. In comparison, existing work that reports results either provides aggregate haircuts only (e.g. Cruces and Trebesch 2013 and Moody's 2012) or covers much fewer deals (Sturzenegger and Zettelmeyer 2006, 2008). The estimation results by Asonuma et al. (2019) are not shown in the paper so that a comparison is not possible.

Table A.1 shows a comparison across debt restructurings and discusses any observed discrepancies. For benchmarking purposes, we focus on work that applies a similar methodology, in particular Sturzenegger and Zettelmeyer (2006, 2008) and Cruces and Trebesch (2013). The estimates by Moody's (2012) use a different methodology and starkly different timing assumptions. More specifically, Moody's (2012) uses the trading price of defaulted bonds 30 days after the default occurred (i.e. the price that is observable after the entry into default) as a proxy for the bond recovery rate. This differs from the approach in the academic literature which focuses on "ultimate recovery" rates, i.e. haircuts at the exit from default that result from a restructuring or buy-back.

Table A.1: Comparison of haircuts with prior estimates, aggregates

Restructuring	Our Estimates: Haircut (baseline)	Haircut (yield curve)	Face value haircut	Previous Haircut Estimates: Sturzenegger Zettelmeyer (2006, 2008)	Cruces Trebesch (2013)[1]	Moody's (2012)[2]	Explanation for Discrepancies
1994 Panama	27.0	27.0	0.0	n.a.	15.1	n.a.	We compound past due principal payments by original coupon rates whereas CT do not, we use forward LIBOR rates from Bloomberg that are lower than CT's, and we account for cash payments that CT omit. We obtain identical results with CT adjusting for these differences.
1999 Pakistan	31.6	31.6	0.0	30.9	15.0	48.0	We use a lower discount rate than CT, see Footnote 1.
1999 Ukraine[3]	37.7	37.7	45.0	n.a.	n.a.	n.a.	Ukraine restructured three debt instruments in 1998/99: loans by Chase (1998) and ING (1999), and a bond held by Merrill Lynch (1999). Our estimate here refers to the Merrill Lynch bond only, which is not included on its own in either SZ or CT.
2000 Ecuador	22.7	20.2	13.3	27.4	38.3	24.8	We use more granular data on past due principal and amortization payments compared to SZ and CT. We use trading prices of new bonds instead of their discounted present values as in CT.
2000 Russia (MinFin3)	54.9	54.9	0.0	52.2	51.5	75.0	No significant discrepancy with CT or SZ.
2000 Russia (PRINs/IANs)	53.5	52.4	36.4	52.6	50.8	90.0	No significant discrepancy with CT or SZ.
2000 Ukraine	33.1	33.2	0.5	31.6	18.0	31.0	Difference to CT is mostly because we do not include the Gazprom Notes. Results are very similair when restricting to the other bonds.
2002 Moldova	39.5	39.5	0.0	33.5	36.9	40.0	We use more granular data on amortization compared to SZ and CT.
2003 Uruguay	14.5	11.6	0.0	14.1	9.8	34.0	No significant discrepancy with CT or SZ.
2004 Dominica	63.5	63.5	10.0	n.a.	54.0	53.0	We only include the two external bonds and disregard the loans. There is little discrepancy with CT when restricting to the two bonds.
2005 Argentina	74.0	70.5	43.5	74.1	76.8	71.0	There is little discrepancy in the aggregate estimates with either SZ or CT. However, we cover 144 bonds whereas SZ cover 64 and CT cover 62.
2005 Dominican Republic	0.9	1.1	0.0	1.5	4.7	5.0	Difference to CT is mainly because we calculate cash flows on a more granular monthly level.
2005 Grenada	37.5	37.9	0.0	n.a.	33.9	35.0	There is little discrepancy in the aggregate estimates with CT. Note, however, that we do not consider loans.
2006 Belize	17.1	17.6	0.0	n.a.	23.7	24.0	We do not include loans whereas CT do. We use a higher discount rate than CT, see Footnote 1.
2009 Ecuador[3]	60.8	60.8	65.0	n.a.	67.7	72.0	We use the yield on a 2015 bond series that is not part of the buyback for discounting, which is higher than the discount rate in CT.
2009 Seychelles	69.5	70.3	50.0	n.a.	56.2	70.0	We use a higher discount rate than CT, see Footnote 1. We use market trading prices of the new bonds instead of their discounted present values.
2010 Cote d'Ivoire	40.6	41.7	20.0	n.a.	55.2	82.0	CT focus on the three USD-denominated bonds whereas we also consider the three series denominated in Franc. In addition, CT apply exchange ratios to the face values of the principal, whereas the exchange offer specifies using present values (corrected here).
2012 Cote d'Ivoire	0.3	-1.0	0.0	n.a.	6.1	25.0	We use a lower discount rate than CT, see Footnote 1.
2012 Greece	55.0	54.0	53.5	n.a.	n.a.	76.0	Our bond-level estimates are very similair to Zettelmeyer et al (2013). The aggregate haircuts differ (they show 61% with uniform discount rate) because we weight averages using the face value of the bonds, whereas they use present values for weighting.
2012 St. Kitts and Nevis	43.6	43.6	31.7	n.a.	62.9	62.0	We do not include loans whereas CT do. There is little discrepancy with the same coverage of instruments.
2013 Belize	31.9	34.8	10.0	n.a.	31.5	n.a.	No significant discrepancy with CT.
2015 Grenada	43.1	42.9	25.0	n.a.	n.a.	n.a.	No comparison applicable.
2015 Ukraine[3]	13.0	12.8	20.0	n.a.	n.a.	n.a.	No comparison applicable.

Notes:

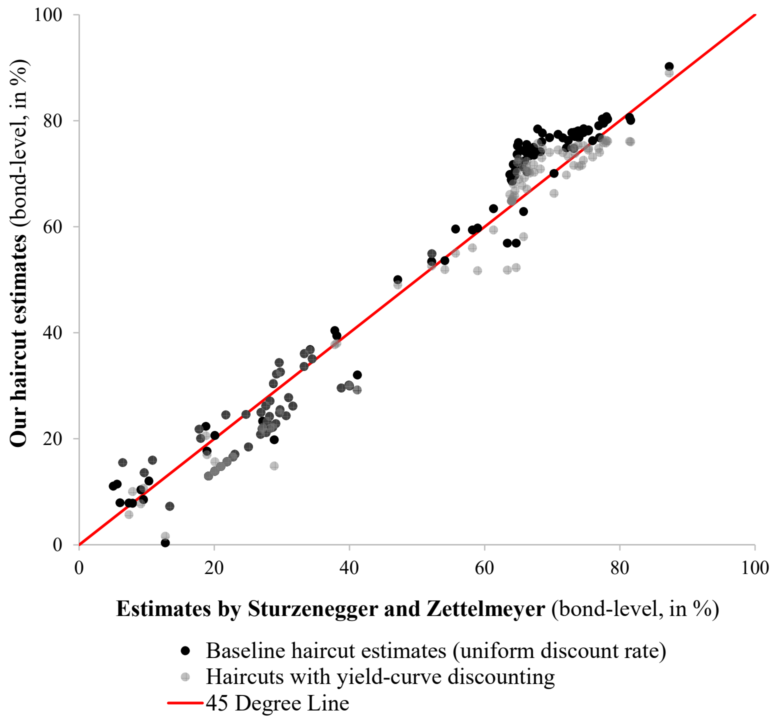
1. For our baseline haircut estimate, we compute exit yields as the average yield of all outstanding bonds as of the conclusion of the restructuring, whereas Cruces and Trebesch (2013) use implied secondary market yields derived by mapping the country's Institutional Investor credit rating score on high-yield corporate bonds with an equivalent rating by Moody's.

2. For comparison we focus on Sturzenegger and Zettelmeyer (2006, 2008) and Cruces and Trebesch (2013); Moody's (2012) uses secondary market trading prices of the old debt instruments as haircuts, which resultis in systematically higher estimates.

3. The NPV haircut should usually be higher than the face value reduction, because a unit of principal of the old bond usually has a higher PV than that of the new bond, due to the extension of maturity, lower coupon rates etc. The reason why this is not the case here is as follows: In Ukraine 1999, the old bond has a zero coupon whereas the new bond has a high coupon rate of 16% (albeit with longer maturity), making the new bond more valuable than the old one. Ecuador 2009 is a buyback and that the old bond was worth less in NPV terms than the cash payments offered. In Ukraine 2015 (as well as Argentina 2005), the face value reduction does not count the new conditional GDP-linked securities, as per market convention. In Ukraine 2015, the package of GDP-linked warrants was particularly generous, thereby reducing the haircut significantly.

The only other paper providing bond-level haircut estimates is Sturzenegger and Zettelmeyer (2008). As a second benchmarking exercise, we therefore compare our baseline haircut estimates as well as our haircuts using yield-curve discounting to their bond-by-bond estimates. The results are summarized in Figure A.1.

Figure A.1: Comparison of haircut to Sturzenegger and Zettelmeyer (2006, 2008), bond-level



The main take away from Table A.1 and Figure A.1 is that the haircut estimates in this paper are similar to those in earlier work. More specifically:

- Our estimates are most similar to Sturzenegger and Zettelmeyer (2006, 2008), which is unsurprising since they use a very similar approach, focus on bonds only, and also aggregate haircuts using bond-level estimates. The absolute difference (positive or negative) to our estimates is 1.7 percentage points.

- The differences to Cruces and Trebesch (2013) are larger, with an average absolute difference of about eight percentage points. The discrepancy can be explained by three main factors. First, differences in sample coverage: CT include loans and bonds while we focus only on bonds. Second, we apply different discount rates: CT use an imputed series, while we use exit yields based on market prices. Third, there are differences in the methodology: to approximate the value of the new bonds, we use the post-restructuring bond price, while CT compute discounted present values. A minor factor that also contributes to the discrepancy is that CT calculate discounted cash flows on an annual level, while similar to Sturzenegger and Zettelmeyer (2006, 2008) calculation is done on a more granular, monthly level in our analysis.

- The difference are largest when comparing our estimates to those of Moody's (2012) who use prices of bonds immediately after default. On average, the absolute difference amounts to 13 percentage points, but for some deals the discrepancy is as large as 30 or 40 percentage points. The difference between Moody's (2012) and the estimates by Sturzenegger and Zettelmeyer (2006, 2008) or Cruces and Trebesch (2013) are also substantial.

3 Holdouts - comparison with earlier work

Analogous to the previous section, we now compare our data on holdout rates with those reported in earlier work, in particular Sturzenegger and Zettelmeyer (2008), Moody's (2013) and Das et al. (2012). Again, our contribution compared to those studies is that we gather bond-level holdouts, compared to the aggregates provided in earlier work. Table A.2 shows the comparison by restructuring.

For almost all deals the differences in aggregate holdouts are small. Moreover, the observed differences can be easily explained in each case (different sources or a different sample of bonds).

Arguably, the most notable discrepancy appears for Argentina 2005, where we report an aggregate holdout rate that is about 5 percentage points lower than that shown in Moody's (2013) and Sturzenegger and Zettelmeyer (2008). Earlier studies use the official participation rates, as reported in press releases by the Argentinian authorities. These official rates, however, are based on all 315 eligible instruments, including about 160 coupon or principal "strips" for which there is very limited information. For consistency and transparency reasons, we prefer focusing on the 145 regular sovereign bonds of the Argentine exchange rather than including separately traded coupon or principal strips. Our sample of 145 Argentine bonds builds on Schumacher (2014) and is larger, and thus more representative, than the sample used in earlier work (CT cover 62 Argentine bonds and SZ cover 64).

Table A.2: Comparison of holdouts with earlier work

	Our estimates: aggregate holdouts in % (from bond-level holdout data)	**Earlier estimates** (aggregates only): Sturzenegger Zettelmeyer (2006, 2008)	Das et al. (2012)	Moody's (2013)	**Explanation for discrepancies**
1994 Panama	n.a.	n.a.	n.a.	n.a.	No comparison applicable.
1999 Pakistan	0.04	1	1	1	The 1% aggregate holdout rate is as of December 1999. Due to lack of data we calculate holdout rates as of Feburary 2001 by using litigated amounts per bond. This is a lower bound estimate on total holdouts.
1999 Ukraine	50.61	n.a.	n.a.	50	Only minor difference to Moody's. We use outstanding amounts in the subsequent restructuring in 2000, which allows us to calculate the holdout rate with more precision.
2000 Ecuador	3.95	2	2	3	We use the bond-level amounts (tendered/outstanding) in Ecuador's Listing Pariculars Document dated August 23, 2000. The other studies use a reported average.
2000 Russia MinFin3	9.10	25	n.a.	10	We rely on a news article by Dow Jones as of December 6, 2000 which gives detailed amounts. SZ (2008)'s number is "as of mid-August 2000 […] final participation rate was significantly higher."
2000 Russia PRINs/IANs	1.28	1	n.a.	1	We use bond-level holdout rates as of August 21, 2000 – four days before the closing/settlement date on August 25, 2000. Other studies report final aggregate holdouts.
2000 Ukraine	1.92	3	3	1	We exclude the Gazprom Notes and use bond-level holdout rates as of March 17, 2000. The other studies use aggregates at the settlement date on April 14 and/or include the Gazprom debt.
2002 Moldova	0.00	n.a.	0	0	No discrepancy.
2003 Uruguay	8.53	7.5	7	7.5	The other studies refer to the 7.5% aggregate number also reported in the IMF Country Report 03-247. this number, however, omits the Yen bonds and a number of local-law bonds. We add this information using data from SZ and other sources.
2004 Dominica	n.a.	n.a.	28	28	Only aggregate data available. We could not find bond-level holdout data for the two series involved.
2005 Argentina	19.70	24	24	24.8	The other studies report the aggregates from official press releases and these included holdouts on bonds *and* so called "strips". Our numbers are based on the holdout rates of the 145 sovereign bonds, but we exclude 160 "strips". Strips had higher holdouts than regular bonds, thus biasing the aggregate estimate.
2005 Dominican Republic	6.36	n.a.	3	3	Existing studies report holdouts after the reopening of the exchange (second round). For consistency with the other deals, we focus on the holdout rates at the closing of the first, original debt exchange, resulting in a higher aggregate.
2005 Grenada	6.68	n.a.	9	6	We use instrument-level holdout rates of bonds only, resulting in a lower aggregate holdouts compared to earlier studies. The aggregate holdout rate is 9.05% if we include loans.
2006 Belize	3.04	n.a.	2	1.9	We focus on bonds and exclude loans, resulting in somewhat higher aggregate holdouts compared to the other studies. If we include loans we get the same 1.9% aggregate as Moody's.
2009 Ecuador	9.05	n.a.	n.a.	9	Minor discrepancy only. We use bond-level holdout rates which allow us to calculate a more precise aggregate number.
2009 Seychelles	0.00	n.a.	0	0	No discrepancy.
2010 Cote d'Ivoire	0.38	n.a.	n.a.	0.02	We use the bond-level holdout rates at the expiration date of the offer on April 8, 2010, whith holdouts amounting to 0.38%. One week later, as of April 16, 2010 the aggregate holdout rate declined to 0.02%, the rate referenced by Moody's.
2012 Cote d'Ivoire	0.00	n.a.	n.a.	0	No discrepancy.
2012 Greece	3.12	n.a.	n.a.	3.1	We have a more precise number that is the same as in Zettelmeyer, Trebesch, Gulati (2013).
2012 St. Kitts and Nevis	0.00	n.a.	n.a.	0	No discrepancy.
2013 Belize	0.00	n.a.	n.a.	0	No discrepancy.
2015 Grenada	0.00	n.a.	n.a.	n.a.	No comparison applicable.
2015 Ukraine	0.00	n.a.	n.a.	n.a.	No comparison applicable.

Note: The sources referenced in Moody's (2013) are "Moody's, IMF country reports, Sturzenegger and Zettelmeyer (2005), Diaz-Cassou, Erce-Dominguez and Vazquez-Zamora (2008), and Andritzky (2006)." The book by Sturzenegger and Zettelmeyer (2007) lists numerous sources in the footnotes. The sources referenced in Das, Papaioannou and Trebesch (2012) are "Trebesch (2010), complemented with information by Andritzky (2010), Lim, Medeiros and Xiao (2005) and IMF (2003)."

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