Assessing the appropriate size of relief in sovereign debt restructuring[*]

Martin Guzman[1]

Domenico Lombardi[2]

Abstract

This paper provides a methodology for assessing the appropriate size of debt relief in sovereign debt restructuring initiatives, with the baseline premise being that a restructuring must be principles based. We show how to calculate the amount of debt relief that restores sustainability with high probability subject to the satisfaction of other restructuring principles. The amount of debt relief is deemed appropriate if it leads to trajectories of economically and politically feasible fixed points for the primary surplus to GDP ratio that satisfy the government's intertemporal budget constraint in a "high" percent of possible future states of nature. Economic feasibility is defined by natural economic constraints, and political feasibility is defined by the constraints imposed by the restructuring principles. We also provide

[1] Columbia University Business School, Division of Economics; University of Buenos Aires, Department of Economics; and Centre for International Governance Innovation. Email: mg3463@columbia.edu

[2] The Oxford Institute for Economic Policy. Most of the work included in this paper was carried on while this author was the director of the Centre for International Governance Innovation's Global Economy Program. Email: dlombardi@cigionline.org

evidence suggesting that sovereign debt restructuring relief amounts to date have been 'too little'.

JEL Codes: F34, G01, H63

Keywords: Sovereign Debt, Sustainability, Restructuring

1. Introduction

The ultimate goal of sovereign debt restructuring is to restore the conditions for the implementation of economic policies that allow a society to pursue its development goals. And while a necessary economic principle that a restructuring must respect in order to achieve its objectives is the recovery of debt *sustainability,* there are other economic and legal principles that must also be respected. More generally, the 'restructuring principles' must also aim to preserve the good health of sovereign lending markets.

The postulate that sovereign debt restructuring must be principles based is gaining traction.[3] But restructuring principles still lack a codification for their practical implementation. This paper contributes to filling this gap by presenting an approach for computing the amount of debt relief that is appropriate for *restoring debt*

---

[3] Countries are at times explicit about the principles that should be respected in a debt crisis resolution. For instance, Argentina's restructuring proposal following the default of 2001 was explicit about the priority of achieving sustainability in a way that did not undermine the country's recovery, and also explicitly announced that the restructuring proposal would treat different creditors (official and private) differently (see Guzman, 2016a). Puerto Rico's fiscal plan proposal presented by its government in 2015 states seven principles that the resolution of the debt crisis should respect, some of which referred to the restructuring process—minimize the impact of austerity on growth, protect vulnerable stakeholders as pensioners and low-income credit union depositors, protect investments in education, health, and public safety, and create a sustainable debt level that allows for growth. The United Nations has advanced the agenda of setting general principles of international law for sovereign debt restructuring through a resolution that in September 2015 approved nine principles (the principles adopted by United Nations General Assembly Resolution 69/319 are sovereignty, good faith, transparency, impartiality, equitable treatment of creditors, sovereign immunity, legitimacy, sustainability, and majority restructuring; henceforth the *UN Principles*). For a discussion on the meaning of the principles, see Goldmann (2016); Bohoslavsky and Goldmann (2016); and Guzman and Stiglitz (2016b). However, those principles have not been respected in many of the recent restructurings, contributing to the failure of many restructuring events (see Guzman and Stiglitz, 2016b).

sustainability with high probability while respecting the other restructuring principles. The debt write down in a restructuring is deemed appropriate if, taking into account the endogenous relationships between fiscal policies, economic performance, and fiscal outcomes, and given the probability distributions of the relevant shocks, the restructured debt stock is such that the government's intertemporal budget constraint and the constraints imposed by principles are satisfied for a 'sufficiently large' probability mass – where 'sufficiently large' must satisfy the analyst's choice of "high probability". The addition of the statement 'with high probability' to the principle of sustainability is the consequence of sustainability being a stochastic concept: sustainability assessments must be made ex ante, before the uncertainty about the variables that determine the capacity for debt service is resolved. The higher the threshold that defines 'high probability,' the deeper will be the necessary debt write-down that will restore sustainability.[4]

We believe this is an important contribution to the literature mainly because of two reasons, one related to the empirical evidence, and the other theoretical. The empirical reason, that we document in this paper, is that sovereign debt restructurings are often delivering insufficient relief as to provide a long-lasting resolution to the crisis that made debts unsustainable. Over the last four decades, more than half of the restructurings with private creditors were followed by another restructuring (also with private creditors) or a default shortly afterwards.[5] This evidence clearly points to the need for guidance on how to compute the appropriate relief in sovereign debt restructuring.

---

4 Clearly, a full debt write-down would restore sustainability with probability 1. But that would create ex ante inefficiencies that would worsen the functioning of sovereign lending markets.

5 The computation of these statistics for post-restructuring time windows of three to seven years is described in section 4.

On the theoretical front, we note a number of issues that give importance to our contribution. First, the classical approach for testing sustainability is uncapable of responding the question of interest of this paper.[6] Second, the theoretical literature does not incorporate the issue that there are other constraints besides the government's budget constraints that may be relevant for the definition of debt sustainability, as those imposed by the principles that must be respected in a restructuring process. Third, the current practice, as for instance the one followed by the IMF fan charts approach, also leaves aside the importance of these other constraints. Finally, the more recent literature that intends to define what is an appropriate amount of debt relief in restructuring episodes is taking a dangerous road—one that does not provide proper guidance for designing sovereign debt restructuring proposals aligned with the objectives of restructuring. Recent papers and commentaries, rather than assessing whether the depth of a debt restructuring is appropriate based on whether it was *just enough* to restore sustainability, instead make claims on the appropriateness of these processes based on international comparisons of the market haircuts across different restructuring experiences.[7] But those comparisons are not informative of the appropriateness of relief, because they do not answer the question of whether the size relief was the necessary to restore debt sustainability. This paper intends to change the direction that the literature is taking and to redefine the metrics for evaluating restructuring proposals.

The computation of the necessary debt relief requires a model that describes the macroeconomy of the distressed debtor. Generally, not only will the necessary debt relief depend on the economic situation of the debtor, but also the debtor's economic performance will depend on the relief that it obtains. The model must be able to identify different consistent paths of policies for a given level of debt. In

---

[6] The limitations of the classical approach for testing sustainability initiated by Bohn (1995) are recognized by the more recent literature. See for example D'Erasmo, Mendoza, and Zhang (2016) and Polito and Wickens (2012).

[7] See, for example, Edwards (2015) and Cruces and Levy Yeyati (2016).

addition, the number of macroeconomic policies consistent with the satisfaction of a solvency condition with high probability may be multiple. Mathematically, finding those consistent policy paths is equivalent to finding the trajectories of fixed points for the relationship between policies and economic performance that satisfy the debtor's intertemporal budget constraint with high probability mass.[8]

One of the paths of fiscal policies for which consistency with the sustainability principle is worth studying is the constant fiscal surplus to GDP ratio. This is a measure that is often invoked in restructuring proposals. We illustrate our approach for computing the appropriate debt relief referring to this case, but we note that the approach is general and can be extended to any other non-constant path of primary surplus over GDP ratio. For the sake of simplicity, our illustration refers to a very simple model that does not represent any real economy.

A summary of the approach

The application of the approach proceeds as follows. In the first step, the analyst translates the constraints imposed by the restructuring principles that are defined for the episode under analysis into economically interpretable terms. For instance, one of the principles might state that the outcome of a restructuring should meet a minimum target of expected economic growth that would generate the resources to satisfy some demands that for the sovereign are considered indispensable, such as maintaining a capitalized pension system, or avoiding the sale of sovereign assets that are essential for the development strategies of the nation, etc. This first step assigns bounds to the set of proposals that are *politically feasible*.[9]

---

[8] Consistency also requires that the interest rate at which the future flows are discounted incorporates a risk premium that corresponds to the 'small' probability of debt unsustainability accepted at the moment of the restructuring or the debt sustainability analysis. See Guzman and Heymann (2015).

[9] Note that the IMF Debt Sustainability Analysis Framework also refers to political feasibility in its definition of sustainable public debt (see IMF 2013, p.4).

The second step requires taking a stance on the model that governs the relationship between the fiscal surplus and the economic performance, measured, for example, by GDP growth, and estimating or making distributional assumptions for the parameters and shocks that govern that relationship. Given those inputs, the analyst computes the trajectories of fixed points for the circular relationship between the primary surpluses to GDP ratio, on the one hand, and GDP growth, on the other hand, that satisfy the government's intertemporal budget constraint. The computation of the fixed points is made for each of the possible scenarios, defined by the different combinations of states derived from the distributional assumptions.

The third step classifies each of the fixed points according to whether they are economically and politically feasible. Economic feasibility is achieved if no natural economic constraints are violated. For instance, a fixed point where the growth rate of output is less than -1, or where the ratio of primary surplus over GDP is in all periods greater than 1, is not economically feasible. Political feasibility simply refers to whether the fixed point does not violate any constraint defined by the principles in step 1. For instance, there could be an economically feasible fixed point in which the economy grows at a very negative rate but in which the government still manages to generate the necessary fiscal surpluses to repay debt in full. Such a fixed point would probably be dismissed on the basis of not being politically feasible.

The fourth step is the assessment of whether, conditional on the choice of the model of the economy under analysis and the distributional assumptions made, a given amount of debt (or a certain ratio of debt over GDP) is sustainable with high probability. Letting x be the measure of high probability, a level of public debt will be sustainable if, for the relevant distributions for the parameters governing the model, there are trajectories of economically and politically feasible associated fixed points that satisfy the government's intertemporal budget constraint with

6

probability mass equal not smaller than x. If this is not the case, the conclusion is that there needs to be debt relief in order to restore sustainability with high probability. The last step is to compute the appropriate amount of debt relief, which equals the minimum write-down that restores sustainability as defined in the fourth step, i.e., the minimum amount of debt relief for which the probability mass of the possible states for which there is at least one trajectory of economically and politically feasible fixed points is equal to x. The difference between the outstanding debt and the appropriate relief is the 'principles-based sustainable debt.'

Our contribution is methodological but has direct and immediate policy applicability. It could provide guidance to practitioners and policy makers for designing restructuring proposals. It must be noted that the 'macro' number that this process computes may still not ensure the satisfaction of other restructuring principles. For instance, one of the restructuring principles could be that different creditors will receive different treatment, in order to ensure an 'equitable treatment of creditors.'

The rest of the paper is organized as follows. Section 2 reviews the related literature and frames our contribution. Section 3 presents evidence that suggests the existence of a 'too little' syndrome in sovereign debt restructuring. Section 4 presents our methodological contribution. Section 5 illustrates our methodology with a simple example. Section 6 discusses the consistency and the limitations of our approach. Section 7 offers the conclusions.

2. Relation to the literature

Our contribution belongs primarily to the field of the economics of sovereign debt, but it is also related to the legal literature on sovereign debt. The literature on legal

and economic principles for sovereign debt restructuring is growing rapidly, probably in response to the recent failed experiences of sovereign debt restructurings that have raised awareness of the negative consequences implied by the lack of a principles based system. A large and growing number of papers support the hypothesis that a restructuring approach should in fact be principles based (Raffer, 1990; Bohoslavsky and Goldmann, 2016; Li, 2015; Goldmann, 2016; Blankenburg and Kozul-Wright, 2016; Gelpern, 2016; Guzman and Stiglitz, 2016a, 2016b; Howse, 2016; among others). The literature also offers insights on the meaning of different principles for practical purposes, such as good faith (Kolb, 2006; Goldmann, 2016), legitimacy (Lienau, 2016), equitable treatment of creditors (Brooks et al., 2015), majority restructuring (ICMA, 2014; IMF, 2016; Gelpern, Heller, and Setser, 2016), transparency, and impartiality (Guzman and Stiglitz, 2016b). However, the literature is still unclear about how the principle of sustainability should be codified for practical purposes. Our contribution intends to fill this gap, under the premise that any restructuring proposal must assess sustainability as a function of the other restructuring principles.

Recent literature analyses whether debt write-downs in sovereign debt restructuring episodes have been excessively high, low, or appropriate. The approach of Edwards (2015), for instance, focuses on a cross-country comparison of experiences, based on a sample that includes 180 restructuring episodes with private creditors from 1970 to 2010 (from Cruces and Trebesch, 2013). The evaluation of the appropriateness of a market haircut is done by comparing residuals between actual market haircuts and predicted market haircuts. Predicted haircuts are obtained from a regression of market haircuts on a set of covariates that includes domestic and global conditions at the time of the restructuring, regional dummy variables, and binary variables that capture special aspects of the restructuring. In this view, the predicted haircut constitutes what is an 'appropriate' haircut. If the actual haircut is

significantly larger than the predicted haircut, then the restructuring would be deemed excessively aggressive. But the approach is fundamentally flawed. Of the episodes in the sample, 56.9% were followed by another restructuring with private creditors or a default[10] within five years. If we extend the sample to include the seven additional episodes added in Cruces and Trebesch's (2013) extended database[11], this figure changes to 55.3%. In a sample in which more than half of the restructurings were not effective in addressing relief needs, the regression line is certainly not representative of what is appropriate. Instead, the predicted haircuts represent what is too little.

An approach that uses market haircuts as a measure of the depth of a restructuring has an additional problem: the market haircut is not a comprehensive measure of debt relief, but is just an approximation of private creditors' losses, and leaves aside official creditors' claims.[12] From the viewpoint of a distressed debtor, it is not only the proportion of debt with private creditors that is written off that matters, but also the write-off relative to the total debt burden. Our approach does not refer to market haircuts but to the entire stock of outstanding debt and the relief relative to the total debt.

Relatedly, Benjamin and Wright (2009) offer evidence that suggests that restructuring negotiations since 1970 have not been effective at reducing the debt burden that distressed sovereigns face. They find that the average debtor exits default more highly indebted than when it enters default.

Our paper is connected to the empirical literature on the sustainability of fiscal policies. Bohn's seminal work (Bohn, 1995, 2007, 2008) describes conditions that are sufficient for fiscal sustainability. That literature tests whether past fiscal

---

[10] Either default on bondholders or on bank loans.

[11] Updated on August 2014, available at https://sites.google.com/site/christophtrebesch/data.

[12] Although haircuts on official creditors can also be computed. See Schlegl, Trebesch, and Wright (2017).

policies can be sustained over time in a way that satisfies the government's intertemporal budget constraint under general equilibrium conditions—conditions that make the relevant constraint different than the standard intertemporal budget constraint that equates the initial value of debt with the present discounted value of fiscal surpluses. This conception of sustainability raises other issues, such as whether the fiscal function reaction depends on the debt ratio (Mendoza and Ostry, 2008). But ultimately this analytical approach refers to a concept of fiscal sustainability that focuses on past behaviors as indications of whether observed fiscal paths can consistently be sustained. This puts limitations on what these tests can inform: they do tell us whether debt sustainability would be threatened under the continuation of the behavior that represents the past, but they do not tell us whether there is a future feasible course of policies that would be able to satisfy the government's intertemporal budget constraint. This limitation is well recognized in the literature (see D'Erasmo, Mendoza, and Zhang, 2016; Polito and Wickens, 2012[13]). Our object of study is different: we are interested in situations where fiscal policies were already unsustainable, and, recognizing the need for policy shifts, our goal is to provide answers on the debt relief that would make *feasible* the satisfaction of the government's intertemporal budget constraint without resorting to default *if* the government were willing to realign its policy approach with that goal.

Another branch of the literature on debt sustainability focuses on commitment issues (D'Erasmo, Mendoza, and Zhang, 2016; D'Erasmo and Mendoza, 2016). In models with commitment constraints, a government may default even when full repayment is economically (and possibly politically, although this is not modelled) feasible. The threat of exclusion leads to repayment in some states of nature, but

---

[13] Polito and Wickens (2012) go further and develop an alternative way to assess the evolution of fiscal policy, that is based on an index that compares a measure of desired debt to GDP ratio at future points with forecasts of that ratio that must be consistent with the government's budget constraints.

not in others (Eaton and Gersovitz, 1981; Aguiar and Gopinath, 2006; see also the survey by Eaton, Gersovitz, and Stiglitz, 1986, and Eaton and Fernandez, 1995). In a context of imperfect commitment, moral hazard is a relevant concern: a system where punishment to the defaulting debtor is less severe may lead to more defaults in equilibrium (although an equilibrium with more punishment costs will not necessarily be superior to one with fewer punishment costs). We leave moral hazard considerations aside, and simply compute whether full debt repayment is economically and politically feasible with high probability, independent of whether strategic behavior will make full repayment an equilibrium outcome. Our approach could be enriched in future research by including strategic considerations.

The literature also shows that virtually every default falls in the category of excusable defaults (see Levy Yeyati and Panizza, 2011), a concept developed by Grossman and Van Huyck (1988). The premise of excusable defaults is that governments default only as a last resort, when all the resources they can muster— given by the sum of the country's primary surplus and the proceeds from new debt issuance—fail to cover the cost of debt service. Whereas strategic default can be viewed as a matter of will, in which the government decides to default as the result of a cost-benefit analysis that deems default more attractive than debt repayment, excusable default can be viewed as a matter of means. Based on this concept, Collard, Habib, and Rochet (2016) develop a measure of maximum sustainable debt. Their model of excusable default improves the match between sovereign yield spreads and default probabilities for a sample of 23 OECD economies. This approach for understanding defaults is closely related to our concept of debt levels whose full payment is both politically and economically feasible. Although Collard, Habib, and Rochet's (2016) model features an exogenous stochastic process for GDP, the approach is flexible enough to consider the endogeneity of GDP growth

11

(and hence the debt service capacity) on fiscal policies—an issue that our analysis does consider.

The definition of scenarios as the basis for assessing debt restructuring needs has antecedents in the risk management optimization approach to sovereign debt restructuring (Celasun, Debrun, and Ostry, 2005; Consiglio and Zenios, 2015). Our approach requires taking a stance on the probability distributions for the variables that determine debt repayment capacity. To some extent, similarly, the risk management optimization approach requires postulating plausible scenarios. In our approach, the sustainability assessment for each scenario derived from the distributional assumptions is made based on whether the government's intertemporal budget constraint and other principles based constraints are satisfied. In the risk management optimization approach, sustainability analysis in each scenario is based on stress tests that require a risk measure that must be bounded. For instance, in Consiglio and Zenios (2015), the risk measure refers to the tail of the distribution of the debt-to-GDP ratio measured vis-à-vis its mean value.

Our computation of restructuring needs require to identify feasible primary surpluses. Abiad and Ostry (2005) propose a set of alternatives for projecting primary surpluses. More generally, the IMF develops techniques to produce fan charts of debt, then it imposes that the primary surplus and/or the debt remains below an upper limit with certain probability, and finally checks that the fiscal balance paths are realistic.

Finally, our paper is related to the analysis of the relationship between debt relief and economic performance. The analysis of Reinhart and Trebesch (2016) points out the importance of debt relief for restoring economic growth. Their study of the aftermath of debt restructuring episodes shows that the economic performance of distressed debtors improves significantly after relief operations only if they involved debt write-downs. Instead, debt reprofiling as maturity extensions and

interest rate reductions are not generally followed by improvements in the economic growth performance, or even improvements in credit ratings. Relatedly, Galofré-Vilà et al. (2016) find that West Germany's rapid economic recovery following World War II was possible due to the significant debt relief that the country obtained through the implementation of the London Debt Agreement. The logic that underlies our computations is that while large levels of debt would require levels of fiscal surplus to ensure the satisfaction of the government's transversality condition that could be self-defeating, a debt write-down would release resources for fiscal policies that could be sustainable and consistent taking into account their associated endogenous feedback effects.

3. Evidence on recent sovereign debt restructuring experiences

This section presents evidence that suggests the existence of a 'too little' syndrome in sovereign debt restructuring. If the goal of a restructuring is to restore sustainability with probability x, then we would conclude that the system for sovereign debt restructuring is successful if asymptotically only 100–x percent of the restructuring episodes were not effective at restoring sustainability.

Judging the effectiveness of past sovereign debt restructurings requires taking a stance on the value of x. Our paper has nothing to say about what value of x would be reasonable, as that definitional task is a matter of debate. [14] But it is clear that high probability cannot mean x close to 50 percent. This section shows that restructurings have, and continue to provide too little debt relief to achieve success in any reasonable definition of 'high' probability.

---

[14] IMF (2013) refers to the risk of debt positions as high, moderate, and low.

We study the fraction of restructurings with private creditors for the period 1970–2013 that were followed by either another restructuring or default in j years, for $j = \{3,4,5,6,7\}$. The data of sovereign debt restructurings with private creditors comes from Cruces and Trebesch (2013, last updated on 08-07-2014), and includes 187 restructuring episodes with foreign banks and bondholders. The data on sovereign defaults comes from Beers and Nadeau (2014, update on 04-05-2015), and includes bonds and other marketable securities, bank loans, and official loans in default, valued in U.S. dollars, for the years 1975 to 2014 on both a country-by-country and a global basis. The database includes annual information on the amount of defaulted debt per type of creditor for the categories defined above. We classify an episode as a sovereign default with a group of creditors when the defaulted debt with that group of creditors goes from zero to a positive number.[15]

We use the year $2013 - j$ for each j as the final period of the sample of restructuring episodes, and present the results in Table 1.[16]

Table 1: Fractions of restructurings with private creditors followed by another restructuring or default within j years, 1970–2013

j	3	4	5	6	7
Fraction 1	0.492	0.519	0.547	0.570	0.594
Fraction 2	0.497	0.525	0.553	0.575	0.600

Notes:
Fraction 1: Fraction of restructuring with private creditors followed by another restructuring or default with private bondholders within j years.
Fraction 2: Fraction of restructuring with private creditors followed by another restructuring or default with private bondholders or on bank loans within j years.

[15] A caveat is that Beers and Nadau (2014) do not include data on defaults with private creditors for Argentina, Cuba, Greece, Croatia, Iraq, Poland, Sao Tome and Principe, Slovenia, South Africa, Trinidad and Tobago, and Uruguay.
[16] If we included the restructuring of last j years of the sample, we would not have j years ahead for computing our fractions of interest.

The fraction of restructuring episodes with private creditors that were followed by another restructuring with private creditors or default with private bondholders within j years goes from 49.1% for $j = 3$ to 59.4% for $j = 7$. Those figures rise to 49.7 and 60%, respectively, if we include defaults on bank loans.

Table 2 shows the same figures for different income groups following the World Bank classification. The results show that this is not a phenomenon that is circumscribed to low or middle income countries but it is general.

Table 2: Fractions of restructurings with private creditors followed by another restructuring or default within j years, 1970–2013, by income group

j	3	4	5	6	7
Fraction 1					
High Income	0.619	0.650	0.700	0.700	0.700
Upper middle income	0.500	0.548	0.578	0.590	0.622
Lower middle income	0.467	0.477	0.500	0.523	0.548
Low Income	0.424	0.424	0.438	0.500	0.516
Total	**0.492**	**0.519**	**0.547**	**0.570**	**0.594**
Fraction 2					
High Income	0.619	0.650	0.700	0.700	0.700
Upper middle income	0.500	0.548	0.578	0.590	0.622
Lower middle income	0.467	0.477	0.500	0.523	0.548
Low Income	0.455	0.455	0.469	0.531	0.548
Total	**0.497**	**0.525**	**0.553**	**0.575**	**0.600**

Note: see definitions of "Fraction 1" and "Fraction 2" in Table 1

One possible concern could be that these results were driven by a few outliers that default and restructure too often. We show that this is not the case. Figure 1 shows the distribution of countries by number of defaults and restructurings. The mean is 2.88 episodes, the median is 2, and the standard deviation is 2.06. No country is

more than three standard deviations beyond the mean. Only one country, Poland, is more than two standard deviations beyond the mean. Tables 3 and 4 show the same fractions as Tables 1 and 2 but excluding Poland. The pattern of results remains.

Figure 1: Distribution of countries by number of defaults and restructurings, 1970-2013
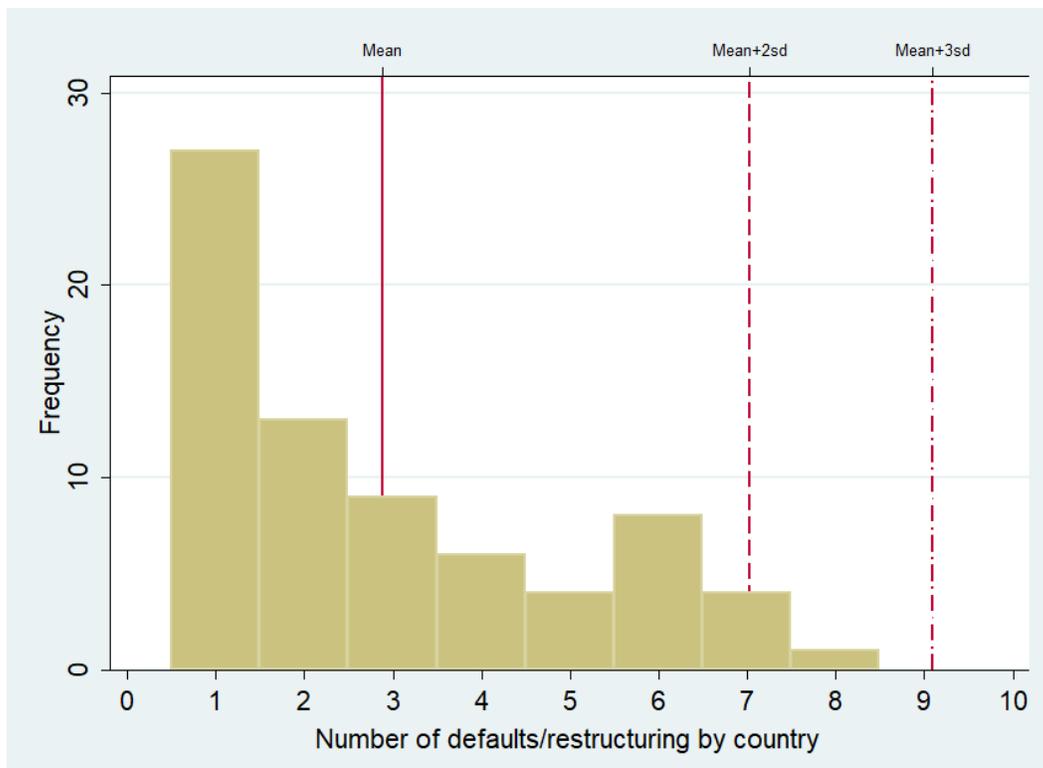

Table 3: Fractions of restructurings with private creditors followed by another restructuring or default within *j* years, 1970–2013, excluding Poland

j	3	4	5	6	7
Fraction 1	0.480	0.509	0.532	0.556	0.581
Fraction 2	0.486	0.514	0.538	0.561	0.587

Note: see definitions of "Fraction 1" and "Fraction 2" in Table 1

Table 4: Fractions of restructurings with private creditors followed by another restructuring or default within j years, 1970–2013, by income group (excluding Poland)

j	3	4	5	6	7
Fraction 1					
High Income	0.538	0.583	0.583	0.583	0.583
Upper middle income	0.500	0.548	0.578	0.590	0.622
Lower middle income	0.467	0.477	0.500	0.523	0.548
Low Income	0.424	0.424	0.438	0.500	0.516
Total	**0.480**	**0.509**	**0.532**	**0.556**	**0.581**
Fraction 2					
High Income	0.538	0.583	0.583	0.583	0.583
Upper middle income	0.500	0.548	0.578	0.590	0.622
Lower middle income	0.467	0.477	0.500	0.523	0.548
Low Income	0.455	0.455	0.469	0.531	0.548
Total	**0.486**	**0.514**	**0.538**	**0.561**	**0.587**

Note: see definitions of "Fraction 1" and "Fraction 2" in Table 1

This evidence, although not entirely conclusive, is very suggestive of the existence of a 'too little' syndrome that indicates that restructuring processes are not providing enough relief to restore sustainability with high probability. To illustrate this claim, suppose $x = 0.95$. Then, if restructuring processes were effective to restore sustainability with 95% probability, we should asymptotically observe that only 5% of the restructuring processes had 'shortly' after been conducted again. For the sake of argument, we could claim that perhaps these restructurings occurred in an exceptionally unlucky period, and that on these grounds the evidence is not sufficient to say that the debt restructuring efforts are unsuccessful with high probability. Suppose that the unlucky period consists of prevalent negative shocks from a known distribution that did imply a 5% probability of unsuccessful restructuring, but nevertheless there were too many 'failed restructurings'

concentrated in the last 40 years. According to this argument, if we waited longer, we would observe a decrease in "Fraction 1" and "Fraction 2" for each j, as defined in tables 1 to 4; asymptotically those frequencies would converge to 5%.

We could next ask what is the probability of observing the frequencies of restructuring followed by another default or restructuring that we document in this paper given the actual distribution of that variable. Suppose, for the sake of illustrating how suggestive of a "too little" syndrome this evidence is, that the *actual* probability that a restructuring with private creditors is followed by another restructuring or default with the same group within five years is 0.05, and that that variable follows a Poisson distribution. Then, for instance, the probability of observing that fraction 2 is 0.553 for $j = 5$, or equivalently the probability of observing 95 failed attempts at resolving the sovereign debt crises in a sample of 179 episodes, would be equal to $5.37 * 10^{-62}$ – an extremely rare event. Of course, what is more likely is that the last forty years were not a period of extreme bad luck, but that indeed restructurings are coming in the form of "too little".[17]

4. A methodology for assessing the appropriate size of debt relief

This section describes analytically our approach for computing the appropriate size of relief in a sovereign debt restructuring process. The computation of the appropriate relief requires (i) the definition of the relevant constraints for defining sustainability of the public debt, and (ii) the choice of a model that captures the endogenous feedback effects associated with fiscal policies and that incorporates the relevant shocks.

---

[17] The characteristics of the bargaining process may also explain the recurrent restructurings that follow a default, as studied in Ghosal, Miller, and Thampanishvong (2016). Relatedly, the characteristics of the bargaining process can also explain the delays in beginning a restructuring process, as studied in Benjamin and Wright (2009).

4.1. The definition of the relevant constraints

The first step of the process of computing the appropriate relief is the definition of the relevant constraints for defining sustainability. A constraint that must always be included is the government's intertemporal budget constraint. The form of the constraint will depend on to what extend the government's bonds can be used as insurance: If a government could issue bonds in an environment that features complete markets, then the government might be able to spend more than its revenues plus its debt obligations, if lenders value the safety of government bonds sufficiently. For simplicity, the description of our approach assumes markets are not complete, and leaves this possibility aside.

We assume the government can issue non-contingent bonds with a maturity of one period. Also, for simplicity, we assume the government cannot resort to seigniorage for funding its public deficits. Then, the government's budget constraint in nominal terms in period t is given by

$$-S_t + R_{t-1,t}D_{t-1,t} = D_{t,t+1} - D_{t-1,t}$$

where S_t is the nominal primary surplus in period t, respectively, and $R_{t-1,t}$ is the nominal borrowing cost for debt issued in period $t-1$ that matures in period t, $D_{t-1,t}$.

The government's budget constraint in period t as a ratio of GDP is

$$d_{t,t+1} = \frac{(1+R_{t-1,t})}{1+\gamma_t} d_{t-1,t} - s_t \tag{DD}$$

where γ_t is the growth rate of nominal GDP between periods $t-1$ and t. The equation (DD) defines the government's debt dynamics.

Let s_t be the primary fiscal surplus to GDP ratio in period t and $1 + r_t = \frac{1+R_t}{1+\gamma_t}$. Let $d_{t-1,t} = \frac{D_{t-1,t}}{Y_t}$, where Y_t denotes the GDP in period t. Let $z_\infty^i \in Z_\infty$ be a possibly trajectory of realization of states, where Z_∞ is the set of all possible trajectories of states.

At the time of making a judgment on the sustainability of a state of debt, the analyst cannot know with certainty what will be the evolution of the state variables that determine the debt repayment capacity. From an ex-ante perspective, there is one possible intertemporal budget constraint associated with each possible story of states. Therefore, any statement on debt sustainability is by definition probabilistic. For each possible trajectory of realization of states, the government's transversality condition (TC) will hold if and only if the government's intertemporal budget constraint (IBC) holds, where

$$d_t^* = \sum_{j=0}^{\infty} [\, 1 + r(t, t+j)]^{-1} s_{t+j} \,|z_\infty^i \tag{IBC}$$

$$\lim_{j \to \infty} [\, 1 + r(t, t+j)]^{-1} d_{t+j} |z_\infty^i = 0 \tag{TC}$$

where the intertemporal budget constraint (IBC) and its associated transversality condition (TC) are conditional on the trajectory of realization of states z_∞^i, $d_t^* = (1 + r) d_{t-1,t}$ denotes debt at the start of period t, and

$$1 + r(t, t+j) = \prod_{k=0}^{j} (1 + r_{t+k})$$

The other relevant constraints will be determined by the principles that are imposed for the restructuring process. Those constraints have to be represented mathematically for the computation of the appropriate amount of debt relief, as explained below.

4.2. The choice of a model

The analyst performing the debt sustainability analysis has to define a model that captures the relevant causal mechanisms and the relevant shocks that will affect the relevant constraints.

In general terms, suppose that

$$s_t = s(\gamma_t, R_t, X_t^s, \epsilon_t^s)$$

$$\gamma_t = \gamma(s_t, X_t^\gamma, \epsilon_t^\gamma)$$

and

$$R_{t,t+1} = R(s_t, X_t^R, \epsilon_t^R)$$

where X_t^i are vectors that include other determinants of variable i,[18] and ϵ_t^i are random shocks that affect the realization of variable i, $i = s, \gamma, R$.

Then,

$$s_t = s\left[\gamma(s_t, X_t^\gamma, \epsilon_t^\gamma), (s_t, X_t^R, \epsilon_t^R), X_t^s, \epsilon_t^s\right] = T(s_t) \equiv s_t^*$$

that is, fiscal surpluses to GDP ratios are fixed points.

4.3. A criterion for assessing the appropriate size of debt relief

The goal is to ensure that the state variables are such that with high probability there is a path of feasible fiscal policies that satisfy the government's intertemporal budget constraint as well as the principles based constraints. For high levels of debt,

---

[18] This general representation can accommodate any number of factors that may affect the sustainability of the public debt. For instance, the representation of the borrowing cost may account for the fact that emerging economies issue debt in multiple currencies, hence exchange rate risk would be a relevant factor for the analysis. Note that in such a case the dynamics of the nominal value of debt could be written as $D_t = \frac{E_t}{E_{t-1}}\left(1 + R_{t-1,t}^f\right)D_{t-1}^f + \left(1 + R_{t-1,t}^d\right)D_{t-1}^d - S_t$, where D_t^f and D_t^d denote the nominal debt issued in period t in foreign and domestic currency, respectively, and $R_{t-1,t}^f$ and $R_{t-1,t}^d$ denote the nominal interest rate on the debt issued in $t-1$ in foreign and domestic currency, respectively.

the necessary fiscal surpluses may be so high that they cannot be achieved—instead, if those necessary surpluses were pursued, the economy would fall into an austerity trap. The model must identify the consistent trajectories among the ones that are economically feasible. Let γ^{ss} and R^{ss} be the growth rate of GDP and the nominal interest rate in steady state.

Definition 3: The set of <u>economically feasible</u> s_t is defined as $J^E = \{s_t \in \mathbb{R}: \gamma(s_t, X_t^\gamma, \epsilon_t^\gamma) > -1 \wedge R^{ss} > \gamma^{ss}\}$.

If the dynamic efficiency condition $R^{ss} > \gamma^{ss}$ did not hold, there would be no binding intertemporal budget constraint is always binding for the government, an obvious economic impossibility.

Definition 4: s_t^* is an <u>economically feasible fixed point</u> if $s_t^* \in J^E$.

The restructuring principles will generally put additional constraints on what solutions are feasible. We call J^P the set of solutions that respect the restructuring principles. The application of the methodology for practical purposes needs to define the conditions that determine the set J^P, as we do with the illustrative example in the next section.

Definition 5: s_t^* is a <u>politically feasible fixed point</u> if $s_t^* \in J^P$.

We denote the set of feasible fixed points as those that are both economically and politically feasible.

Definition 6: s_t^* is a <u>feasible fixed point</u> if $s_t^* \in J^F = J^E \cap J^P$.

We defined the intertemporal budget constraint associated with each possible trajectory of states as (IBC). More generally, we call the intertemporal budget constraint in expected value IBC.

Definition 7: $d_{t-1,t}$ is <u>x-sustainable</u> if given the probability distributions for ϵ_t^i, there are trajectories of feasible fixed points $\{s_t^*\}_{t=0}^{\infty} \in J^F$ such that IBC holds with probability mass not smaller than x.

Thus, debt is *principles-based sustainable* if it satisfies *x-sustainability*. The concept of *x-sustainability* does not claim that fiscal policies *will* be consistent with full debt repayment with high probability (where high probability is denoted by x). Instead, it says that there are feasible fiscal policies that *may* make full repayment 'highly likely,' leaving aside the issue of whether the characteristics of the government-creditors interaction will make that scenario an equilibrium outcome.

Definition 8: Suppose IBC holds with probability mass $x' < x$ for d_t^*. Then, the <u>appropriate level of debt relief</u> to restore x-sustainability must satisfy $\Delta = d_t^* - d_t^{*\prime}$, where $d_t^{*\prime}$ is the maximum value of d that satisfies x-sustainability.

Note that any relief larger than *Δ* would also satisfy *x*-sustainability. However, a relief larger than *Δ* would not be appropriate, because it would impose a loss to creditors larger than what is necessary to satisfy the *x-sustainability* principle, possibly violating the good faith principle on the debtor's side.

5. An illustration of the methodology

We will next illustrate the methodology making reference to an object that is commonly invoked in practical episodes of sovereign debt restructuring: the constant fiscal surplus to GDP ratio that would be required to stabilize debt. We assume that the model that describes the economy is described by linear functions that represent the relationship between fiscal policies, economic performance, and the interest rate. But a caveat is in order: by no means that model intends to represent any real economy. That simple model is used for the sake of clarity of the illustration. The analyst using the methodology would have to determine what the right model would be for the economy under analysis.

Suppose that $\gamma_t = \gamma$ and $R_{t-1,t} = R$ $\forall t$, but both variables are random variables at time t (the uncertainty is revealed at the end of period t). Then, if $s_t = s$ $\forall t$, the IBC becomes

$$d_t^* = sE_t \sum_{j=0}^{\infty} \left(\frac{1+\gamma}{1+R}\right)^{j+1}$$

with $\gamma < R$.

Let γ^n and R^n be any possible realization of γ and R, respectively. Then, the associated s^n that will restore sustainability will be given by

$$s^n = d_t^* \left(\frac{R^n - \gamma^n}{1+\gamma^n}\right) \qquad\qquad (*)$$

5.1. A linear functions example for the case of constant s

Suppose that the relationship between s, g, and R is represented by the following linear functions:

$g = \alpha_0 - \alpha_1 s$

and

$R = \beta_0 - \beta_1 s$

where α_i and β_i are random variables, $i = 0,1$. We can think of α_0 and β_0 as a linear combination of a constant plus a random shock. Under these linear functional forms, the solution to s^n will be a quadratic polynomial, with two fixed points for each combination of parameters.

We assume α_i and β_i have discrete uniform distributions, $\alpha_0 \sim unif\{0.02,0.07\}$ with $pmf = 1/6$; $\alpha_1 \sim unif\{0,1\}$ with $pmf = 1/11$; $\beta_0 \sim unif\{0.03,0.07\}$ with $pmf = 0.2$, $\beta_1 \sim unif\{0,1\}$ with $pmf = 1/101$.

Under these distributional assumptions, we have $n = 33,330$ combinations of states. We compute the value of s^n that resolves (*) for each of those possible combinations, for each value of d_t^* from 0.01 to 1.8.

Next, we eliminate all the cases that are 'irrelevant,' i.e., the cases where there is no real root corresponding to the dynamically efficient economy (where $\gamma \geq R$).

Economic feasibility

Economic feasibility requires $\gamma > -1, s < 1$, and we assume that the lower bound to the nominal interest rate $R \geq 0$ also holds.[19] We count the number of relevant scenarios where there is at least one fixed point that is economically feasible for each value d_t^* of the defined range.

Political feasibility

We assume political feasibility is defined by $J^P = \{s_t \in (-1,1): \gamma(s_t, X_t^\gamma, \epsilon_t^\gamma) \geq 0.01\}$, and count the number of relevant scenarios where there is at least a fixed point that is politically feasible, also for each possible value of d_t^* over the defined range.

Feasibility

Finally, we count the number of relevant scenarios for which there is at least one feasible fixed point, where 'feasibility' follows definition 6.

x-sustainability

Figure 2 shows the mass probability corresponding to the existence of feasible fixed points that satisfy (*) for different values of d_t. While (*) holds with a feasible solution with probability 1 for $d_t^* \leq 0.16$, that probability mass decreases for higher initial ratios of debt to GDP.

Figure 2: Fraction of states with feasible fixed points

Fraction of states with feasible fixed points

1.2

1

0.8

0.6

0.4

0.2

0

Initial debt to GDP ratio
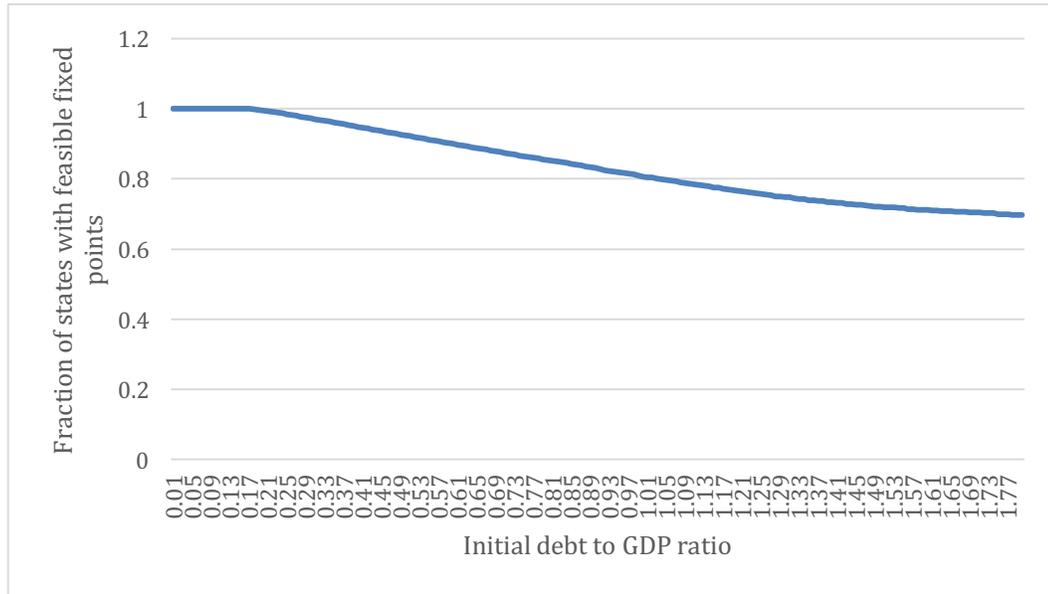
Appropriate amount of debt relief

Suppose $x = 0.95$. Then, under our distributional assumptions, the initial debt to GDP that satisfies x-sustainability is $d_t^* = 0.6$.[20] Therefore, a restructuring will satisfy the condition of 'appropriateness' if the debt relief to restore x-sustainability if the value of d^* is reduced to 0.6. Figure 3 shows the appropriate relief for different initial values of debt to GDP.

Figure 3: Appropriate debt relief to restore x-sustainability, $x = 0.95$

[20] An equivalent way of interpreting these results is in terms of the probability of default for each initial debt to GDP ratio. For an initial ratio of 0.6, given the model and the political constraints the ex-ante probability of default is 0.05.
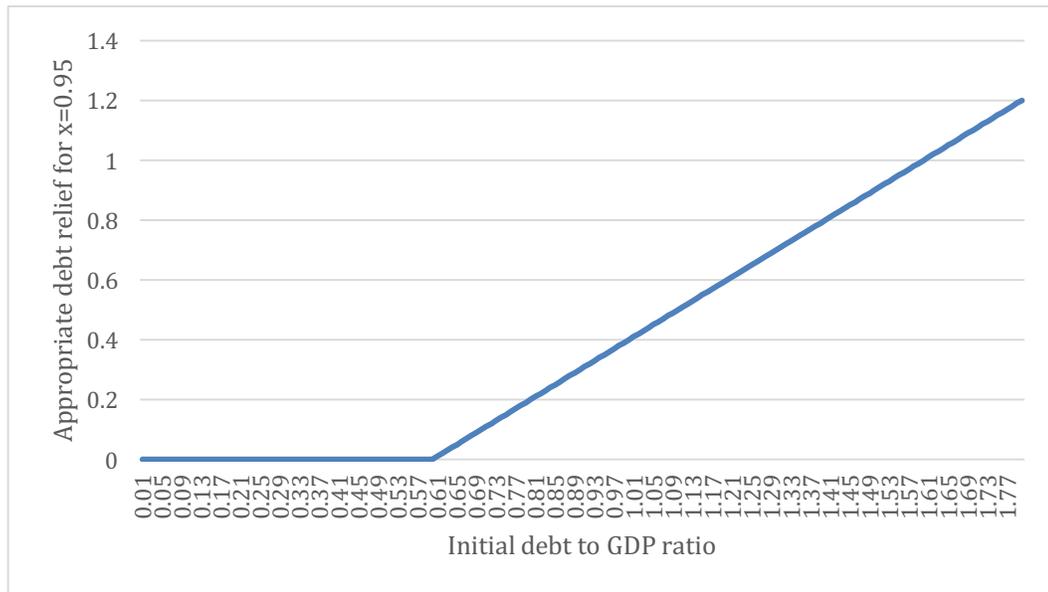
It is worth emphasizing once more that the results we showed in this section are not informative of any particular restructuring episode, because we make functional and distributional assumptions that do not correspond to any particular case. Instead, the whole point of the exercise was to illustrate the usage of the methodology. It must also be emphasized that in more complex setups the trajectories of feasible fixed points will not correspond to constant values. For instance, in a richer model the impact of fiscal policies could give rise to dynamic effects.[21]

6. Limitations and extensions

The methodology proposed in this paper for computing the size of debt relief that respects the restructuring principles will likely help practitioners and policy makers moving forward. The evidence on recent restructuring experiences shows that there

---

[21] Introducing non-linearities in the parameters that represent the fiscal multipliers, as those documented by Auerbach and Gorodnichenko (2012a, 2012b), Blanchard and Leigh (2013), and suggested by the analyses of Jayadev and Konczal (2010, 2015), would similarly give rise to richer dynamics.

is a demand for this technical contribution. Even though, at times, countries are explicit about the principles that should be respected in a restructuring process, the implementation of the actual proposal is not always aligned with those principles. The lack of a proper guide for codifying principles into an equivalent applicable version may explain why this occurs.

Defining the principles must always be the first step of a restructuring process. Those principles must encourage restructuring outcomes that are aligned with the objectives of sovereign debt restructuring, both in terms of efficiency and equity (see Guzman and Stiglitz, 2016a for an analysis of the objectives of sovereign debt restructuring). Those principles must also respect the possibility of the sovereign debtor effectively pursuing its development goals. The United Nations General Assembly has provided guidance on what principles should guide a restructuring process in its Resolution 69/319.

The illustration of our approach made simplifying assumptions in order to translate the restructuring principles into economic constraints. Matters are, of course, more complex in practice. The satisfaction of the principles could also entail distributional matters: for instance, the satisfaction of the principle of equitable treatment of creditors—another principle often sought in restructuring processes, and also adopted by the United Nations General Assembly Resolution 69/319— would raise definitional issues on what is equitable when the structure of creditors is heterogeneous. Equitable treatment does not imply equal treatment. For instance, official creditors that lend at lower interest rates could be given senior status at the moment of a restructuring (something that is an effective feature of debt workouts in practice). Other principles will imply other constraints.

Our paper also left other important themes aside. One aspect of public finance that we did not take into account is the possibility of financing through seigniorage, which would alter the relevant government's budget constraints. Another important

theme is the possibility that a government issues debt in multiple currencies, which is the most common behavior in practice. In that case, a proper analysis of the debt dynamics should take into account the possibility of exchange rate movements.

Finally, any sustainability exercise faces problems of consistency. When there is an equilibrium in which creditors lend to a government at a risk premium, the possibility of default is already contemplated. Therefore, there will be paths where default will have high probability in which decisions might be called 'sustainable' because of their consistency. We clarified that that is not the sense in which we use the term sustainability.[22]

7. Conclusions

The evidence we presented in this paper strongly suggests that sovereign debt restructuring processes are not being effective at providing the necessary debt relief to restore the conditions for economic recovery.

This paper contributed to the field of sovereign debt by providing a tool kit for computing the appropriate relief in a sovereign debt restructuring process, defined as the one that restores sustainability in a broad sense that permits the incorporation of other principles based constraints besides the government's intertemporal budget constraint. The approach thus offered a precise meaning of sustainability in a context of debt distress, and distinguished it from its standard usage in the empirical literature on fiscal sustainability.

We argued that the approach for testing the sustainability of fiscal policies is complementary of the tool kit we presented in this paper, as the two approaches

---

[22] The meaning of debt sustainability analysis itself is complex. The interest rate premium indicates that in some states of nature the debtor will not be able to pay its debts in full. A sustainability analysis that requires payment with larger probability than the one reflected in the default premium is inconsistent. In practice, these inconsistencies appear often. See Guzman and Heymann (2015) for an extended discussion.

focus on different phenomena. While the ad hoc or model-based sustainability approach identifies whether the continuation of a fiscal policy path would be consistent with the the satisfaction of the government's intertemporal budget constraint, appropriately defined, we focus on situations of distress where the continuation of past policies is obviously unfeasible, and analyse what size of debt write-down would restore the conditions for *feasible* fiscal policies that would satisfy the government's intertemporal budget constraint with 'high probability.'

The implementation of the methodology we propose requires a recognition of the endogeneities that govern the relationships between macroeconomic performance, debt, and fiscal policies. In this sense, the parallelism of the sustainability concept used in environmental economics with the sustainability concept in public finance is misleading. Take, for example, any problem of the commons, such as overfishing. While a reduction in fishing would increase the growth rate of the stock of fish, a contractionary fiscal policy will not necessarily increase the growth rate of output or of fiscal revenues—and most likely will actually reduce it.

The tool kit presented in this paper could help practitioners and policy makers designing a debt restructuring proposal, and could be the basis of the codification of the principle of sustainability adopted by Resolution 69/319 of the United Nations General Assembly for improving sovereign debt restructuring practices. The application of our methodology must be accompanied by the use of economic models that describe the economy under analysis. This stage of the exercise will of course be idyiosincratic to each country in distress in its particular circumstances.

Finally, we note that our approach is flexible when it comes to the definition of the principles based constraints. For instance, the principles on which the IMF could base its debt sustainability analyses could differ from the ones endorsed by the United Nations General Assembly, which would simply imply a difference in the

definition of the relevant constraints for the purposes of applying the methodology described in this paper.

References

Abiad, Abdul, and Jonathan Ostry (2005) Primary Surpluses and Sustainable Debt Levels in Emerging Market Countries, *International Monetary Fund* Policy Discussion Paper 05/6.

Aguiar, Mark, and Gita Gopinath (2006) Defaultable debt, interest rates and the current account, *Journal of International Economics*, 69, 64–83.

Auerbach, Alan, and Yuriy Gorodnichenko (2012a) Fiscal multipliers in recession and expansion, in Alberto Alesina and Francesco Giavazzi (eds.) *Fiscal Policy after the Financial Crisis*, University of Chicago Press, Chicago, IL.

Auerbach, Alan, and Yuriy Gorodnichenko (2012b) Measuring the output responses to fiscal policy, *American Economic Journal: Economic Policy*, 4, 1–27.

Beers, David T., and Jean-Sébastien Nadeau (2014) Introducing a new database of sovereign defaults, Bank of Canada Technical Report. Available at SSRN 2609162.

Benjamin, David, and Mark Wright (2009). Recovery Before Redemption: A Theory of Delays in Sovereign Debt Renegotiations. Available at http://www.acsu.buffalo.edu/~db64/2013-11-11%20Econometrica_1.pdf

Blanchard, Olivier and Daniel Leigh (2013) Growth forecast errors and fiscal multipliers, IMF Working Paper, Research Department, WP/13/1.

Blankenburg, Stephanie and Richard Kozul-Wright (2016) Sovereign debt restructurings in the contemporary global economy: the UNCTAD approach, *Yale Journal of International Law*, forthcoming.

Bohn, Henning (1995) The sustainability of budget deficits in a stochastic economy, *Journal of Money, Credit and Banking*, 27, 257–71.

Bohn, Henning (2007) Are stationarity and cointegration restrictions really necessary for the intertemporal budget constraint?" *Journal of Monetary Economics*, 54, 1837–47.

Bohn, Henning (2008) The sustainability of fiscal policy in the United States, in Reinhard Neck and Jan-Egbert Sturm (eds.) *Sustainability of Public Debt*, MIT Press, Cambridge, MA.

Bohoslavsky, Juan Pablo and Matthias Goldmann (2016) An incremental approach to sovereign debt restructuring: sovereign debt sustainability as a principle of public international law, *Yale Journal of International Law*, 41, 13–43.

Brooks, Skylar, Martin Guzman, Domenico Lombardi, and Joseph E. Stiglitz (2015) Identifying and resolving inter-creditor and debtor-creditor equity issues in sovereign debt restructuring, CIGI Policy Brief No. 53 (January).

Celasun, Oya, Xavier Debrun, and Jonathan Ostry (2006) Primary Surplus Behavior and Risks to Fiscal Sustainability in Emerging Market Countries: A "Fan-Chart" Approach, *International Monetary Fund* Working Paper 06/67.

Collard, Fabrice, Michel Antoine Habib, and Jean-Charles Rochet (2016) The reluctant defaulter: a tale of high government debt.

Consiglio, Andrea, and Stavros A. Zenios (2015) Risk management optimization for sovereign debt restructuring, *Journal of Globalization and Development*, 6, 181–213.

Cruces, Juan José, and Eduardo Levy Yeyati (2016) What the world can learn from Argentina's holdout saga, available at http://voxeu.org/article/what-world-can-learn-argentinas-holdout-saga.

Cruces, Juan José, and Christoph Trebesch (2013) Sovereign defaults: the price of haircuts, *American Economic Journal: Macroeconomics*, 5, 85–117.

D'Erasmo, Pablo, and Enrique G. Mendoza (2016) Distributional incentives in an equilibrium model of domestic sovereign default, *Journal of the European Economic Association*, 14, 7–44.

D'Erasmo, Pablo, Enrique Mendoza, and Jing Zhang (2016) What is a sustainable public debt? *Handbook of Macroeconomics*, 2493-597.

Eaton, Jonathan, and Raquel Fernandez (1995) Sovereign debt, *Handbook of International Economics*, 3, 2031–77.

Eaton, Jonathan, and Mark Gersovitz (1981) Debt with potential repudiation: theoretical and empirical analysis, *The Review of Economic Studies*, 48, 289–309.

Eaton, Jonathan, Mark Gersovitz, and Joseph E. Stiglitz (1986) The pure theory of country risk, *European Economic Review*, 30, 481–513.

Edwards, Sebastian (2015) Sovereign default, debt restructuring, and recovery rates: was the Argentinean 'haircut' excessive? *Open Economies Review*, 26, 839–67.

Galofré-Vilà, Gregori, Martin McKee, Christopher M. Meissner, and David Stuckler (2016) The Economic Consequences of the 1953 London Debt Agreement. *National Bureau of Economic Research* Working Paper No. 22557.

Gelpern, Anna (2016) Sovereign debt: now what?" *Yale Journal of International Law*, 41, 45–95.

Gelpern, Anna, Ben Heller, and Brad Setser (2016) Count the limbs: designing robust aggregation clauses in sovereign bonds, in Martin Guzman, José Antonio Ocampo, and Joseph E. Stiglitz (eds.) *Too Little, Too Late: The Quest to Resolve Sovereign Debt Crises*, chapter 6, Columbia University Press, New York, NY.

Ghosal, Sayantan, Marcus Miller, and Kannika Thampanishvong (2016) Waiting for a haircut? A bargaining perspective on sovereign debt restructuring, *CEPR Discussion Papers* 11710.

Goldmann, Matthias (2016) Putting your faith in good faith: a principled strategy for smoother sovereign debt workouts, *Yale Journal of International Law*, forthcoming.

Grossman, Herschel I., and John B. Van Huyck (1988) Sovereign debt as a contingent claim: excusable default, repudiation, and reputation, *The American Economic Review*, 78, 1088–97.

Guzman, Martin (2016a) An analysis of argentina's 2001 default resolution, CIGI Paper No. 110.

Guzman, Martin, and Daniel Heymann (2015) The IMF debt sustainability analysis: issues and problems, *Journal of Globalization and Development*, 6, 387–404.

Guzman, Martin and Joseph E. Stiglitz (2016a) Creating a framework for sovereign debt restructuring that work, in Martin Guzman, José Antonio Ocampo, and Joseph E. Stiglitz (eds.) *Too Little, Too Late: The Quest to Resolve Sovereign Debt Crises*, chapter 1, Columbia University Press, New York, NY.

Guzman, Martin and Joseph E. Stiglitz (2016b) A soft law mechanism for sovereign debt restructuring based on the UN Principles, *International Policy Analysis*, forthcoming.

Howse, Robert (2016) Toward a framework for sovereign debt restructuring: what can public international law contribute, in Martin Guzman, José Antonio Ocampo, and Joseph E. Stiglitz (eds.) *Too Little, Too Late: The Quest to Resolve Sovereign Debt Crises*, chapter 14, Columbia University Press, New York, NY.

ICMA (2014) Standard collective action and pari passu clauses for the terms and conditions of sovereign notes.

IMF (2013) Staff Guidance Note for Public Debt Sustainability Analysis in Market-Access Countries, Prepared by the Strategy, Policy, and Review Department in collaboration with the Fiscal Affairs Department, approved by Siddharth Tiwari, available at www.imf.org/external/np/ pp/eng/2013/050913.pdf.

IMF (2016) Strengthening the Contractual Framework to Address Collective Action Problems in Sovereign Debt Restructuring (October).

Jayadev, Arjun and Mike Konczal (2010) The boom not the slump: the right time for austerity, University of Massachusetts Boston, ScholarWorks at UMass Boston, Economics Faculty Publication Series.

Jayadev, Arjun, and Mike Koncza (2015) Searching for expansionary austerity, University of Massachusetts Boston Working Paper.

Kolb, Robert (2006) Principles as sources of international law (with special reference to good faith), *Netherlands International Law Review*, 53, 1–36.

Levy Yeyati, Eduardo, and Ugo Panizza (2011) The elusive costs of sovereign defaults, *Journal of Development Economics*, 94, 95–105.

Li, Yuefen (2015) The long march towards an international legal framework for sovereign debt restructuring, *Journal of Globalization and Development*, 6, 329–41.

Lienau, Odette (2016) Legitimacy and impartiality as basic principles for sovereign debt restructuring, *The Yale Journal of International Law*, 41(2), 97-116.

Mendoza, Enrique G., and Jonathan D. Ostry (2008) International evidence on fiscal solvency: is fiscal policy 'responsible'? *Journal of Monetary Economics*, 55, 1081–93.

Polito, Vito, and Mike Wickens (2012) A model-based indicator of the fiscal stance. *European Economic Review* 56(3): 526-51.

Raffer, Kunibert (1990) Applying chapter 9 insolvency to international debts: an economically efficient solution with a human face. *World Development* 18, 2: 301-311.

Reinhart, Carmen M., and Christoph Trebesch (2016) Sovereign debt relief and its aftermath, *Journal of the European Economic Association*, 14, 215–51.

Schlegl, Matthias, Christoph Trebesch, and Mark Wright (2017) The seniority structure of sovereign debt. Presented at DebtCon2 in Geneva Graduate Institute, October 6.

Stiglitz, Joseph (2016) *The Euro: How a Common Currency Threatens the Future of Europe*. WW Norton & Company, New York, NY.