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

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How do sovereign debt restructurings affect debt-to-GDP ratios? We explore this empirically using a comprehensive dataset covering 115 countries over 1950–2021. After addressing selection bias through an Augmented Inverse Probability Weighted estimator, we show that restructurings significantly reduce debt-to-GDP ratios over 1-5 years, with the effects working primarily through debt levels. The effect is larger when restructurings are combined with fiscal consolidation. We find heterogeneity depending on the creditor type, and the type and size of debt relief. In the short run, restructurings with higher creditor coordination, face value reductions, and larger debt reliefs, reduce debt-to-GDP ratios more effectively. (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, 2023; 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 and academics. It is applied extensively when evaluating a country's capacity to repay and is a core element of debt sustainability analyses (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 stock (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 (also 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

[1] As of October 31, 2024, out of the Poverty Reduction and Growth Trust (PRGT)-eligible countries, 11 countries are in debt distress, 24 countries are at high risk, 25 countries are at moderate risk, and 7 countries are at low risk of debt distress. (IMF, 2024).

[2] See Sturzenegger (2004), Tomz and Wright (2007), Borensztein and Panizza (2009), Asonuma and Trebesch (2016), Trebesch and Zabel (2017), Kuvshinov and Zimmermann (2019), and Asonuma et al. (2024).

issues that can erode fiscal responsibility or due to a more favorable economic recovery after debt restructuring.

In addition, the timing of the effects on the debt stock and on GDP can be different. The debt stock can be significantly reduced only after the completion of debt restructurings. Until then, it can be reduced only gradually through scheduled payments when debtors remain current on debt service; the debt stock could increase too through the accumulation of arrears from missed payments. On the other hand, GDP can be negatively impacted from the start of the restructuring event. Moreover, different types of debt relief can have different impacts over time. Restructurings with face value reductions have an immediate and direct impact on the debt stock, while restructurings without face value reductions (i.e., a maturity extension and/or a coupon rate reduction, called cash flow relief) can provide fiscal space for the debtors to implement fiscal consolidation and/or stimulate growth. As a result, the impact of cash flow relief on the debt ratio is typically gradual over longer horizons.

This paper contributes to the literature by assessing the cumulative effects of debt restructurings on debt ratios over time, how these effects interact with fiscal consolidation, how these vary across different types of creditors (private versus official, external versus domestic), presence of coordination (e.g., if the restructuring is part of a large-scale coordinated debt reduction program), and different types and size of debt relief (face value reduction versus cash flow relief only, large versus small debt relief).[3] We compile a novel dataset covering restructuring events with a wide range of creditors (external private, official Paris Club and with multilateral creditors, and domestic) across 115 emerging market and developing countries between 1950 and 2021. Because the occurrence of debt

[3] Broadly, there are two patterns of creditor coordination in sovereign debt restructurings. One is coordination among creditors of different types, e.g., among multilateral, bilateral, and private external creditors. The other is coordination within creditors of the same type, e.g., a formation of creditor committees, an appointment of chairs, and acceleration of collective action clauses in debt restructurings with private external creditors (Asonuma and Joo 2020; Fang et al. 2021).

restructuring is likely to be endogenous to overall macroeconomic conditions in a debtor country, we follow Jorda and Taylor (2016) and use an Augmented Inverse Probability Weighted (AIPW) estimator 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 the information on predicted probabilities 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 ratio of 2.8 percentage points in the first year and a cumulative 6.2 percentage points after five years. This impact is most evident when restructurings are combined with fiscal consolidation, suggesting the importance of comprehensive reforms designed for debt ratio reduction.

The observed reduction in the debt-to-GDP ratio is driven primarily by changes in the numerator (debt stock) rather than the denominator (GDP). Our estimates show that the debt stock falls by nearly 40 percent within five years following restructuring. While real GDP also declines, the magnitude is substantially smaller, and the effect becomes statistically insignificant by year five. We find no statistically significant effect on inflation as measured by the GDP deflator.

We also find heterogeneity depending on the type of creditor and the type and size of debt relief. Restructurings with domestic creditors are relatively rare in the data; however, once they happen, they tend to be more effective in reducing debt ratios. Restructurings with private external creditors, on the other hand, have statistically indistinguishable effects on debt ratios over the five-year horizon. Further, restructurings that occur through face value reductions, and those with

higher creditor coordination are relatively more effective (though the differences for the former tend to diminish over time).

The results also highlight heterogeneity across different "sizes" of debt relief, as some debt restructurings can involve larger interventions than others. Restructurings with large *debt relief*—defined as the product of the net present value (NPV) haircuts and debt treated (measured as a share of GDP)—have a larger impact on the debt-to-GDP ratio than those with small debt relief; like the differential effects of relief through face value reductions—the initially large impact of large size debt relief subsides over time.

The rest of the paper is organized as follows. Section I provides a brief survey of the literature and highlights our contributions, Section II describes the data along with a first look at some stylized facts, Section III describes the empirical strategy, and Section IV presents the findings. Section V concludes.

I. Literature

This paper contributes to the empirical literature on sovereign debt restructurings by quantifying their impacts on debt-to-GDP ratio. 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 during 1920–1939 and private external debt restructurings in 35 emerging market economies over 1978–2010, and find significantly lower debt ratios after restructurings in both samples.[4]

[4] 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

Cheng et al. (2019) employ a sample of official Paris Club debt restructurings over 1956–2015 in 93 emerging market and low-income countries 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.[5]

This paper complements the existing work in several ways (see a summary in Table 1). First, we employ the most comprehensive database to date, ranging from 1950 to 2021 across 115 emerging market and low-income countries (advanced economies rarely restructure debt; see Section II.C.). 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—official bilateral creditors (both Paris Club creditors and China), official multilateral creditors, external private creditors, and domestic creditors—and both post-default restructurings (defined as a restructuring after and with missed payments) and preemptive restructurings (defined as a restructuring before and without missing payments),[6] in contrast to the existing empirical literature that has focused primarily on restructurings with sovereign defaults, i.e., post-default restructurings (Reinhart and Rogoff, 2009, 2011; Benjamin and Wright 2013; Kaminsky and Vega-Garcia, 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

restructuring and default, (v) unanticipated inflation, (vi) wealth taxes and financial repression. They find that advanced economies 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.

[5] 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), Asonuma and Trebesch (2016), and Asonuma et al. (2024).

[6] See definitions of post-default and preemptive restructurings in Section II.A.

Trebesch (2016) and Cheng et al. (2019) instead focus on the *end* of debt restructurings, or the end of debt crisis. The timing of debt restructuring negotiations can significantly influence the debt ratio. In post-default restructurings, the total debt stock can increase before negotiations conclude, primarily due to accumulated arrears on missed payments. Conversely, in preemptive restructurings, the debt stock may decrease during negotiations as debtors continue making scheduled repayments. By the time restructuring concludes, the debt relief process generally results in a substantial reduction of the overall debt stock, regardless of the restructuring strategy; and debt relief from restructuring is typically recorded at the end of the restructuring episode. At the same time, GDP can be negatively affected since the onset of debt crisis, much before restructuring negotiations are concluded. Overall, the dynamics of the debt stock, GDP, and of the debt ratio at the start of the restructuring event may not necessarily be obvious, or mechanical.[7]

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.[8] 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. Studying restructurings combined with fiscal consolidation efforts provides implications for the ongoing policy discussion on both elevated public debt and sovereign debt

[7] Our dataset of restructuring episodes (see data section for the definition of restructuring episodes) covers the duration of debt restructurings by making the distinction between start and end of the episode.

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

restructurings (IMF 2021a; 2023). The interaction between sovereign debt restructurings and fiscal consolidations has not been studied in the previous literature. The analysis of heterogeneity in the impact of restructurings—by type of creditor, with and without creditor coordination, and by type and size of debt relief—is also unique to this study. We show that restructurings with large debt relief have larger impacts on the debt ratio than those with small debt relief, and that restructurings with creditor coordination, such as those under the Heavily Indebted Poor Country (HIPC) Initiative, have larger impacts on the debt ratio than the average restructuring. The findings on greater effectiveness of domestic restructurings, of face value reductions, and of deeper restructurings, are significant contributions to the literature of sovereign debt.

II. Data

A. *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 NPV loss for the creditors (Asonuma and Papaioannou, forthcoming; Das et al., 2012).[9] 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.

[9] "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.

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).

The implementation of debt restructuring can also take different forms. While there is no universally agreed upon taxonomy, this paper follows Das et al. (2012) and Asonuma and Papaioannou (forthcoming) and considers two types: (i) face value reduction—also called nominal haircut—defined as a cut in the nominal (face value) 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 changes cash flow streams of the old debt generating loss in NPV terms.[10]

B. *Sources*

We assemble a novel dataset that covers (i) private external debt restructurings; (ii) official bilateral and multilateral external debt restructurings—by Paris Club

[10] 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.

creditors, China, and multilateral creditors—; and (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 contain information on timing of restructurings; (ii) Horn et al. (2022) and Paris Club database for official bilateral and multilateral 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 from the October 2022 vintage of the World Economic Outlook database, published by the IMF.

C. *A First Look*

Drawing from the compiled database, 709 restructuring events were reported from 1950 to 2021 across 115 countries. Debt restructuring typically lasts long: 3.2 years on average for 197 private external debt restructurings.[11] Almost all events were in emerging market economies and low-income countries, which are where we will focus our attention.[12]

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 bilateral creditors, especially in low-

[11] Duration for official debt restructurings (Paris Club and China) is less accurate compared to private external debt restructurings largely due to the difficulty in coding the "start of debt restructurings" precisely.

[12] Restructuring events involving advanced economies 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 advanced economies exhibit very different features compared to emerging and low-income countries (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 advanced economies' episodes.

income countries. Restructurings with domestic creditors are rare and may reflect intentions to avoid risks in the domestic financial sector. Policymakers and market participants have conventionally recognized that these are also less likely to involve face value reduction—and even when they do, the reduction tends to be shallower compared to restructurings with external creditors (e.g., Jamaica 2010 and 2013 and Cyprus 2013).

Fiscal consolidations, measured by an increase in primary-balance-to-GDP ratio, are commonly implemented prior to debt restructuring. In the sample where data on both primary balances and debt restructurings is available, 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.[13]

Before going into the empirical framework, Figure 1 presents stylized facts. Panel A shows that the debt ratio declines around debt restructuring events, both on average and across the distribution. Panel B reports the decomposition of changes in the debt ratio across its components around restructuring episodes. Reductions in the face value of debt play a significant role in reducing debt ratios during restructuring events, and their impact tends to be immediate (which is not obvious a priori, as face value reduction negotiations can be protracted. The role of nominal GDP (through both real growth and inflation) rises over time, and it is the largest contributor to the decline in debt ratio in the medium term. The contribution of primary balance becomes smaller after the beginning of restructuring, suggesting consolidation efforts for median sample.

Panel C reports the distribution of the debt ratio in year 0 and year 5 of the restructuring event, showing a clear shift in the mass from high debt (T=0) to low

[13] Our empirical analysis focuses on impacts on debt-to-GDP ratio since the onset of debt crisis, not the start of fiscal consolidation. For theoretical analysis on sequences and timing of fiscal consolidation and debt restructurings, see Asonuma and Joo (2024).

debt (T=5) levels. Panel D shows the change in the debt ratio over the 5 years. The thick left tail indicates a significant number of large debt reduction episodes, consistent with the results from Panel C.

Notably, the movements of debt and GDP in the sample reported in Figure 1 reflect only the "treatment group," comprised of countries involved in debt restructuring events. In the next section, we compare this group with a set of "control group" countries that are not undergoing debt restructuring. Our empirical strategy will help us control for selection into treatement (i.e., debt restructuring) and other confounding factors to identify the causal impact of restructurings on debt ratios, debt growth, and GDP growth.

III. 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 average treatment effect (ATE) through a local projection of changes in the debt ratio onto a restructuring dummy (treatment) and its interaction with other controls. Our results are based on the following specification:

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

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 year-on-year change in the debt-to-GDP ratio. It also includes one lag of all other determinants of the dynamics of debt: inflation, changes in the nominal exchange rate (measured by home currency per US dollar), the effective interest paid on debt (defined by the current government interest expense over the debt stock in the previous year), and

the ratio of current primary balance to GDP. Taken together, these variables account for how much public debt is driven purely by conventional drivers of debt. The specification also interacts covariates with the treatment dummy to account for heterogeneous impacts based on macroeconomic conditions, and includes country and year fixed effects, α_c^h and α_t^h. Finally, to avoid results being driven by extraordinary changes in the nominal debt stock that are unrelated to typical policy instruments (e.g., when countries undergo currency reforms or experience hyperinflation), changes in the debt ratio below the 1st percentile or above the 99th percentile in our sample are set to these percentiles instead (winsorized).

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

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

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

where Φ is the cumulative distribution function of the standard normal distribution. The predictors include the same set of covariates in equation (1), denoted by $x_{c,t}$, as well as additional covariates $z_{c,t}$. These include one lag of US short and long interest rates, the global output gap (which taken together account for global economic and financial conditions), and current-account-balance-to-GDP ratio (which may be related to countries' exposure to international shocks). We also include the *level* of the debt ratio in the previous year, $d_{c,t-1}$, as countries with low debt ratios tend not to restructure. Because the threshold for countries to consider

debt restructuring might be different, we interact debt 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 $\hat{p}_{c,t} \in \left(10^{-4}, 1-10^{-4}\right)$.

In the second stage of the AIPW estimation, 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 the debt ratio for each country and each year: one in which the treatment dummy equals 1, and the other in which the treatment dummy equals 0, denoted by $\widehat{m}_{c,t}^{h}(1)$ and $\widehat{m}_{c,t}^{h}(0)$, respectively. To ensure that the same data are used to obtain all treatment effects, the sample for the propensity and outcome models 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

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

where n is the number of observations. 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, the AIPW estimator is consistent (Glynn and Quinn, 2010).

IV. Results

A. *Propensity Score and Average Treatment Effect of Restructuring*

Table 3 reports the results from the probit estimation in the first step of the estimation. 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 often 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 accept restructuring terms, 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 signs for coefficients on long- and short-run US rates, and large standard errors.[14] The model has reasonably good classification power, with the implied area under the Receiver Operating Characteristic (ROC) curve slightly above 0.85.

[14] 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.

Additional Checks on Propensity Scores

Figure 2 presents additional results on the propensity scores estimated in the first stage of our AIPW estimation and discusses whether these are appropriate as sample weights. Panel A plots the distribution of the propensity scores for the treatment and control groups, showing there is a considerable overlap between the two distributions, a condition required to identify treatment effects in the AIPW estimator (see Jorda and Taylor, 2016; Asonuma, et al 2024). Panel B plots the ROC curve under different specifications of the probit model in the first stage. As indicated by the figure, including only the main covariates ($x_{c,t}$ and $z_{c,t}$ above) in the probit model results in an area under the ROC curve of about 0.67. Our preferred model, saturated with country dummies and their interaction with the debt ratio) increases this area under the ROC curve to 0.85. Taken together, these results suggest a robust estimated probability to reasonably classify the ATE.

To further confirm this assertion, Figure 2 Panels C and D show the standardized mean differences and variance ratios (with their respective 90 percent confidence intervals obtained from bootstrapping the data 200 times) of all the covariates included in the model, both weighted and un-weighted by the inverse probability $1/\hat{p}_{c,t}$.[15] In an ideal sample in which treatment is randomly assigned, the means and variances of all group characteristics would be the same between the treatment and control groups. The results in Figure 2 confirm that the inverse probability weighting leads to a better-balanced sample, with standardized mean differences generally closer to zero, and variance ratios generally closer to 1.[16]

[15] The standardized mean difference is simply the difference between means in the treatment and control groups, divided by the square root of the sum of their variances; the variance ratio is the ratio of variances between the treatment and control groups. While not a formal test of sample balance, these measures are commonly used to test whether propensity score weighting improves the balance of a sample (see Austin and Stuart, 2015).

[16] While the inverse probability weighting doesn't necessarily bring *all* means and variances of variables in the treatment and control groups closer to each other, it does significantly reduce their distance when the unweighted distributions are very far apart. This is most visible for the means of interest rates and variances of the debt ratio and nominal exchange rates. In other cases, the means/variances are already relatively similar in the unweighted sample, so there is not much gain from the IPW.

Baseline Results

The baseline AIPW estimation results are reported in Figure 3 Panel A (the estimated treatment effects and their standard errors are also shown in Table 3, right panel). 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 economically significant: on average, debt ratios decrease by 2.8 percentage points in the first year of restructuring, with the effect increasing to 6.2 percentage points in five years.

Is the Reduction in Debt Ratio Driven by Debt or GDP?

A key question is: why does the debt-to-GDP ratio fall? One way of answering this is to study whether the reduction is driven by lower debt levels or higher GDP. This is important since achieving debt ratio reduction through higher GDP as opposed to lower debt levels could have different implications for policymaking and welfare. To understand this better, we estimate the (AIPW) responses of debt and GDP growth separately.

The results are summarized in Figure 3. AIPW estimates clearly attribute the effects on the debt ratio to movements in debt, rather than to real GDP. On average, the debt stock declines by almost 40 percent within five years of the restructuring event. Real GDP declines too, though the declines are much smaller, and the effect on GDP is statistically indistinguishable from zero by the fifth year of restructuring. Similarly, while there is a slight increase in the inflation rates (measured by the

GDP deflator) over the period of restructuring, the standard errors around the cumulative effects are large.[17]

The impact on debt, on the other hand, is statistically significant through the entire horizon. Online Appendix II repeats this breakdown between debt levels and real GDP growth for all other exercises discussed below, highlighting that, while restructuring can sometimes have significant impacts on GDP growth, the results reported throughout the paper tend to be driven primarily by movements in public debt levels.

Longer Horizon

Figure 3 Panel E presents the impact of restructuring events over long horizons—up to 10 years after the start of the restructuring event. The ATE in this case is slightly different from what is shown in Panel A due to sample differences (not all events have 10 leads in the data), but the results are comparable. The cumulative change in debt ratios tends to diminish in the long term (dropping between 2 and 4 percentage points beyond 5 years), suggesting that most of the impact of debt restructuring happens in the first 5 years. However, the point estimates remain negative in every period (albeit not always statistically significant), indicating that those effects can be long lasting, on average.

In Figure 1 in Online Appendix II, we estimate the impact of restructuring events on the growth of both nominal debt and real GDP over the longer 10-year horizon after the start of restructuring. We find that nominal debt decreases by an additional 40 percent over years 6-10 after the start of restructuring, on top of the initial 30 percent in years 0-5. Note that this does not mean that countries that restructure will decrease their actual debt by 70 percent over 10 years; it simply implies that, were

[17] Some countries in our sample underwent spells of very high inflation, introducing outliers in our sample and making the treatment effects on the GDP deflator extremely large and imprecise. Because of this, we cap the deflator at 1000 percent at each period (setting it to 1000 if it is larger). Other methods of dealing with large numbers in the sample (e.g., estimating the regression in logarithms) yield similar results.

it not for the restructuring event (i.e., relative to the control group), debt in the treated countries would have been about 70 percentage points of GDP higher than what is observed after 10 years. Similarly, after the initial negative impact in the first few years since restructuring, real GDP starts to see some gains towards the end of the estimation horizon, though the effects are not statistically significant.

B. *Restructuring and Fiscal Consolidation*

How do fiscal consolidation and restructuring interact? Under which conditions are fiscal consolidation and debt restructuring more likely to durably reduce debt ratios? This is an important question because a predominant fraction of restructuring events in the sample were accompanied by fiscal consolidation.[18]

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. Figure 4 shows that the impact of restructuring when it is combined with fiscal consolidation ranges from 3 percentage points in the first year to 9.5 percentage points in the fifth year (similar to the average restructuring episode at first but larger after some time) signaling some lag before the effects are felt. The results highlight the importance of continued fiscal efforts to enhance the effects of debt restructuring in reducing debt ratios.

As a robustness check, we consider a more lenient definition of consolidation, which includes cases where the average level *or the change* in the cyclically

[18] In section II, it is mentioned that about 60 percent of restructuring episodes are preceded by an increase in the primary balance-to-GDP ratio. In our ATE estimation the sample of restructurings are slightly reduced due to availability of explanatory variables, and we identify fiscal consolidations with a cyclically adjusted primary balance instead (the cycle is identified with an HP filter). This increases the share of episodes that coincide with consolidations to about two-thirds.

adjusted primary balance is positive over the duration of the restructuring event. Our findings are similar and shown in Panel B of Figure 8.

Lastly, we consider the impact of other macro policies to reduce debt, proxied by the presence of IMF-supported programs during the restructuring episode (available through the Monitoring of Fund Arrangements database, MONA). This is again shown in Panel B of Figure 8, with a larger impact on the debt ratio in the first few years, but similar effects to consolidation by the end of the estimation horizon.

C. *Heterogeneity in the Impact of Restructuring*

Debt restructuring can be more effective in specific environments. We consider three dimensions that could be important for policy makers: (i) the type of creditor involved, (ii) the type of relief, and (iii) the size of the relief. To evaluate the effects of restructuring along those three key dimensions, we re-estimate the AIPW model within each of the relevant subsamples.

Type of Creditor

Public debt restructuring is a complex process that involves burden sharing among domestic residents, domestic creditors, and foreign creditors. In external debt restructurings, the burden is primarily shared between domestic residents and foreign creditors, while in domestic debt restructurings it is mostly shared between domestic residents and domestic creditors (mainly financial institutions; for example, Cyprus and Jamaica in 2010 and 2013). Restructuring with external creditors often involves debt relief in the form of face value reduction, which can be provided by both official or private creditors, and immediately reduces the debt ratio (e.g., Seychelles in 2008-10). In restructurings with domestic creditors, financial stability concerns play a role, and they are typically implemented through

cash flow relief with no face value reduction. In those cases, reductions in debt ratios tend to be gradual.[19]

We split the restructuring episodes into those that occur through domestic creditors from those that involve private external creditors.[20] Figure 5 Panel A reports the estimation results. While the share of restructurings with domestic creditors is small (around 8 percent of restructurings in our sample), the effects on debt ratios of restructurings with domestic creditors are statistically significant and larger than restructurings with external creditors. Additionally, the impact of restructuring through domestic creditors on growth becomes positive by year 4 of the restructuring episode (after a larger negative—though not statistically significant—effect on impact, see Online Appendix II), further contributing to the larger decline in debt ratios.

The finding on larger effects on domestic debt could reflect governments' tendency to refrain from restructuring domestic debt until public debt reaches a high level due to spillovers to domestic financial sector; domestic debt restructurings also occur relatively rarely (IMF, 2021). Countries that conduct domestic restructurings may have no other option, ending up with a large debt relief or adopting more stringent policies to reduce debt. Once governments decide to restructure domestic debt (often together with external debt), the size of debt relief necessary to restore debt sustainability tends to be large. That said, the larger effects of restructurings through domestic creditors could also be driven by a small number of observations.

The effects of restructurings with private external creditors on debt ratios, on the other hand, are slightly negative (i.e., restructurings are associated with rising debt

[19] IMF (2023) provides case studies of each of these episodes.

[20] Domestic and private external restructurings are less frequent in our data. Because of this, the first stage in the AIPW estimator is simplified to remove the interaction between debt-to-GDP ratio and the country fixed effects. Otherwise, it perfectly predicts most restructuring episodes. The first stage estimator is otherwise identical—lags of changes in debt-to-GDP ratio and the country fixed effects are still part of the model—only the interactions are excluded.

ratios) but statistically insignificant over the five-year horizon. This likely reflects the fact that most restructurings with private external creditors occur post-default and involve longer implementation periods. Approximately 60 percent of private external restructuring episodes are post-default and take an average of five years to implement (Asonuma and Trebesch, 2016). Consequently, debtors accumulate arrears until settlement (debt treatment), leading to increased nominal debt growth (Figure 4, panel A, Online Appendix II). Simultaneously, these restructurings are associated with larger declines in real GDP growth, which further elevates the debt ratio (Figure 4, panel B, Online Appendix II).

Finally, to ensure success of restructuring in reducing debt ratios, mechanisms promoting coordination and confidence among creditors and debtors may be necessary. To address heterogeneity by type of creditor and large-scale creditor coordination, we consider a subset of official restructurings through the Paris Club and restructuring events under the Heavily Indebted Poor Countries (HIPC) and Multilateral Debt Relief Initiative (MDRI) debt relief programs.

Figure 5 Panel B summarizes the findings. Restructuring under the HIPC or MDRI more successfully reduced debt ratios than the typical restructuring, especially in the first few years.[21] The ATE in the first year of restructuring under the HIPC and MDRI debt relief programs was 4.95, increasing to just over 6.56 in year 2, and roughly stabilizing thereafter. The results are expected, as the HIPC and MDRI debt relief programs were (1) characterized by coordination among creditors (multilateral, bilateral, and private external), (2) involved deep face value reductions, and (3) included IMF-supported programs (see Panel B of Figure 8 for the overall effect of restructurings under IMF-supported programs). The slight decline in the cumulative impact of restructuring after the third year of the episode

[21] Treatment in this case is identified as a restructuring event that (1) involved an official creditor (Paris Club or multilateral institution) and (2) happened in a country that benefited from either the HIPC Initiative or MDRI.

could indicate a relaxing of the fiscal stance after the initial tightening under IMF-supported programs.

These results should be interpreted with a few caveats. First, HIPC and MDRI were one-off initiatives and are no longer active. Replicating this high-level of creditor coordination may be challenging going forward and could create an expectation that emerging market and low-income countries will be "bailed out" when in high debt. Second, debt restructurings under these debt relief programs were more likely to involve face value reduction, which, as shown below, may also contribute to the higher reduction in the debt ratio. Countries participating in those initiatives were, by definition, poor and heavily indebted, which could also play a role in the dynamics of the debt ratio (for example, if those countries have less space or capacity to adopt macro-prudential policies).

Because of this, we also estimate the impact of official bilateral Paris Club restructurings in Figure 5. Again, we find these are more effective than the typical restructuring at reducing the debt ratio and can even be more effective than the HIPC and MDRI debt relief programs. As above, about half of official bilateral Paris Club restructurings happen along with an IMF-supported program, one in four have a face value reduction on debt. As before, this makes it hard to disentangle the direct impact of creditor coordination from other factors that may change the effectiveness of debt restructuring. However, taken together, the results above speak to the importance of creditor coordination in improving the odds of a successful restructuring—even if only through an increased likelihood of having a face value reduction or implementing macroprudential policies.

Type of Debt Relief

The implementation of debt restructuring can take different forms. Restructurings can take place through a reduction in the face value of debt (which reduces the debt stock immediately) or through cash flow relief with no face value reduction (an

extension of maturity and/or a reduction in coupon payments). Cash flow relief with no face value reduction reduces the present value of debt through changes in the schedule of principal and interest payments.

We subset the treatment group into restructurings that involve a face value reduction during the restructuring event, and those that do not. As before, we keep the same control group as in our baseline analysis.

Conventionally, Alesina and Weder (2002) define a face value reduction as percent change in the face value of the "new" debt compared to that of the "old" debt. This measure is also widely used among market participants and policymakers:

$$FVR_i = 1 - \frac{FV(b_i^{NEW})}{FV(b_i^{OLD})}, \tag{4}$$

where $FV(b_i^{NEW})$ and $FV(b_i^{OLD})$ are the face value of new debt (b_i^{NEW}) and old debt (b_i^{OLD}) in country *i*.

Since the outcome we are interested in is debt as ratio of GDP, we also measure this face value reduction on debt as a share of GDP. Specifically, our proposed measure is the *face value relief* (hereafter FV relief), which captures both the terms of treatment (in percent in face value of old debt) and the amount of debt treated as a share of GDP (this measure will also be important for the discussion on the size of debt treated below). The FV relief is defined as:

$$FVRelief_i = FVR_i \cdot \frac{FV(b_i^{OLD})}{GDP_i} \cdot 100 = \frac{FV(b_i^{OLD}) - FV(b_i^{NEW})}{GDP_i} \cdot 100, \tag{5}$$

where GDP_i is GDP in the first year of restructuring (measured in the first year of the restructuring episode to avoid confounding changes in GDP over the length of the restructuring episode).

To address outliers in debt relief, we drop the top and bottom 5 percent of the FV relief distribution (see the *Robustness Checks* section for results including the full sample). The episodes removed through this process are those where FV

relief is very small (close to 0.1 percent of GDP), offering little to no debt relief; or where this ratio is very high, primarily for countries that experience very high inflation during the restructuring episode, increasing nominal GDP and artificially inflating the FV relief (which is normalized by GDP in the first year of the episode).

Figure 6 illustrates that restructuring events that include face value reduction have a larger impact on the debt-to-GDP ratio, compared to the average restructuring. Most of the additional effect of face value reductions is visible in the first year of restructuring, as a face value reduction would provide immediate debt relief. In the first year, the impact of restructuring with face value reduction on the debt-to-GDP ratio is about 13 percentage points, compared to an average impact of 2.8 percentage points in the typical event.

This impact is not merely mechanical: even if a face value reduction reduces the value of debt (numerator) immediately, there could be an impact on GDP as well (denominator), which implies that the impact on the debt ratio over projection horizon may not be obvious. Indeed, in our estimation sample, the average FV-relief is about 5.3 percent of GDP which purely reflects treatment on debt stock at debt settlement—considerably smaller than the estimated ATE (13 percentage points on impact) over 5 years.

The larger ATE compared with the magnitude of the FV relief may reflect the fact that the restructuring events with face value reductions are associated with higher nominal GDP growth (including higher real growth from macro policies and higher inflation) immediately after restructurings (see Online Appendix II Figure 5, for decomposition of the effects occurring through nominal debt and real GDP separately).

The average long-run impact of a face value reduction on debt ratio drops to -5.5 percent after 5 years and has large confidence bands. Unlike the subsample with fiscal consolidation, the impact of a face value reduction is frontloaded, and the

effect is smaller in the long run, highlighting the importance of fiscal efforts in sustaining the impact of restructuring.

The effects of restructurings *without* face value reductions—that is, involving cash flow relief only—are positive on impact but become negative over time. After 5 years, the cumulative impact on the debt ratio is negative and statistically significant; and comparable (though still smaller) to the average restructuring.

Size of Debt Relief

We next explore heterogeneity by size of debt relief. As before, we define debt relief to capture both the terms of debt treatment (defined in percent changes of present value) and the amount of debt treated (in percent of GDP). Following Sturzenegger and Zettelmeyer (2008, SZ hereafter), we define the NPV haircut in country *i* as the percent change in the present value of the "new" debt compared to present value of the "old" debt:

$$SZH_i = 1 - \frac{PV(b_i^{NEW}, r_i^{NEW})}{PV(b_i^{OLD}, r_i^{NEW})}, \tag{6}$$

where $PV\left(b_i^{OLD}, r_i^{NEW}\right)$ indicates the present value of old debt (b_i^{OLD}) discounted by exit yield of new debt (r_i^{NEW}). To calculate the size of debt relief, we follow the method discussed above and multiply the NPV haircut by debt treated (old debt outstanding in percent of GDP), which we call "SZ haircut debt relief":

$$DebtRelief_i^H = \frac{SZH_i \times FV(b_i^{OLD})}{GDP_i} 100, \tag{7}$$

where $FV\left(b_i^{OLD}\right)$ is the face value of old debt and GDP_i is country *i*'s GDP in the first year of the restructuring episode.

The data on NPV haircuts (SZH_i), however, are available for only the subset of restructurings that involve private external and domestic debt. Therefore, to complement these data, we use the size of the face value reduction in official debt

restructurings (Paris Club dataset and Horn et al., 2022) to proxy for the NPV haircut for official restructurings. [22]

$$(7') \qquad DebtRelief_i^F = FVR_i \frac{FV(b_i^{OLD})}{GDP_i} 100.$$

In other words, we assume the NPV haircut from the maturity extension and/or coupon rate reduction components of debt relief are negligible (i.e., equivalent to "NPV neutral") for official restructurings, so that the only meaningful reduction comes from the change in the face value of debt (note that equation (7') shows the same expression as the FV relief in equation (5), though in this case applied only to official debt restructurings). This is a reasonable assumption given that the coupon (interest) rate of old debt in official restructurings tends to be lower than that of private creditors and close to the discount rates applied.

To summarize, we construct an overall measure of the size of debt relief that is available for a relatively large number of restructuring episodes:

$$(8) \qquad DebtRelief_i = \begin{cases} DebtRelief_i^H, & \text{if private external or domestic} \\ DebtRelief_i^F, & \text{if official} \end{cases}.$$

Next, we classify our full sample of debt restructurings into those with "*large* debt relief" (above the median of the distribution across all restructuring episodes) and those with *"small* debt relief" (below the median). Episodes with missing or zero SZ haircuts and FVR are not counted for this classification. As in the analysis on types of restructuring above, we drop the top and bottom 5 percent of the distribution of debt reliefs to avoid outliers and potential mismeasurement. Following the same strategy of subsampling the data, we calculate the ATE of restructurings with large and small debt relief separately, utilizing our AIPW estimator. In all cases, the control group is kept the same as in the baseline results,

[22] Schlegl et al. (2019) compute the "market haircut"—defined as 1 – present value of new debt / face value of old debt—for official debt restructurings (Paris Club). Present value of new debt is discounted by an exit yield of new debt. This requires only appropriate exit yields of new debt. Cheng et al. (2018) compute haircuts based on "terms of debt treatment" (e.g., Classic, Cologne, Huston, London, Naple and Toronto) in official debt restructurings (Paris Club).

while treated observations outside of the relevant category are dropped from the sample in each exercise.

The results of the AIPW estimation are shown in Panel A of Figure 7. Restructurings with large debt relief are considerably more effective in reducing debt ratios when compared to those with small debt relief, especially on impact. In year 1, the impact of large debt relief on the debt ratio is a bit over 17 percentage points, while the impact of small debt relief is about 4.6 percentage points.[23] Notably, the difference in the size of the impact can been seen in all periods, even as the initially large impact of the restructuring subsides over time, like the differential effects of relief through face value reductions (FVR) in Figure 6.

We further explore large vs small debt relief in two subsamples of debt restructurings with FVR, and those with only private external and domestic creditors (where data on NPV haircuts is available). First, Panel B of Figure 7 looks at restructurings which have FVR differentiated by large vs small FV relief $DebtRelief_i^F$, again defined based on their position relative to the median of the FV relief distribution (and again, only cases with positive FVR are counted in this classification). The findings confirm our results on debt relief based on the whole sample, though with even larger effects: restructurings with a large FV relief reduce the debt ratio by an average of 24 percentage points in the first year, while restructurings with a small FV relief reduces it by about 12 percent. However, this initially large impact tends to diminish over time: by year 5, restructurings with large and small FV relief have a comparable effect over the debt ratio, at about 10 and 7 percentage points, respectively. This could be driven by a more positive impact of small FV relief on GDP growth (see Figure 6 in the Appendix), providing space for GDP growth and lower primary balances to contribute to debt reduction.

[23] Note that even the small debt relief ATE is larger than the overall ATE of debt restructurings (Figure 3). This is entirely due to sampling: restructuring events where the SZ haircut is unavailable and the size of the FVR is zero are removed from the treatment group.

Second, Panel C of Figure 7 presents the results for private external and domestic restructurings differentiated by large and small debt relief ($DebtRelief_i^H$)—where the sizes of NPV haircuts are available. The sample, however, is too small to use the AIPW estimator, as the first stage of the estimation almost perfectly predicts all treated cases. We thus revert to a simpler local projection model where the ATE (measured by the parameter β_0^h in this case) is estimated via OLS

$$\Delta^h y_{c,t} = \alpha_c^h + \alpha_t^h + \beta_0^h T_{c,t} + x'_{c,t}\gamma^h + \varepsilon_{c,t}^h. \quad (10)$$

We find that, despite the timid effects in early years, private external and domestic restructurings with a large debt relief can have a significant impact on the debt ratio over longer horizons—about 17 percentage points 5 years since the beginning of the restructuring episode. In contrast, those with a small debt relief do not significantly reduce the debt ratio over any horizon.

These estimates, however, should be interpreted with caution since the OLS estimates could be confounded with selection bias. In addition, the lack of data on the size of the NPV of haircuts means that these findings are based on a small number of treated observations. Nevertheless, the fact that the results are broadly consistent with the overall impact of small vs large debt relief, as well as with the sub-sample including only FV Relief, gives us confidence in our findings of a larger differential effect of large debt reliefs compared to small ones.

Robustness Checks

We conduct several robustness checks on our specifications discussed above. Figure 8 summarizes our findings.

First, Panel A shows that the results from the baseline specification are robust to adding GDP forecast to the control variables. This exercise is done to check whether both restructuring and growth are driven by the expectation on a high GDP growth, which could lead to a spurious relationship between restructuring and the debt ratio. The concern seems to be negligible as the estimated ATEs are

quantitatively similar to those in Figure 3, Panel A, ranging from -3 to -6 percent over the five-year horizon.

Second, the baseline specification interacts all control variables with the treatment to account for heterogeneous impacts based on macroeconomic conditions. We drop these interactions to check if they drive the results. It appears this is not the case (Figure 8 Panel A).

Third, Panel A also reports results with local projections without controlling for selection into restructurings; the estimated effects are qualitatively similar, but almost twice in magnitude compared to the baseline in Figure 3 Panel A, indicating an upward bias due to endogenous selection and confirming the need to address selection via the AIPW estimator.

Fourth, Panel B shows the interaction between restructuring and fiscal consolidation using a weaker definition of fiscal consolidation. Specifically, we restrict the sample to restructuring events where the average year-on-year level *or change* in the cyclically adjusted primary balance (CAPB) is positive. Note that our original sample of fiscal consolidation based on the stricter definition (positive CAPB only) of fiscal consolidation remains covered in this alternative sample. Panel B of Figure 8 reports the ATE estimates under the two definitions of consolidation. Using the alternative definition, we find an even larger impact on the debt ratio on the first few years, but levels off after that. By the end of the episode, the impact of the stricter definition is larger. This is not surprising, as a positive change in primary balance can take place even when the primary balance is in deficit and public debt increases.

Fifth, Panel B shows the impact of restructurings that also involved an IMF-supported program. [24] Since IMF-supported programs typically involve

[24] Except HIPC and MDRI debt relief programs, IMF-supported programs provide only new financing to fill external financing gaps, but do not provide debt treatment.

conditionalities on macro policies, these can be interpreted as a proxy for the adoption of macro-prudential policies to reduce debt. The impact can be immediately seen, as restructurings with IMF-supported programs have a larger impact on the debt ratio in the early stages of the restructuring episode. By year 5, however, restructurings with consolidation (either definition) have a similar effect. This underlines the importance of fiscal consolidation to control public debt, but also highlights that consolidation does not preclude any of the other macro policies from being implemented.

Sixth, Panel C reports the ATE of restructurings that involve face value relief, but without eliminating potential outliers. The results are consistent with the earlier findings. The ATE of restructurings with FV relief *excluding outliers* ranges from approximately -13 to -5.5 percent (Figure 6), while the ATE *including outliers* ranges from -10 to -6.5 percent (years 1 through 5). The similarity is reassuring but results still suggest that outliers may need proper handling.

Lastly, since governments often do not know whether they will be granted a face value reduction in advance, our last robustness check instead uses the likelihood that an FV relief will occur to define the treatment group. To do this, we first estimate the probability that a face value relief occurs in each restructuring event based on the information available in the year before restructuring begins. This is estimated using a probit model, where the explanatory variables include a set of variables designed to capture global financial conditions (global output gap, US long and short 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 debt-to-GDP ratio interacted with dummies that indicate if that country is eligible for the participation in debt relief initiatives such as the HIPC Initiative and MDRI, as countries in those debt relief initiatives

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. Figure 8, panel B shows that the estimated ATE is quantitatively similar, except the statistically insignificant 5th year.

V. Conclusion

While there is a growing literature that focuses on the impact of debt restructurings on GDP growth, 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 the debt stock and GDP differently over time. This paper contributes to the literature by focusing on the effects of restructurings on debt ratios over different horizons, employing the most comprehensive sample of countries and time periods to date (which covers 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 heterogeneity along three key dimensions: (i) type of creditor, (ii) type of relief, and (iii) size of relief. Restructurings with creditors involving large-scale creditor coordination, those with domestic creditors, and those executed through face value reduction, and particularly those with larger size of debt relief, are relatively more effective in reducing debt ratios, particularly in the short run.

The focus on different types and sizes 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 are all unique to this study. Taken together, our findings suggest the importance of the type of creditors, how restructuring is executed, and depth of the treatment, in raising the effectiveness of restructurings towards significant and durable declines in debt ratios over the medium term.

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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.
This paper	115 EMs and LICs 1950–2021	Private external, official bilateral external (including Paris Club and China), domestic creditors	Local projection + 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	24.8	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).

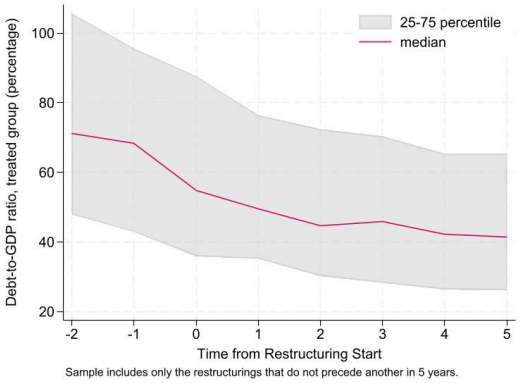
TABLE 3—AIPW ESTIMATION OF THE IMPACT OF DEBT RESTRUCTURING ON DEBT TO GDP

First Stage to Estimate Propensity Score		Second Stage	
Variable	Coefficients	Horizon	ATE
Treatment (t-1)	-0.490	0	-2.782
	(0.156)		(1.141)
Treatment (t-2)	-0.419	1	-3.324
	(0.153)		(1.311)
GDP growth (t-1)	-0.022	2	-4.730
	(0.014)		(1.567)
GDP growth (t-2)	-0.004	3	-5.397
	(0.013)		(1.794)
Change in Debt/GDP (t-1)	-0.019	4	-5.641
	(0.005)		(1.841)
Change in Debt/GDP (t-2)	-0.013	5	-6.152
	(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)	-0.072		
	(0.046)		
US Short Rate (t-1)	0.040		
	(0.069)		
US Long Rate (t-1)	-0.091		
	(0.123)		
Effective Interest Rate (t-1)	-0.013		
	(0.053)		
Primary Balance/GDP (t-1)	-0.000		
	(0.004)		
Current Account/GDP (t-1)	-0.004		
	(0.008)		
Observations	1233		1069 (total)
			161 (treated)
Pseudo R-squared	0.295		
AUROC	0.85		

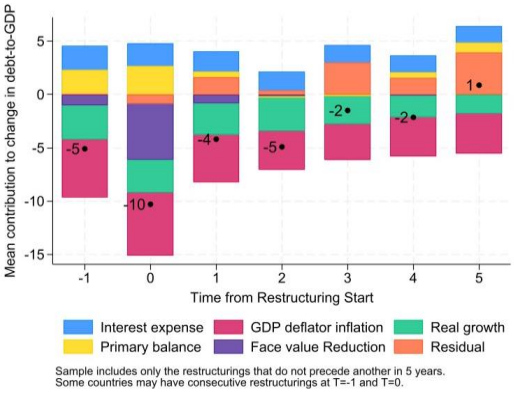
Notes: The table shows the results from the first and second stages of the AIPW estimator, with the left-hand-panel showing the impact of different variables on the probability of restructurings, and the right-hand-panel showing the estimated average treatment effect (ATE). In both cases, coefficients are approximated to the nearest 3 digits and standard errors are reported in parentheses.

Figures

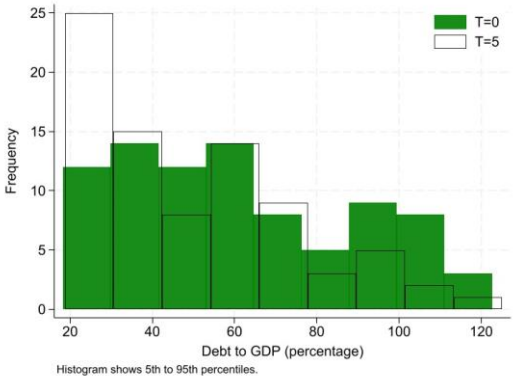
(A) Time Series of Debt to GDP



(B) Decomposition of Change in Debt to GDP



(C) Histogram of Debt to GDP



(D) Histogram of Change in Debt to GDP

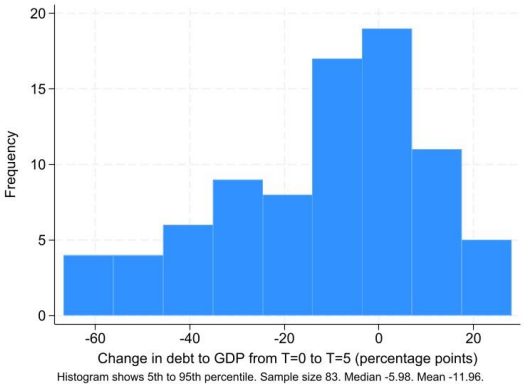


FIGURE 1. SUMMARY STATISTICS

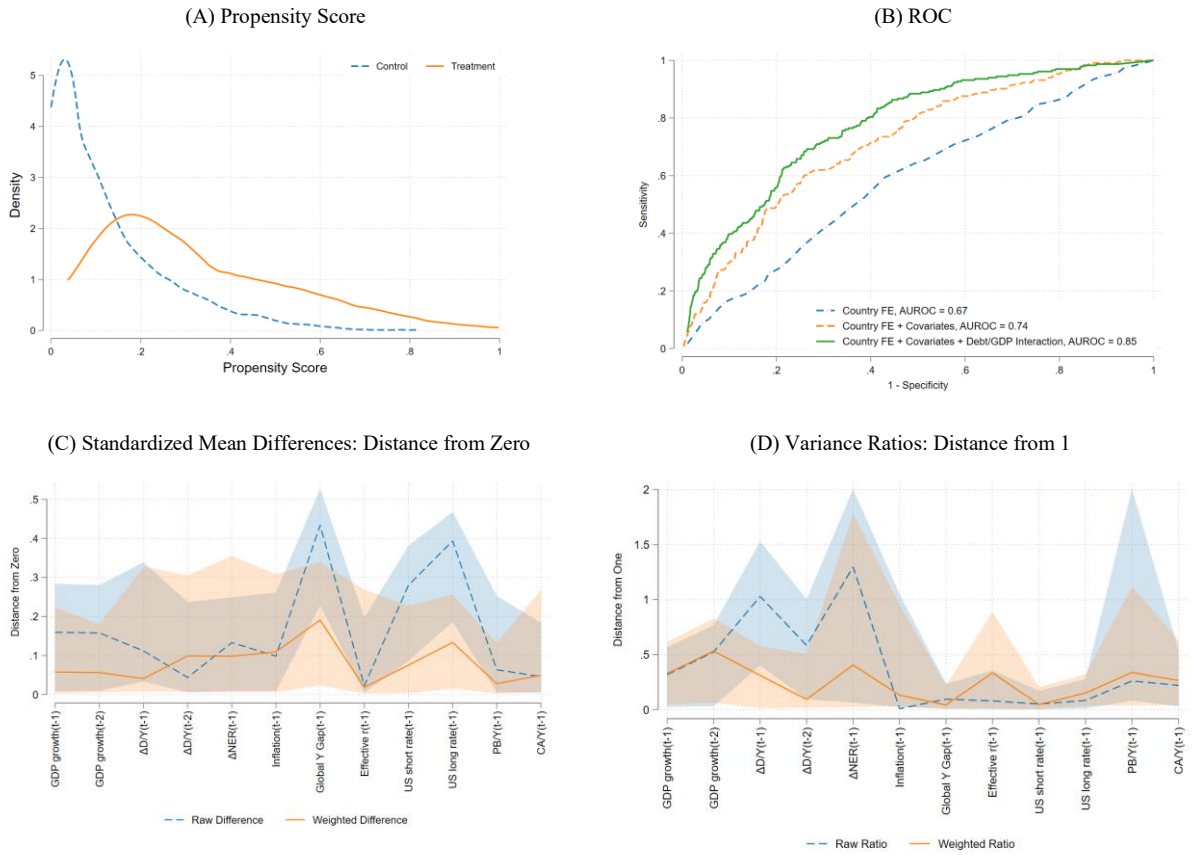


FIGURE 2. ADDITIONAL ESTIMATION TESTS

Notes: Panel A displays the distribution of estimated propensity scores across the treatment and control samples. Panel B shows the area under the receiver operating characteristic curve—a measure of "goodness of fit" of the first stage—under different specifications of the first stage: (1) having country fixed effects only, (2) including the covariates discussed in the text, and (3) including an interaction between country fixed effects and the debt ratio. Panel C shows the distance between zero and the standardized mean difference across covariates (between the treatment and control samples), in the raw and weighted samples. Panel D shows the distance between 1 and the variance ratio across covariates (between the treatment and control samples), in the raw and weighted samples. A well-balanced sample has mean differences close to 0 and variance ratios close to 1. The shaded areas represent their 90 percent confidence intervals, computed by bootstrapping the data and calculating the respective distances 200 times (note that because we measure distances, our results are always positive numbers). The upper bound of this confidence interval is considerably larger than 2 for the variance ratio of ΔNER and PB/Y in the raw data; for better visualization, we limit the y-axis to [0,2] in panel D.

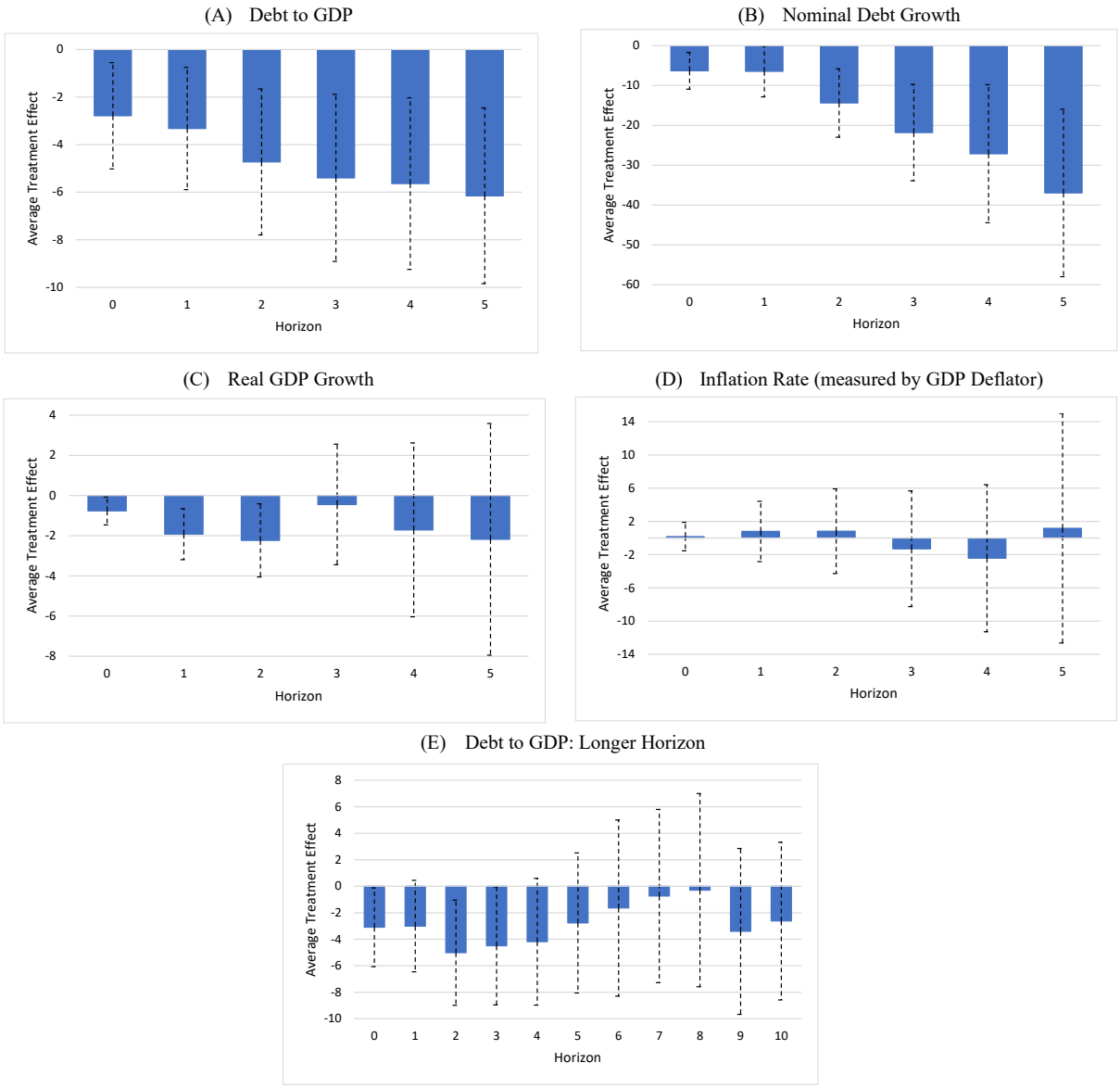


FIGURE 3. IMPACT OF RESTRUCTURING ON DEBT-TO-GDP RATIO, DEBT GROWTH, AND REAL GDP GROWTH

Notes: The chart shows the average treatment effect (ATE) of restructuring episodes on the debt ratio and its components, and along different horizons. The bars indicate the ATE and dashed lines denote the 95 percent confidence interval. Nominal debt growth is winsorized at 1 percent in all periods; Inflation rates (measured by the GDP deflators) are capped at 1000 to avoid outliers (i.e., deflators that exceed 1000 percent in any horizon are set to 1000).

Panels A-D: 1069 observations (161 treated); Panel E: 677 observations (134 treated).

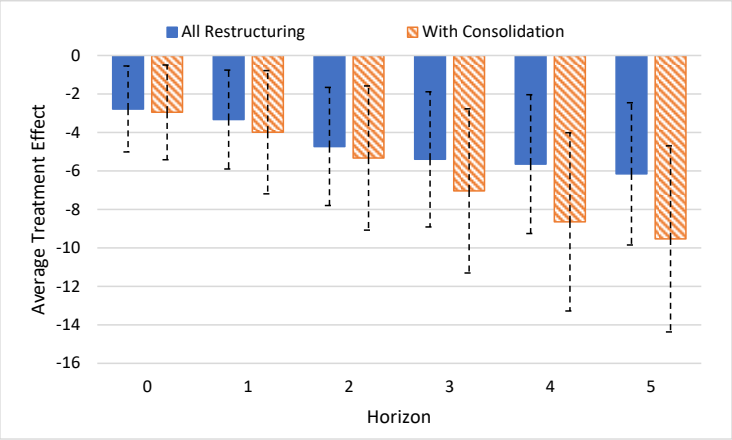


FIGURE 4. RESTRUCTURINGS WITH FISCAL CONSOLIDATIONS (COMPARED TO AVERAGE)

Notes: The chart shows the average treatment effect (ATE) of restructuring episodes on the debt ratio with and without a concurrent fiscal consolidation. The bars indicate the ATE and dashed lines denote the 95 percent confidence interval.

All restructuring: 1069 observations (161 treated); With Consolidation: 456 observations (72 treated).

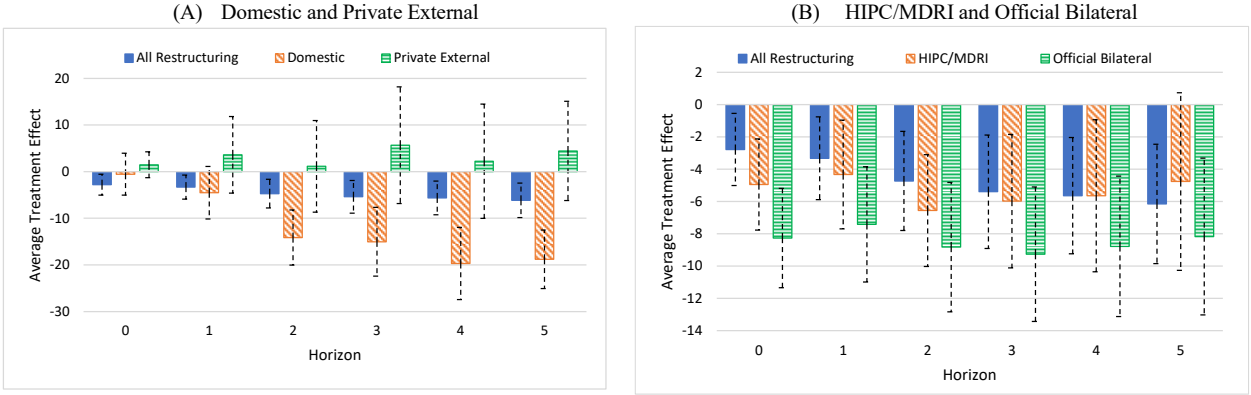


FIGURE 5. HETEROGENEITY BY CREDITOR

Notes: The chart shows the average treatment effect (ATE) of restructuring episodes on the debt ratio under different conditions for debt renegotiation. The bars indicate the ATE and dashed lines denote the 95 percent confidence interval. Restructuring episodes covered in panels A and B are mutually exclusive.

All restructuring: 1069 observations (161 treated); Domestic: 149 observations (17 treated); Private External: 124 observations (16 treated); HIPC/MDRI: 549 observations (89 treated); Official Bilateral: 618 observations (91 treated).

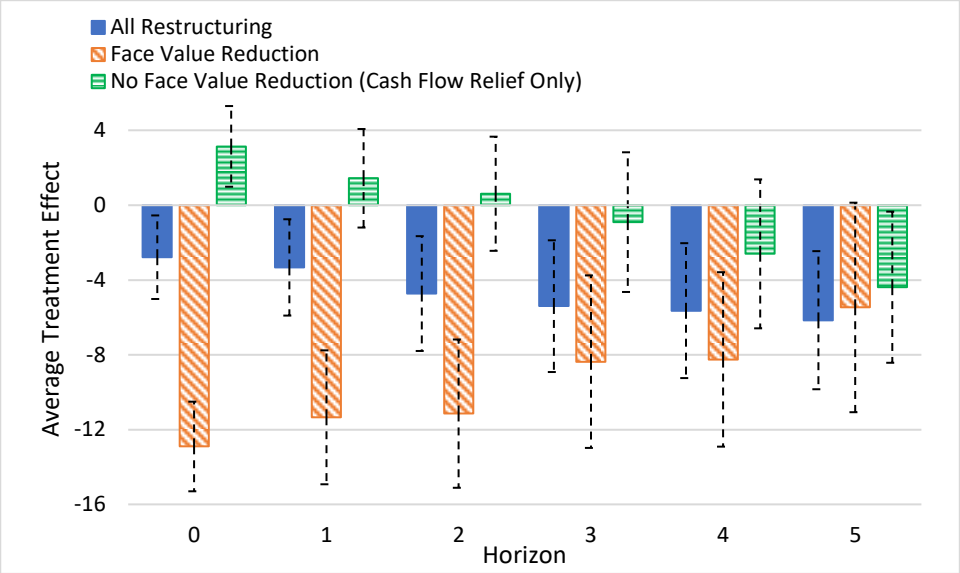
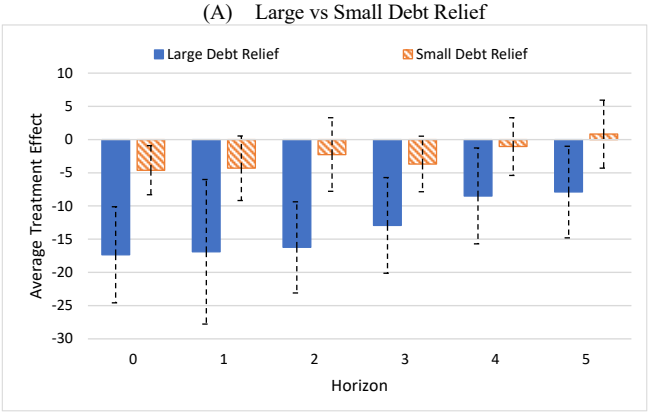


FIGURE 6. HETEROGENEITY BY TYPE OF DEBT RELIEF

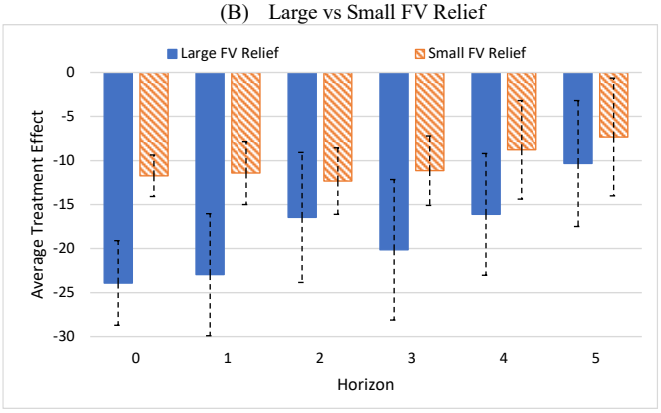
Notes: The chart shows the average treatment effect (ATE) of restructuring episodes on the debt ratio with and without face value reductions on debt—a restructuring that does not involve a face value reduction always entails some form of cash flow relief. To avoid outliers, face value reductions on the top and bottom 5 percent of the distribution have been removed. The bars indicate the ATE and dashed lines denote the 95 percent confidence interval.

All restructuring: 1069 observations (161 treated); Face Value Reduction: 377 observations (48 treated); No Face Value Reduction: 554 observations (68 treated).

(A) Large vs Small Debt Relief



(B) Large vs Small FV Relief



(C) Large vs Small SZ Haircut Debt Relief

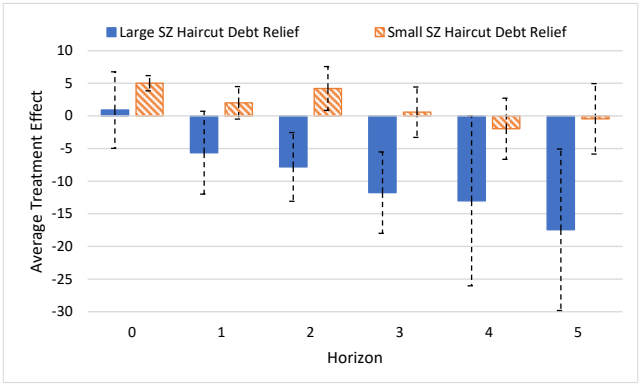
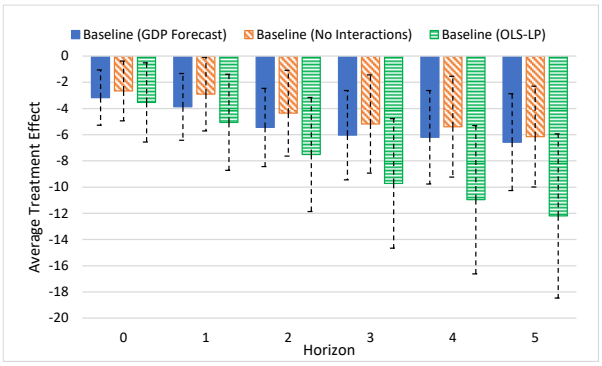


FIGURE 7. HETEROGENEITY BY SIZE OF DEBT RELIEF (AIPW AND OLS)

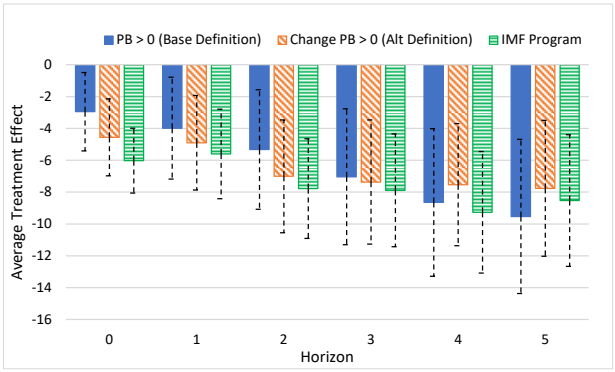
Notes: The chart shows the average treatment effect (ATE) of restructuring episodes on the debt ratio under different treatment sizes. Panel A shows the impact of restructurings with large and small debt reliefs, as defined in equation (8). Panel B focuses on restructurings with face value reduction, showing the impact of large vs small FV reliefs. Finally, panel C compares large vs small debt reliefs for the sample of private external and domestic restructurings where SZ NPV haircuts are available. In all cases, "large" refers to above-median levels of the treatment variable and "small" refers to below-median levels. Treatment levels in the top and bottom 5 percent have been removed to avoid outliers. While the results in panels A and B are estimated using the AIPW estimator described in section III, the findings in panel C are calculated via an OLS estimator due to the small sample for which the SZ NPV haircuts is available. The bars indicate the ATE and dashed lines denote the 95 percent confidence interval.

Large Debt Relief: 157 observations (23 treated); Small Debt Relief: 157 observations (20 treated); Large FV Relief: 161 observations (17 treated); Small FV Relief: 150 observations (21 treated); Large SZ Haircut: 1508 observations (7 treated); Small SZ Haircut: 1477 observations (1 treated).

(A) Alternative Versions of Baseline



(B) Fiscal Consolidation and IMF-supported Programs



(C) Alternative Face Value Relief Exercises

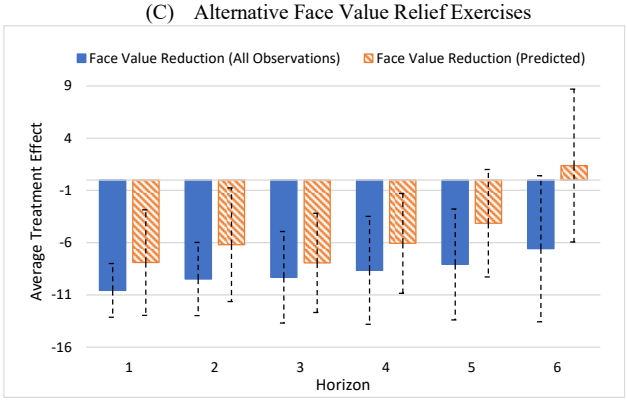


FIGURE 8. ROBUSTNESS CHECKS

Notes: The chart shows the average treatment effect (ATE) of restructuring episodes on the debt ratio under different estimators/models, and under alternative versions of previously discussed features. In panel A, results come from replacing GDP realizations by its forecast, removing interactions with the treatment, and running the local projection with an OLS estimator. Panel B focuses on an alternative definition of fiscal consolidation (positive level *or change* in cyclically adjusted primary balance over the restructuring episode). Panel C shows the impact of restructurings that involve face value reductions but using the entire sample (outliers not removed). It also shows the results of redefining the treatment indicator to reflect the *likelihood* that a face value reduction on debt takes place, instead of using the realized outcomes. The bars indicate the ATE and dashed lines denote the 95 percent confidence interval.

Baseline (GDP Forecast): 1045 observations (157 treated); Baseline (No Interactions): 1069 observations (161 treated); Baseline (OLS-LP): 2012 observations (180 treated); PB > 0: 456 observations (72 treated); Change PB > 0: 923 observations (140 treated); IMF Program: 782 observations (120 treated); Face Value Reduction (All Observations): 399 observations (55 treated); Face Value Reduction (Predicted): 286 observations (43 treated).