Sovereign Debt Restructuring and Reduction in Debt-to-GDP Ratio

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How effective are sovereign debt restructurings in reducing debt-to-GDP ratios? We explore this empirically using a comprehensive dataset covering 115 countries over 1950–2021. After addressing selection into restructuring events through an Augmented Inverse Probability Weighted (AIPW) estimator, we show that debt restructuring has a significant and long-lasting impact on the debt-to-GDP ratio. The impact is larger when debt restructuring is combined with fiscal consolidation. In the short run, restructurings with face value reduction and higher creditor coordination are relatively more effective. In the long run, however, the depth of treatment is important, irrespective of the type of treatment. (JEL F34, F41, H63)

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Public debt as a ratio of GDP ("debt ratio" henceforth) soared across the world during COVID-19. In 2020, the global average of this ratio approached 100 percent, and it is projected to remain above pre-pandemic levels for about half of the world (IMF, 2023a; Arslanalp and Eichengreen, 2023). High public debt ratios pose a growing challenge for policymakers, particularly under modest growth prospects and tight financial conditions. While fiscal consolidation, growth, and inflation can help reduce debt ratios, they may not be sufficient for countries facing disruptive levels of debt. In such cases, debt restructuring, or renegotiation of terms of existing debt, is often employed by countries in debt distress as a strategy to reduce debt ratios.[1]

While a growing literature studies the effects of debt restructurings on GDP,[2] there is surprisingly little evidence on the impact of restructurings on debt ratios. The debt to GDP ratio is a standard metric used by policymakers. It is applied extensively when evaluating a country's capacity to repay and is a core element of debt sustainability analyses (see e.g., IMF, 2017; 2021b). Debt ratios are also commonly used in empirical research assessing the impact of public debt on growth and other macroeconomic factors, as discussed in Romer and Romer (2019) and in a decade of research papers surveyed by Salmon and de Rugy (2020).

Since debt restructurings can impact both debt (numerator) and GDP (denominator), the overall effect of restructurings on debt ratios is not obvious—and over time those effects grow even more opaque. Even if a reduction in the face value of debt (commonly referred to as "nominal haircut") has an immediate impact in reducing the debt stock, a restructuring could also reduce incentives for countries to commit to fiscal consolidation in the future, for example due to moral hazard issues that can erode fiscal responsibility or more favorable economic recovery

[1] As of August 31, 2023, out of the Poverty Reduction and Growth Trust (PRGT)-eligible countries, 10 countries are in debt distress, 26 countries are at high risk, 26 countries are at moderate risk, and 7 countries are at low risk of debt distress. (IMF, 2023b).

[2] See Asonuma and Trebesch (2016), Asonuma and Papaioannou (forthcoming), and Asonuma et al. (2022).

after debt restructurings. In addition, the timing of the effects on the debt stock and on GDP can be different. The debt stock is reduced only after the completion of debt restructurings, but GDP can be negatively impacted from the start of the event. Moreover, different types of debt treatment can have different impacts over time. While a "nominal haircut" has an immediate and direct impact on the debt stock at the completion of debt restructuring, cash flow relief—i.e., maturity extension and/or a coupon rate reduction can provide fiscal space for the debtors to implement fiscal consolidation or stimulate growth. In addition, cash flow relief can impact the debt stock (as well as GDP growth) over a longer horizon too.

This paper contributes to the literature by assessing the cumulative effects of debt restructurings on debt ratios over time, how these effects vary across different types of debt treatment (nominal haircut versus cash flow relief only), types of creditors and coordinator (e.g., if the restructuring is part of a large-scale debt reduction program), and how these effects interact with fiscal consolidation.

We compile a novel dataset covering restructuring events with a wide range of creditors (external private, official Paris Club, official non-PC, and domestic) across 115 emerging market and developing countries between 1950 and 2021. Because the occurrence of debt restructuring is likely to be endogenous to overall macroeconomic conditions in a country, we follow Jorda and Taylor (2016) and use an Augmented Inverse Probability Weighted estimator (AIPW) to attenuate the selection bias in the estimation of the average treatment effect (ATE). The AIPW estimator first computes the probability of a restructuring event taking place, and then uses this information in a second stage to obtain an ATE. One of its key features is that it is doubly robust, so if either the first or the second stage are correctly specified, the estimator is consistent.

Our main finding is that, on average, sovereign debt restructuring has a negative, significant and, importantly, long-lasting impact on the debt ratio. A typical sovereign debt restructuring event leads to a decline in debt-to-GDP of 3.8

percentage points in the first year and a cumulative 7.2 percentage points after five years. The impact is even larger when the treatment group is restricted to restructuring events that happen concurrently with fiscal consolidations, those that involve a reduction in the face value of debt (instead of simply a rescheduling of payments) or involve large-scale creditor coordination initiatives. The long-run impact (after five years or later), however, is most evident when restructurings are combined with fiscal consolidation, suggesting the importance of comprehensive reforms designed for debt ratio reduction.

The results also highlight heterogeneity across different "sizes" of treatment as some debt restructurings can involve larger interventions than others. Restructurings that involve larger face value reductions have a larger impact on the debt ratio relative to the average effect. While intuitive, the magnitude of those effects is not obvious, as larger face value reductions can be associated with worse economic prospects (i.e., lower GDP growth).

Lastly, we analyze the effects of restructurings with face value reduction versus those that only provide a cash flow relief. Specifically, we calculate the Average Treatment Effect (ATE) *per unit of treatment* in each of those categories by diving the ATE by the average size of the treatment in each event. We find that the initial ATE per unit of treatment is larger when a face value reduction is involved; however, the long-run impact of restructurings involving cash flow relief only is comparable, suggesting cash flow relief can also be an effective form of debt restructuring, as long as the treatment is deep enough.

Literature

This paper contributes to the empirical literature on debt restructurings by quantifying their impacts on debt-to-GDP ratios. As mentioned above, there is a growing body of work that studies the effects of sovereign debt restructurings on

GDP, but the evidence on the effects on debt-to-GDP ratio remains scarce. Among the few that do, two papers closely related to ours are Reinhart and Trebesch (2016) and Cheng et al. (2019). Reinhart and Trebesch (2016) compare simple averages of the debt-to-GDP ratio before and after restructuring events for a sample of official bilateral debt restructurings in 18 advanced economies (AEs) during 1920–1939 and private external debt restructurings in 35 emerging market economies (EMs) over 1978–2010, and find significantly lower debt ratios post-restructuring in both samples.[3] Cheng et al. (2019) employ a sample of official Paris Club debt restructurings over 1956-2015 in 93 EMs and low-income countries (LICs) and use local projection methods to find that restructurings with face value reduction decrease countries' external debt stock and increase their GDP growth—implicitly suggesting a decline in debt ratio on average—after debt restructurings.[4]

This paper complements the existing work in several ways (see summary in Table 1). First, we employ the most comprehensive database to date, ranging from 1950 to 2021 across 115 emerging market and developing countries (advanced economies rarely restructure debt; see data section). In particular, our data has a larger coverage both across countries and across time when compared to the datasets employed in the existing literature. In addition, our dataset includes restructurings vis-à-vis a broader spectrum of creditors—bilateral creditors (both Paris Club creditors and China), external private creditors, and domestic creditors—and restructurings outside sovereign defaults, in contrast to the existing empirical literature that has focused primarily on restructurings with sovereign

[3] In related work, Reinhart et al. (2015) explore a menu of options to reduce public debt ratios in the long run that include: (i) growth above the interest rate, (ii) fiscal consolidation (e.g., primary balance improvement), (iii) privatization, (iv) debt restructuring and default, (v) unanticipated inflation, (vi) wealth taxes and financial repression. They find that AEs relied more on "heterodox" polices, including restructuring debt contracts, generating unexpected inflation, taxing wealth, and repressing private financing. In recent work, Patel and Peralta-Alva (2023) evaluate the effect of fiscal consolidations on debt ratios using a Structural Vector Autoregression (SVAR) methodology and find nearly zero average impact across a sample of 17 advanced economies.

[4] The empirical literature on sovereign defaults and debt restructurings finds GDP decline since the onset of sovereign debt crisis, i.e., start of sovereign debt restructurings. See Sturzenegger (2004), Tomz and Wright (2007), Borensztein and Panizza (2009), Reinhart and Rogoff (2009), Levy-Yeyati and Panizza (2011) and Asonuma and Trebesch (2016).

defaults (Sturzenegger and Zettelmeyer, 2008; Reinhart and Rogoff, 2009, 2011; Cruces and Trebesch, 2013; Kaminsky and Vega-Garcia, 2016; Reinhart and Trebesch, 2016, among others).

Second, we study the impact of the debt restructurings on the debt ratio since the *start* of debt restructurings, or equivalently the onset of debt crisis. Reinhart and Trebesch (2016) and Cheng et. al. (2019), instead focus on the end of restructurings or the end of a debt crisis. The timing of the treatment variable can be of great relevance for debt ratios: while the debt stock only changes at the end of the restructuring episode (resolution of the crisis), GDP can be affected before that. Moreover, since debt relief from restructuring is typically recorded at the end of the restructuring episode, the dynamics of the debt stock, GDP, and of the debt ratio at the start of the restructuring event are not necessarily obvious, or mechanical.[5]

Third, we address the endogeneity related to countries self-selecting into restructuring by employing an AIPW estimator, which helps to attenuate selection bias and is "doubly robust" compared to other estimation methods.[6] For one example, see Jorda and Taylor (2016), who use the AIPW to analyze the effects of fiscal consolidation episodes on GDP in Advanced Economies. Our contribution is to apply the AIPW estimator to evaluate the effects of a comprehensive set of sovereign debt restructuring events on the debt-to-GDP ratio.

Fourth, we study the types of restructuring that are more effective in reducing debt ratios, such as those combined with fiscal consolidation, face value reductions, and creditor coordination. Studying restructurings combined with fiscal consolidation efforts provides implications for the ongoing policy discussion on both elevated public debt and sovereign debt restructurings (IMF 2021a; 2023a). The interaction between sovereign debt restructurings and fiscal consolidations has

[5] About one-third of restructuring episodes (see data section for its definition) last for 2 or more years, making the distinction between start and end of the episode relevant.

[6] Alternative estimation methods such as an Inverse Probability Weighted (IPW) estimator (Kuvshinov and Zimmermann 2019) have also been used in the sovereign debt literature.

not been studied in the previous literature. The analysis of heterogeneity in the impact of restructurings with and without creditor coordination is also unique to this study. We find that restructurings with creditor coordination under the Heavily Indebted Poor Country (HIPC) Initiative have larger impacts on the debt ratio than the average restructuring. This result contrasts with previous research that argued that HIPC countries remained heavily indebted even after two decades (1980-1997) of debt relief and concessional financing (Easterly, 2002).

Finally, a new finding in this study is that debt restructurings with cash flow relief only (i.e., maturity extension and/or coupon rate reduction) can provide a significant reduction in the debt ratio over the long run, comparable in magnitude to that with a face value reduction. We do this by comparing the ATE *per unit of treatment* for restructurings with face value reduction and those with cash flow relief only. Consistent with previous papers, we find that when debt restructurings involve a face value reduction, the initial ATE per unit of treatment is large. In contrast, when debt restructurings involve cash flow relief only, the initial ATE per unit of treatment is small, while the ATE increases monotonically over time. As a result, the impact of cash flow relief is largely driven over the longer term by additional effects over the medium and long run (e.g., through GDP growth and fiscal consolidation). Overall, we find that a debt restructuring event with cash flow relief only can also be an effective form of debt restructuring as long as it provides the required space for longer term adjustments to be made. This is a new finding compared to the literature which has mostly focused on the effects of face value reductions.

[Insert Table 1 Here]

I. Data

Definition of Sovereign Debt Restructuring

Sovereign debt restructuring is a "debt distress" event in which the terms of contractual payments of some outstanding government instruments are renegotiated, typically with a net present value loss for the creditors (Asonuma and Papaioannou, forthcoming; Das et al., 2012).[7] The definition applies to both domestic and external debt, and to debt held by both private and official (multilateral and bilateral) creditors, and is also in line with what credit rating agencies use. While an external restructuring involves outstanding debt instruments issued under foreign jurisdiction and held by external creditors, a domestic one includes instruments issued under domestic jurisdiction and held mainly by domestic creditors. Online Appendix I contains more details.

Although sovereign debt restructuring may be correlated with sovereign default (or a failure of a sovereign to make a principal and/or interest payment by the time specified in debt contracts), they do not necessarily happen at the same time, as a debtor could approach the creditors and engage in restructuring preemptively. Asonuma and Trebesch (2016) distinguish two types of restructuring strategies: (i) preemptive restructurings, defined as those which are implemented with no missed payments (i.e., no legal default) or with some missed payments but only over a short period after the start of renegotiation process with creditors (i.e., no unilateral default); (ii) post-default restructuring, defined as those where payments are missed unilaterally and without the agreement on debt settlement with creditors (i.e., a unilateral default ahead of negotiations).

[7] "Under debt distress" refers to a circumstance where a sovereign government loses market access and/or faces difficulty in servicing principal and interest payments. Debt distressed exchanges should be differentiated from regular liability management operations (LMOs) such as debt swaps or debt buybacks, which are voluntary market exchanges often implemented during normal times and not as a part of crisis resolution.

The implementation of debt restructuring can also take different forms. While there is no universally agreed taxonomy, this paper follows Das et al. (2012), Asonuma and Papaioannou (forthcoming) and considers two types: (i) face value reduction—also called principal (nominal) debt reduction—defined as a cut in the nominal amount of the old (existing) instruments; and (ii) debt rescheduling—also called a reprofiling, or cash flow relief without face value reduction—, defined as maturity extension of the old instruments, sometimes with a coupon rate (interest rate) reduction which results in a change in cash flow streams of the old debt.[8]

Sources

We assemble a novel dataset that covers (i) private external debt restructurings; (ii) official bilateral external debt restructurings—by both the Paris Club creditors and China—; (iii) domestic debt restructurings from 1950 to 2021. The dataset is compiled from several sources including: (i) Asonuma and Trebesch (2016) for private external debt restructurings, which contains information also on timing of restructurings; (ii) Horn et al. (2022) and Paris Club database for official bilateral external debt restructurings; and (iii) IMF (2021) for domestic debt restructurings. We complement these data with additional sources that provide granular information on face value reduction and rescheduling, such as Asonuma et al. (2023), Asonuma and Wright (2022), Cheng et al. (2018), and Cruces and Trebesch (2013).

Country-level economic indicators, including GDP, general government debt, general government primary balance, inflation, and exchange rates, are obtained

[8] Alternative classifications for sovereign debt restructuring types include the one employed by Paris Club creditors, which focus on (i) restructurings that reduce the present value (PV) of debt, whether through face value reduction or other modalities including maturity extensions and/or coupon rate reductions; and (ii) restructurings that do not reduce the PV of debt. Note that a classification based on PV of debt is not employed in this paper due to the lack of data on the present values of debt for a broad sample.

from the October 2022 vintage of the World Economic Outlook database, published by the IMF.

A First Look

Drawing from the compiled database, 709 restructuring events were reported from 1950 to 2021 across 115 countries. Almost all events were in emerging market economies and low-income countries, which is where we will focus our attention.[9] Table 2 documents stylized facts. Debt restructurings typically involve cash flow relief with no face value reduction, tend to happen preemptively rather than post-default, and most frequently involve official creditors, especially in low-income countries. Restructurings with domestic creditors are rare and may reflect intentions to avoid risks in the domestic financial sector. These are also less likely to involve face value reduction; even when they do, the reduction tends to be shallower compared to restructurings with external creditors.

[Insert Table 2 Here]

Fiscal consolidations, measured by an increase in primary-balance-to-GDP ratio, are commonly implemented prior to debt restructuring. In the sample with available data on primary balances, 60 percent of debt restructuring events are preceded by an increase in the primary-balance-to-GDP ratio, indicating that countries often undertake fiscal measures before resorting to debt restructuring.

[9] Restructuring events involving advanced economies (AEs) are rare in our database over the sample period of 1950–2021 and include only three episodes: Slovenia in 1992–96, Greece in 2011–12, and Cyprus in 2013. We drop these in our analysis because public debt in AEs exhibit very different features compared to EMs and LICs (e.g., governing law, currency denomination, creditor composition); the structure of economies and their tolerance for debt are distinctive too. The main findings remain qualitatively similar if we include the three AE episodes.

II. Empirical Strategy

This section presents a framework to estimate the average impact of a debt restructuring event on a country's debt-to-GDP ratio. We estimate an ATE through a local projection of changes in the debt-to-GDP ratio onto a restructuring dummy (treatment) and its interaction with other controls. Specifically, we estimate the following specification:

$$\Delta^h y_{c,t} = \alpha_c^h + \alpha_t^h + (\beta_0^h + x'_{c,t}\beta_1^h)T_{c,t} + x'_{c,t}\gamma^h + \epsilon_{c,t}^h, \quad (1)$$

where h is the horizon of the impact, ranging from 0 to 5 years, $\Delta^h y_{c,t} = y_{c,t+h} - y_{c,t-1}$ indicates changes in the debt ratio over different horizons, and $T_{c,t}$ is a treatment dummy indicating whether country c starts restructuring at year t. The covariates $x_{c,t}$ include two lags of: the treatment dummy (to capture restructuring events that happen in close sequence), GDP growth, and the change in debt-to-GDP ratio; it also includes one lag of: the change in exchange rate (measured by home currency per US dollar), inflation, and global output gap, which captures variation in global economic conditions. The specification interacts the covariates with the treatment to account for heterogeneous impacts based on macroeconomic conditions, and includes country and year fixed effects, α_c^h and α_t^h.

Debt restructuring, however, does not occur randomly. Instead, it is only observed when countries undergo severe debt distress and find the need to renegotiate their public debt. In turn, those conditions are likely to be correlated with other factors that could impact the debt ratio, including depressing GDP growth. To account for this selection, we use an AIPW estimator, following Jorda and Taylor (2016).

The first step in the AIPW procedure is to estimate the probability that a country will go into debt restructuring. We estimate this propensity score using a saturated probit model

(2) $$P\left(T_{c,t}=1\middle|x_{c,t},z_{c,t},d_{c,t-1}\right)=\Phi\left(x'_{c,t}\theta+z'_{c,t}\pi+\mu_c d_{c,t-1}+\eta_c\right),$$

where Φ is the cumulative distribution function of the standard normal distribution. The predictors include not only the same set of covariates as (1), denoted by $x_{c,t}$, but also additional covariates $z_{c,t}$ that include one lag of US short and long interest rates, the effective interest rate (defined by the government interest expense over the previous period's debt stock), primary-balance-to-GDP ratio, and current-account-balance-to-GDP ratio. We also include the *level* of debt-to-GDP ratio, $d_{c,t-1}$, as countries with low debt ratios tend not to restructure. However, because the threshold for countries to consider debt restructuring might be different, we interact debt-to-GDP ratio with country dummies in the term $\mu_c d_{c,t-1}$. Lastly, we add a second set of country dummies, η_c, to capture remaining country-specific features. We use $\hat{p}_{c,t}$ to denote the estimated probability from equation (2). To avoid excessively large weights, we only use observations for which $\hat{p}_{c,t}\in\left(10^{-4},1-10^{-4}\right)$.

Second, we estimate the outcome model in Equation (1) using Ordinary Least Squares. Once the coefficients in that model are obtained, we derive two sets of predicted changes in debt-to-GDP for each country and each year: one in which the treatment dummy equals 1, and one in which the treatment dummy equals 0, denoted by $\widehat{m}^h_{c,t}(1)$ and $\widehat{m}^h_{c,t}(0)$ respectively. To ensure that the same data are used to obtain all treatment effects, the sample on which both the propensity and outcome models are estimated only includes the country-year pairs for which $y_{c,t+h}$ is observed for all horizons $h\in\{0,\ldots,5\}$. The ATE is calculated as

(3) $$ATE^h=\frac{1}{n}\sum_{c,t}\left\{\left[\frac{T_{c,t}\Delta^h y_{c,t}}{\hat{p}_{c,t}}-\frac{(1-T_{c,t})\Delta^h y_{c,t}}{1-\hat{p}_{c,t}}\right]-\frac{T_{c,t}-\hat{p}_{c,t}}{\hat{p}_{c,t}(1-\hat{p}_{c,t})}\left[\left(1-\hat{p}_{c,t}\right)\widehat{m}^h_{c,t}(1)+\hat{p}_{c,t}\widehat{m}^h_{c,t}(0)\right]\right\},$$

where n is the number of observations in the data. The AIPW consistently estimates the average treatment effect under the assumption of selection-on-observables, i.e., the treatment and potential outcomes are independent conditional on the covariates. The estimator is also "doubly robust", meaning that if either the treatment or the outcome models are correctly specified, then the estimated ATE is consistent (Glynn and Quinn, 2010).

III. Results

Estimation of Propensity Score and Average Treatment Effect of Restructuring

Table 3 reports the results from the probit estimation in the first step and the AIPW in the second step. We find a negative and significant effect of the lagged treatment on the propensity score, suggesting that countries that have recently restructured their debt are less likely to do so in the near future (potentially as creditors might be less inclined to negotiate multiple restructurings in sequence). Similarly, countries that start restructuring debt are more likely to have decreased their debt-to-GDP ratio in the two years preceding the restructuring start. This could reflect the discussion above, where the majority of countries undergo fiscal consolidation before starting to restructure debt (debt restructuring is frequently a "last resort" for countries that are not able to sufficiently reduce debt by other means). Our estimation also suggests that restructurings are more likely to happen when global conditions are favorable (measured by higher global output gap) and when countries experience lower GDP growth, though in those cases the p-values are relatively high (close to 0.10). The former could reflect creditors' willingness to restructure, while the latter could make it harder for countries to "grow out of debt." Surprisingly, we find no clear impact of interest rates on the probability of restructuring, with opposite sign for coefficients on long- and short-run US rates,

and large standard errors.[10] The model predicts the probability of a country going into restructuring well, with the area under the receiver operating curve (AUROC) above 0.85.[11] Other statistics and robustness checks to assess the estimation of the propensity score can be found in Online Appendices II and III.

[Insert Table 3 Here]

The AIPW estimation of the ATE of restructuring suggests that debt restructuring in emerging market economies and low-income countries has a negative, statistically significant, and importantly, long-lasting impact on debt ratios. This effect is also economically significant: on average, debt ratios decrease by 3.8 percentage points in the first year of restructuring, increasing to 7.2 percentage points in five years.

[Insert Figure 1 Here]

Robustness checks. We assess the robustness of our findings in several ways, the results of which are detailed in Online Appendix III. First, we increase the horizon of our estimation from 5 to 10 years after the restructuring episode starts, finding consistently negative effects in all years (although the standard error tends to increase with the horizon, partly due to a smaller sample that includes data on all 10 years ahead of each restructuring event; see Online Appendix Figure 1). Next, we address some potential endogeneity concerns on the first stage of our estimates. Specifically, one might worry that countries and their creditors would delay any settlement until growth prospects are high and default risk is low, which would

[10] A higher value for the short-run interest rate could reflect a higher cost for countries to roll over their debt, thus increasing the probability of restructuring. Long-run interest rates, on the other hand, might reflect the opportunity cost of creditors: when long-run rates are high, creditors have a higher cost of renegotiating debt as they would rather invest their capital in other long-run projects, decreasing the probability of restructuring. Note that in neither case, the coefficients are statistically significant.

[11] We also find significant overlap between the distribution of propensity scores across the treatment and control groups, with both distributions displaying close to full support in the [0,1] interval.

decrease the debt ratio through higher GDP growth. By re-framing the analysis above and using percent changes in debt stock as the outcome variable, we compute the ATE of restructuring on debt levels and show that it significantly decreases debt level—about 7 percent on impact and over 35 percent after 5 years (Online Appendix Figure 2).[12] We also include 1- and 2-year ahead GDP forecasts (based on IMF projections) as control variables, finding similar results to our baseline estimation (Online Appendix Figure 3).

We also test the robustness of our specification by removing the interaction terms from the treatment variable in equation (1), finding similar results. Lastly, we estimate the ATE from a standard local projection framework—which in this case amounts to removing the interaction terms before estimating equation (1) via OLS. The ATE of h years ahead then coincides with β_0^h. Online Appendix Figure 3 plots the resulting estimates, showing that the AIPW attenuates the impact of a restructuring episode on the debt ratio, as would be expected given the selection biases outlined above.

Heterogeneity in the Impact of Restructuring

Until now, the reported estimates represent averages across all restructuring events in the sample. However, it could be the case that restructuring is more effective in particular environments. We consider three dimensions that could be important in making policy choices for countries in debt distress: restructuring events that occur jointly with fiscal consolidation, events with face value reduction, and those with large-scale creditor coordination.

[12] Note that the fact that the impact on debt is larger than the impact on the debt ratio means that GDP is negatively impacted by restructuring in our sample. A back-of-the-envelope calculation that sets the average debt ratio $\frac{d}{y} = 1$ and $\Delta\left(\frac{d}{y}\right) = \frac{d}{y} \times \left(\frac{\Delta d}{d} - \frac{\Delta y}{y}\right)$ implies that GDP falls by $\frac{\Delta y}{y} \approx -3.8\%$ after one year of restructuring, compared to the year prior to the restructuring episode (the change in the debt-ratio is about -3.8%, while the change in debt level is about -7.6%).

To calculate the joint effect of restructuring and fiscal consolidation, we re-estimate the AIPW model using a subset of restructuring events – namely those for which the average cyclically adjusted primary balance is positive for the duration of the restructuring. The restructuring events without fiscal consolidation are dropped from the estimation sample, but no changes are made to the control group.

A similar strategy is adopted when we calculate the impact of debt restructuring with face value reduction. We subset the events in the treatment group to those with face value reduction at any point during the restructuring event. As before, the restructuring events without face value reduction are dropped from the sample. We also estimate the impact of debt restructurings with large face value reductions, where we keep only the events with face value reduction to GDP ratio above the 25th percentile of its distribution.[13]

For large-scale creditor coordination, we restrict the treatment group to the restructuring events under HIPC and MDRI. Once again, the restructuring events that are not under HIPC and MDRI are dropped from the sample.

[Insert Figure 2 Here]

Figure 2 shows that the impact of restructuring when it is combined with fiscal consolidation ranges from 4.7 percentage points in the first year to 11.9 percentage points in the fifth year.[14] The results highlight the importance of continued fiscal efforts, to enhance the effects of debt restructuring in reducing debt ratios. Restructuring events that include face value reduction also have a large impact on the debt-to-GDP ratio, compared to the average. Most of this additional effect is

[13] Larger thresholds produce similar results, but can run into small sample issues. Specifically, if only a few episodes with very large FVR are included in the treatment group, the probit model in the first stage estimates a probability of treatment that is very close to 0 or 1 for many of the observations in our sample. Given that we restrict the sample to cases where $\hat{p}_{c,t} \in (10^{-4}, 1-10^{-4})$, larger FVR thresholds can significantly reduce the sample size for the second stage in the estimation.

[14] Online Appendix III Figure 4 reports that the initial impact of restructuring on debt ratios is similar when we use an alternative definition of fiscal consolidation.

visible in the first year of restructuring, as face value reduction provides immediate debt relief. In the first year, the impact of restructuring with face value reduction is 8.9 percentage points, compared to an average impact of 3.8 percentage points in the typical event. The immediate effect of restructurings with face value reduction ranges from 8.1 to 12.3 percent in alternative specifications (Online Appendix II Table 7). Notably, the impact is not merely mechanical: even if a face value reduction reduces the value of debt (numerator), there could be an impact on GDP as well (denominator), which means the impact on the debt ratio is not obvious. Indeed, in our estimation sample, the average face-value-reduction-to-GDP ratio is about 6 percent per year, over the period while the restructuring event lasts—considerably smaller than the estimated ATE.[15] This finding may reflect that the restructuring event could be associated with higher nominal GDP growth, including higher real growth from macro policies, and higher inflation during a crisis.

The average long-run impact of a face value reduction on debt ratio after five years is 5.0 percent. Unlike the subsample with fiscal consolidation, the impact of a face value reduction is more frontloaded, and the impact is smaller in the long run compared to restructuring with fiscal consolidation, highlighting the importance of fiscal efforts in sustaining the impact of restructuring. Consistently, the impact of debt restructuring with a large face value reduction is larger relative to the average and diminishes in the long run.

Finally, the restructuring events with large-scale creditor coordination also has a larger effect on reduction in debt-to-GDP ratio, compared to the average. The ATE in the first and fifth year is 5.4 and 6.4 percent, respectively.

To summarize, debt restructuring in emerging market economies and low-income countries can have a large, negative, and long-lasting effect on debt ratios. This

[15] We note that this average is calculated after removing potential outliers (top and bottom 10 percent of the distribution). While we divide the FVR-to-GDP by the duration of restructuring, we note that over three quarters of restructuring events last a single year.

effect is heightened when the restructuring is accompanied by fiscal consolidation. Restructurings with face value reduction and creditor coordination are also more effective compared to the average, particularly in the short run.

Robustness checks. As before, we conduct several robustness checks on our specifications discussed above. First, we adopt a weaker definition of fiscal consolidation—namely that it amounts to a positive average year-on-year *change* in the cyclically adjusted primary balance while restructuring takes place. Figure 4 in Online Appendix III reports the ATE estimates. In this case, we still find that the initial impact is larger than our baseline estimates, but unlike with the first definition of fiscal consolidation, the cumulative effect starts to decrease after a few years. This is not surprising, as a positive change in primary balance can still take place while it remains negative throughout the whole episode, adding to public debt.

Moving to restructurings with face value reduction, Online Appendix III Figure 5 considers two alternative ways to subset these events. First, to remove outliers, we consider an even more restricted treatment group where we drop events in which the ratio of the face value reduction in public debt to the country's GDP (in the year prior to debt restructuring) is on the top or bottom 10 percent of the distribution (considering only events where the face value reduction is strictly positive). Our findings are robust to this alternative sample. Second, since governments often do not know whether there will be a face value reduction in advance, we instead use the likelihood that an FVR will occur to define the treatment group. We first estimate the probability that a face value reduction occurs in each restructuring event based on the information available in the year before restructuring begins. This is again estimated using a probit model, where the explanatory variables include a set of variables designed to capture global financial conditions (global output gap, US interest rates), whether the current restructuring negotiations involve official creditors and whether the country is undergoing sequential

restructuring events (measured by dummy that indicates whether the country is in a debt restructuring event in year "t", prior to the start of a second restructuring in year "t+1"). We also include the country's level of debt-to-GDP interacted with dummies that indicate if that country is eligible for participation in programs such as the Highly Indebted Poor Countries (HIPC) or Multilateral Debt Relief Initiative (MDRI), as countries in those programs might start restructuring after reaching different thresholds in their debt ratios (relative to countries excluded from the programs). Finally, we include a full set of country dummies to capture other country-specific fixed features. The treatment variable is then set to 1 if the estimated probability exceeds 50 percent.

ATE per Unit of Treatment

Our estimation procedure so far requires that the treatment be represented by a dummy variable, which limits the use of variation in treatment size across our sample. To address this issue, we analyze the *ATE per unit of treatment*, calculated by dividing the ATE by the average size of treatment. For the restructuring events with face value reduction, we estimate the size of treatment using the average nominal reduction in face value of debt in percent of GDP. As mentioned above, the average size of the treatment for restructuring events with face value reduction is approximately 6 percent of GDP.

For the restructurings without face value reduction—that is, those with only cash flow relief—the natural candidate for the "size" of the treatment is the present value of the reduction in debt-to-GDP induced by the rescheduling of payments. This data, however, is available only for private external restructuring events, and thus, are what we will focus on in this section. As a back-of-envelope calculation, we estimate the size of treatment for events with cash flow relief as

(4) $$S_{CFR} = S_{FVR} \times \frac{\eta_{CFR}}{\eta_{FVR}},$$

where S_{FVR} is the size of the treatment with FVR (discussed above), η_{CFR} is the present value of the reduction in debt-to-GDP for restructuring events with cash flow relief only, and η_{FVR} is the same quantity for events with face-value reduction. As mentioned, η_{CFR} and η_{FVR} (5 and 10.6 percent, respectively) are calculated only for private external restructurings and taken from Asonuma et al. (2023). The estimated size of treatment for cash flow relief without face value reduction is 2.8 percent of GDP.

Table 4 compares the *ATE* and *ATE per unit of treatment* for restructurings with and without face value reduction. The ATE of restructurings without face value reduction is small and positive in the first year but turns negative after five years. The ATE per unit of treatment, however, is similar after four years for restructurings with or without a reduction in face value. The findings indicate the importance of depth of the treatment in the long run, irrespective of how the restructuring is executed.

[Insert Table 4 Here]

IV. Conclusion

While there is a growing literature that focuses on GDP effects of debt restructurings, the evidence on the impact of restructurings on debt ratios—a standard metric used by policymakers and academics—is scarce. Furthermore, the impact on debt ratios is far from obvious given that restructurings can affect both debt and GDP differently over time. This paper contributes to the literature by focusing on the effects of restructurings on debt ratios on impact and over a longer horizon, employing the most comprehensive sample of countries and time periods to date, covering both private and official creditors, including China, and applying

well-established methods in the empirical literature to address selection into restructurings.

The main findings suggest that debt restructuring has a significant and long-lasting impact on reducing debt ratios, especially when it is combined with fiscal consolidation. We also find that restructurings with face value reduction and those with large-scale creditor coordination are relatively more effective in reducing debt ratios, particularly in the short run. The focus on different types of restructuring, identifying which of those are more effective in reducing debt ratios, and the enhanced effect of restructurings combined with fiscal consolidation and creditor coordination is unique to this study.

Debt restructurings with cash flow relief only (i.e., maturity extension and/or coupon rate reduction) can also provide a significant reduction in the debt ratio over the long run, with magnitudes that are comparable to those with a face value reduction – a new finding compared to the literature which has mostly focused on the effects of face value reductions. Taken together, our findings suggest the importance of the depth of treatment rather than how restructuring is executed.

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Tables

TABLE 1—COMPARISON WITH LITERATURE

Papers that study Debt-to-GDP ratio	Sample Country Years	Type of Creditors	Method	Horizon	Heterogeneity	Key Findings
Reinhart and Trebesch (2016)	18 AEs 1920–1939 35 EMs 1978–2010	EMs vis-à-vis private external creditors AEs vis-à-vis official bilateral creditors	Comparison of means (diff-in-diff)	5 years before and after the *end* of restructuring		Debt ratio declines on average, but statistical significance only in limited number of restructuring episodes
Cheng et al. (2019)	93 EMs and LICs 1956-2015	Official Paris Club Creditors	Local projection	5 years after the *end* of restructuring	Nominal relief (or face value reduction), cash flow relief	Debt stock declines and GDP increases (implicitly a decline in debt ratio) from nominal relief
Ando et al. (2024)	115 EMs and LICs 1950 to 2021	Private external, official bilateral external including Paris Club and China, domestic creditors	AIPW	5 years after the start of restructuring	Face value reduction, cash flow relief, fiscal consolidation, creditor coordination	Debt ratio declines durably. Decline is larger when combined with fiscal consolidation, face value reduction, and creditor coordination. The average effects of cash flow and nominal relief are comparable in the long run.

TABLE 2—BREAKDOWN OF RESTRUCTURING IN PERCENTAGE

		Emerging Market Economies	Low-income Countries
Treatment	Cash flow relief without face value reduction	85.8	73.5
	Face value reduction	14.2	26.5
Timing	Preemptive	58.4	54.3
	Post default	21.6	31.1
	Both and unidentified	20	14.6
Creditor Type	Paris Club	48.1	73.5
	China	8.4	5.6
	Private external	54.8	10.1
	Private domestic	6.8	4.8
	Jointly	11.9	6.3

Notes: Data are based on the number of restructuring events, which can last for several years. The sample includes 310 restructuring events in emerging market economies and 396 in low-income countries from 1950 to 2021.

Source: Asonuma et al. (2023), Asonuma and Trebesch (2016), Asonuma and Wright (2022), Cheng et al. (2018), Cruces and Trebesch (2013), Horn et al. (2022), IMF (2021).

TABLE 3—AIPW ESTIMATION OF THE IMPACT OF DEBT RESTRUCTURING ON DEBT-TO-GDP

First Stage to Estimate Propensity Score		Second Stage	
Variable	Coefficients	Horizon	ATE
Treatment (t-1)	-0.490	0	-3.100
	(0.156)		(1.119)
Treatment (t-2)	-0.419	1	-3.838
	(0.153)		(1.289)
GDP growth (t-1)	-0.022	2	-5.137
	(0.014)		(1.537)
GDP growth (t-2)	-0.004	3	-6.248
	(0.013)		(1.803)
Change in Debt/GDP (t-1)	-0.019	4	-6.715
	(0.005)		(1.884)
Change in Debt/GDP (t-2)	-0.013	5	-7.237
	(0.005)		(1.885)
Change in FX rate (t-1)	0.004		
	(0.003)		
Inflation (t-1)	0.000		
	(0.006)		
Global Output Gap (t-1)	-0.073		
	(0.046)		
US Short Rate (t-1)	-0.013		
	(0.053)		
US Long Rate (t-1)	0.041		
	(0.069)		
Effective Interest Rate (t-1)	-0.092		
	(0.123)		
Primary Balance/GDP (t-1)	-0.019		
	(0.369)		
Current Account/GDP (t-1)	-0.004		
	(0.008)		
Observations	1233		1069
Pseudo R-squared	0.295		
AUROC	0.85		

Notes: Standard errors are reported in the parentheses.

Source: Author calculations.

TABLE 4—COMPARISON OF RESTRUCTURING WITH AND WITHOUT FACE VALUE REDUCTION

	Size of Treatment		Horizon					
			0	1	2	3	4	5
Face Value Reduction (FVR)	6.0 p.p.	ATE	-10.6	-8.9	-9.7	-8.1	-7.3	-5.0
		Per Unit Effect	-1.77	-1.48	-1.61	-1.35	-1.22	-0.83
Cash Flow Relief (No FVR)	2.8 p.p.	ATE	3.6	1.6	0.1	-2.1	-3.8	-5.7
		Per Unit Effect	1.29	0.57	0.04	-0.75	-1.36	-2.04

Sources: Cruces and Trebesch (2013), Asonuma et al. (2023), and authors' calculation.

Notes: Per unit effect obtained by dividing ATE by size of treatment.

Figures

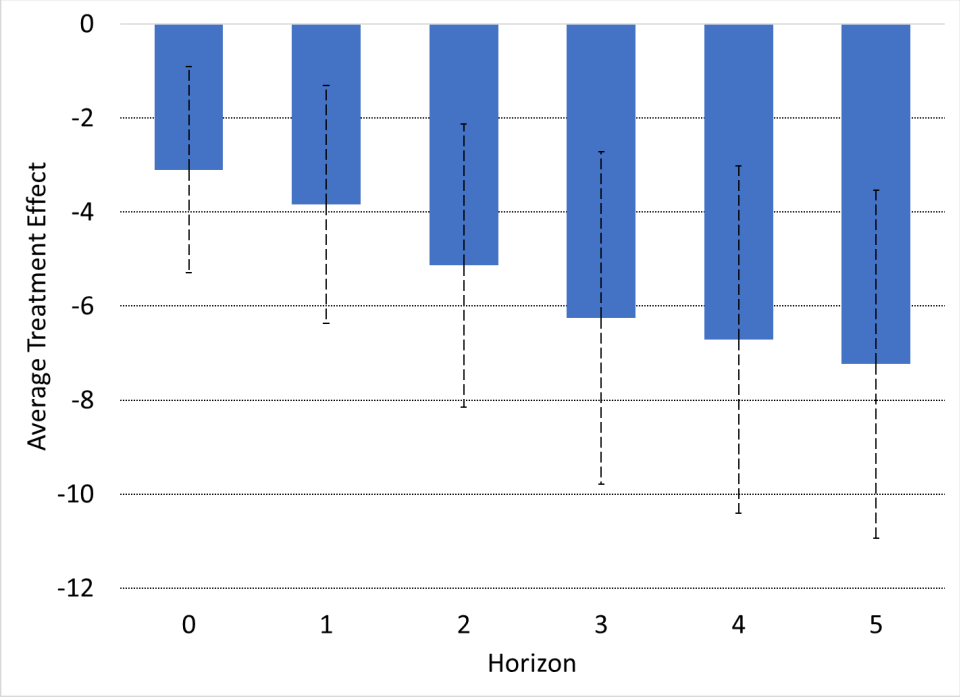

FIGURE 1. IMPACT OF RESTRUCTURING ON DEBT-TO-GDP RATIO

Notes: The dashed lines denote 95 percent confidence interval.

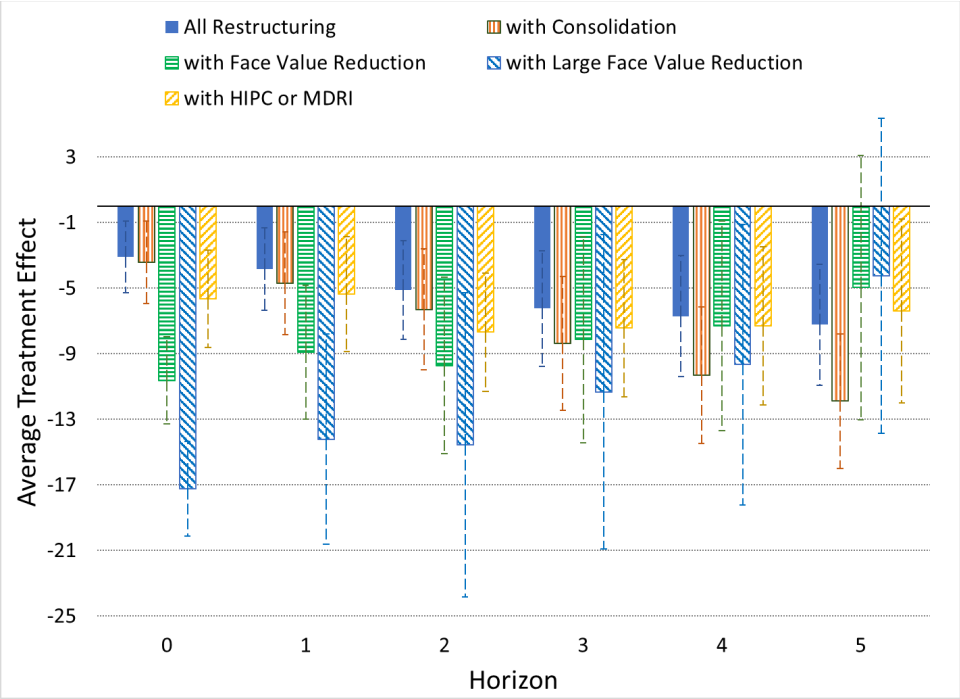

FIGURE 2. HETEROGENEITY IN THE IMPACT OF RESTRUCTURING ON DEBT-TO-GDP RATIO

Notes: The dashed lines denote 95 percent confidence interval.