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Writing-Down Debt with Heterogeneous Creditors: Lock Laws and Late Swaps

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Abstract: The presence of "holdouts" in recent sovereign debt swaps poses a challenge to bargaining models which assume all creditors to be homogeneous. We modify the Rubinstein "alternating offers" framework so as to accommodate exogenous creditor heterogeneity – specifically holdouts more patient than other bondholders. The "second best" equilibrium derived is an initial offer and an associated "lock-law" sufficient to tempt impatient creditors into a prompt bond exchange. This is followed by a delayed, but more generous, swap with the patient creditors, timed to take place when the lock-law expires. In practice, however, the presence of holdouts may be *endogenous*: they may be late-comers who buy distressed bonds with a view to litigating for the full face value plus their costs of waiting. Provisions for protecting other bond holders from the negative externality caused by such tactics are briefly discussed. However, where the judge has mandated good faith bargaining with holdout creditors, the bargaining outcome we derive may be useful to indicate a basis for compromise.

Keywords: bargaining; delay; holdouts; lock law; second-best; sovereign debt restructuring.

JEL Classifications: C70; C78; F34; K00.

1 Introduction

In the current paradigm, sovereign debt restructuring – by debt swaps or otherwise – is treated as an integral part of the risk-sharing involved in sovereign lending, Obstfeld and Rogoff (1996, chapter 6).[1] For domestic "junk" bonds, the risk-spread over Treasuries is expected to cover the potential effects of restructuring

1 The "insurance" that is extended to the debtor in this way will, however, be limited for familiar reasons – moral hazard and adverse selection.

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or liquidation under a bankruptcy code administered by a judge. So, by analogy, the sovereign debt write-downs involved in a crisis should, in principle, be balanced by risk-premia paid in non-crisis states of the world.

The writing-down of sovereign debt obligations is much more problematic, however, as they have to be restructured by negotiation between the sovereign and its creditors.[2] In their classic paper on "debt-recontracting," Bulow and Rogoff (1989) proposed an elegant solution: that the Rubinstein alternating-offers model be used to characterize these negotiations and to predict their outcome. In this framework, the settlement essentially depends on the relative impatience of debtor and creditor (i.e. how their subjective rates of discount compare); and, with complete information, it is achieved without delay.

The presence of "holdouts" in recent debt swaps, i.e. creditors who do not accept a swap which has been taken up by other "exchange" bond holders, implies, however, that creditors are *heterogeneous*. Can the alternating-offers bargaining approach still be used? We show that it can be adapted appropriately where such heterogeneity is exogenous – when, for example, the population of creditors, independently of the crisis, happens to be divided between some who are patient and others who are impatient. Specifically, we show that, where the type of individual creditors is not known to the debtor, there is a role for *more than one debt swap*, each tailored to attract a different type, with *"lock laws"* put in place to ensure that the swaps get taken up by the creditors for whom they are intended.

These lock laws correspond to the rights upon future offers (RUFO) clauses used in practice, which (as the name implies) ensure that creditors who have agreed to an earlier swap can, for a determined period, participate in later swaps if they so desire.[3] In the two-creditor case of Section 2, the outcome derived is an initial offer which, together with the RUFO clause, is sufficient to tempt impatient creditors (the exchange bondholders) into a prompt bond swap. This is followed by a delayed – but more generous – swap with the patient creditors (the holdouts), timed to take place when the lock law expires. The waiting-time involved before the second swap represents a loss in bargaining efficiency; but the delay functions as a costly signal to identify the more patient creditors.

2 For a comparison of recovery rates on distressed debt as between corporate and sovereigns see Singh (2003); in addition Trebesch et al. (2012) provide a comprehensive survey of sovereign debt restructurings up to 2010.

3 For example, in the initial debt swap of 2005, where only about 70% of the bonds were exchanged, the Argentina sovereign added a RUFO clause (ratified in Parliament) to assure those in the bond exchange that they would have access any improved offers made over the following decade. Further details on the Argentine case are to be found in Appendix 2.

The theoretical question we address is whether such clauses can lead to second-best or "constrained efficient" outcomes in the presence of creditor heterogeneity.[4] We find that there are, in fact, multiple equilibria; but a second-best "benchmark" can be derived. A simple calibration of such a benchmark settlement is provided to illustrate how both the *shares* of creditors and debtor and the *duration* of the RUFO clause change as the degree of creditor heterogeneity increases – specifically as the holdouts become more patient. (The welfare losses if the debtor and the holdout are unable to coordinate on the second-best benchmark also increase with the patience of the holdout.)

An important caveat is considered in Section 3, namely that the presence of holdouts may be induced by the crisis: they may be late-comers who buy distressed bonds with a view to litigating for recovery of the full face value. Such *endogenous* holdouts may include so-called "vulture funds" who aim to recover all their waiting costs, including those of delay and of litigation; and their activities can seriously disrupt the process of debt restructuring. We discuss *ex ante* provisions for protecting other bond-holders from the negative externality caused by vultures. These include adding aggregation clauses to the collective action clauses (CACs) now included in sovereign debt contracts; finding substitutes for US-law bonds; regional regulation of secondary debt markets; creating some form of SDRM; and promoting "soft law."

In conclusion, however, we argue that the second-best bargaining scenario we outline may be useful as a basis for finding a compromise with holdouts *ex post*. The recovery rate so derived will, of course, fall far short of the punishing claims typically pursued by "vulture funds." But it may be useful for an adjudicator charged with finding a "just accord."

2 Negotiating a Write-Down with Heterogeneous Creditors

2.1 Exogenous Creditor Heterogeneity

To characterize debt renegotiation, Bulow and Rogoff (1989) adopt the "alternating offers" approach of Ariel Rubinstein, where two parties bargaining over fractions of a pie in principle take it in turns to propose how it be shared; and it is

4 The first best would require – contrary to what we assume – that the debtor knows the type of each creditor.

the relative impatience of debtor and creditor to achieve a settlement that determines the outcome. (Broadly speaking, the pie could be thought of as the face value of the debt to be restructured, with the fraction retained by the sovereign debtor indicating the "write-down" involved in restructuring.)[5]

In the light of "holdouts" who decline to enter the initial swap, some modification of this bilateral approach is called for. Here we show how the alternating offers approach may be extended to accommodate creditor heterogeneity.

2.1.1 Alternating Offers – with Swaps at Two Dates

For simplicity, consider the case of a sovereign debtor negotiating with two creditors. The debtor, denoted by D, has a discount rate $\delta_D>0$ and associated discount factor $e^{-\delta_D \Delta t}$, where Δt (which can be assumed to be negligibly small) is the minimal time interval between two successive rounds of bargaining.[6]

The creditors, denoted by X for the Exchange bond holder, and by H for the Holdout, are distinguished by their discount rates $0<\delta_H<\delta_X$ (with associated discount factors $e^{-\delta_H \Delta t}>e^{-\delta_X \Delta t}$ We assume that each creditor knows its own discount rate; and the sovereign debtor is also aware of the different discount rates, but does not know who is which.

At each t, the debtor and the two creditors must decide whether or not to settle. If the debtor and *one of the two creditors*[7] agree to settle, then bargaining proceeds according to Rubinstein alternating offers bargaining game; once an agreement has been reached, the creditor exits the process with a payment equal to the settlement offer.

A lock law (the RUFO clause) effectively bans any improved offer to the other creditor for T periods (to be derived as part of the equilibrium calculations). At T, *the remaining creditor* and the debtor must choose whether or not to settle. Once they do so, bargaining proceeds according to Rubinstein alternating offers bargaining game; once an agreement has been reached, the creditor exits the process with a payment equal to the settlement offer.

5 This is the bilateral approach applied by the current authors to analyze the Argentine debt swap of 2005 (in Dhillon et al. 2006).

6 All our results are stated for the case when Δt is negligibly small at the continuous time limit as $\Delta t \to 0$.

7 If both creditors agree to settle, one of the two is chosen, with equal probability, to bargain with the debtor.

We focus on perfect Bayesian equilibria[8] where strategies and beliefs are configured so that:

(i) the debtor and the exchange bond holder choose to settle immediately and agree to a split;
(ii) after the specified period of waiting time T implied by the RUFO clause elapses, the debtor and the holdout creditor choose to settle immediately and agree to a split;
(iii) the beliefs are such that debtor believes with probability one that (a) the creditor who chooses to settle at $t=0$ is the exchange bond holder and (b) the creditor who chooses to settle at $t=T$ is holdout. (Note that the equilibrium concept requires consistency between beliefs and actions so that we need to check that appropriate incentive constraints are satisfied for both creditor types.)

For convenience the bargaining surplus (the potential gains from restoring the debtor's access to capital markets) is taken to be constant and normalized to one.

A welcome simplification is that it is possible to solve for the shares of the two creditor types separately from the deriving the *waiting time* implied by the incentive constraints. To derive the shares, note that after the period $T>0$ waiting time, there is only one creditor present so, given the initial offer s_X which has been accepted by the exchange bondholder, the bargaining surplus remaining is $1-s_X$.

Consider the complete information bargaining game between the debtor and the holdout at time T: at the continuous time limit, there will be immediate agreement where the share of the Holdout is

$$s_H = \frac{\delta_D}{\delta_D + \delta_H}(1 - s_X)$$

Likewise, at $t=0$, in anticipation that s_H will be committed to the Holdout creditor, the offer made by the debtor to the Exchange bondholder (and immediately agreed to) is

$$s_X = \frac{\delta_D}{\delta_D + \delta_X}(1 - s_H).$$

8 In Appendix 1 (below) we show that there is delay occurs in all the perfet Bayesian equilibira of the game and the minimum delay compatible with a pure strategy Bayesian equilibrium is the second-best benchmark derived below. In a companion paper, "Debt Restructuring with Heterogeneous Creditors: Delay and Endogenous Entry," we consider the general case of T creditor types and show all perfect Bayesian equilibria of the debt restructuring game involve delay and focus on a formal analysis of endogenous entry.

So the shares may be derived as depending simply on the discount rates:

$$s_X = \frac{\delta_D \delta_H}{\delta_D(\delta_X + \delta_H) + \delta_X \delta_H},$$
$$s_H = \frac{\delta_D \delta_X}{\delta_D(\delta_X + \delta_H) + \delta_X \delta_H}.$$

In order to calculate the waiting time, we need to consider the relevant incentive compatibility conditions, namely:

$$s_H e^{-\delta_X \hat{T}} \leq s_X; \quad s_H e^{-\delta_H \hat{T}} \geq s_X$$

where s_X and s_H, δ_X and δ_H are defined as above and $\hat{T}$ is the waiting time (delay) incorporated in the (constrained) efficient RUFO clause.

The first inequality implies that the offer to the Holdout, discounted back at the discount rate of Exchange holder, leaves the latter content with early settlement, with no incentive to join the Holdout. The second inequality implies that the Holdout creditor has no incentive to deviate and join the Exchange bondholder to settle early.

The key feature of the two-stage procedure is that the Holdout has to wait, being induced to do so by an offer which will be better than that accepted by the impatient Exchange bondholder who settles early, i.e. $s_H > s_X$.

Why should the Exchange bond holder accept an initial offer from the debtor, when the latter is free to settle later with the Holdout? Why not delay acceptance to get a higher offer? This is where the mechanism of the RUFO clause[9] plays an important role. Such a clause, a "lock-law" which prevents the debtor from giving a more attractive offer exclusively to the holdouts for a fixed period, reassures the creditor who settles early; and effectively allows the more patient creditor to give a costly signal of his/her type.

Ideally, the expiry of the clause defines the shortest period of waiting acceptable to the more patient creditor, but not the impatient type. It is implicitly assumed that the swap will remain open for those who have not settled – either (in line with RUFO) to accept the terms first agreed or to negotiate better terms when the RUFO expires.

Evidently there are multiple equilibria, in that the incentive compatibility conditions define a range but not a unique period of delay. What is this range? Let $\tilde{T} > 0$ be the solution to $s_H e^{-\delta_H T} = s_X$; and let $\hat{T}$ be the solution to the equation

9 The RUFO clause is a form of most favored creditor clause indicating that, over a specified horizon, any improved offer made to the holdouts must be made available to the exchange bondholders as well.

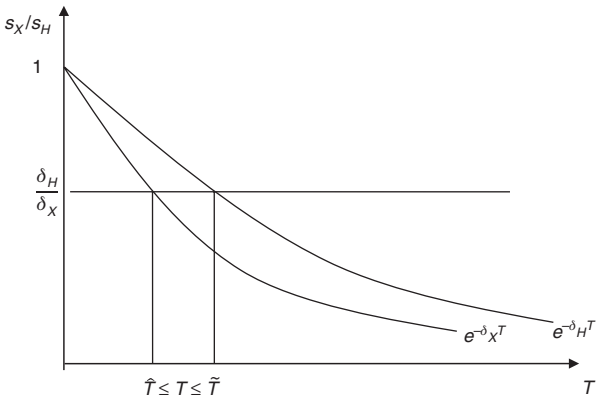

Figure 1: Creditor shares and the waiting time.

$s_H e^{-\delta_X T} = s_X$. Then, in equilibrium, waiting time $T \in [\hat{T}, \tilde{T}]$ where (i) $\hat{T}$ is the earliest point in time at which a second-offer will be made to the holdout and (ii) $\tilde{T}$ is the maximum time the holdout is willing to wait for an offer by the debtor. Taking the earliest waiting time as *the second-best benchmark*, one can treat greater delay, (where agreement is reached at some $T > \hat{T}$, $T \leq \tilde{T}$), as a form of coordination failure between the debtor and the holdout.[10]

We may depict all the equilibria in Figure 1 where the ratio $\frac{s_H}{s_X}$ is measured on the y-axis and time on the x-axis; and the discount factors of the two creditors show how much more patient is the holdout.

Note first that the discount factors immediately imply the relative shares shown by the horizontal line where $\frac{s_H}{s_X} = \frac{\delta_X}{\delta_H}$, i.e. the lower the discount rate of the holdout the higher its share.

Note second that $\hat{T}$, the constrained-efficient RUFO clause, is the point at which the Exchange bond-holder's incentive constraint is satisfied as an equality; while $\tilde{T}$ is the point at which the Holdout creditor's incentive constraint is satisfied as an equality. So, in equilibrium, delay can be for any length of time $T \in [\hat{T}, \tilde{T}]$.

Clearly creditor heterogeneity is crucial for obtaining equilibrium delay in our model: if both creditors are identical, there will be no delay in the continuous time limit. This can be seen in the above diagram; if $\delta_H = \delta_X$ so $\frac{s_H}{s_X} = 1$ then the two

10 There are other perfect Bayesian equilibria which involve coordination failure between the debtor and both the exchange bondholder and the holdout creditor. These are described in Appendix 1.

exponential curves coincide and intersect the line depicting $\frac{s_H}{s_X}$ at 1, so there is no delay.

Observe that as δ_H becomes smaller (so that the holdout creditor is more patient), the curve depicting $e^{-\delta_H T}$ swivels anti-clockwise from 1 on the y-axis; and the line showing the relative shares moves down. Therefore, $\tilde{T}$ is increasing in δ_H: i.e. the more patient is the Holdout creditor, the longer is the delay associated with any equilibrium of the debt restructuring game.

Although the model is stated for the case with two creditors, this analysis can be extended to cover the case where there are many creditors but only two types (distinguished by different discount factors and/or waiting costs). However, the debtor, who does not know which creditor is of which type, is assumed to know the overall distribution of creditors over the two types.[11] The simple model studied here, then, corresponds to the case where the proportion of creditors of each type is one half each and the debtor bargains with a representative creditor from each type.[12]

2.2 Calibration

Next, we provide a simple calibration to quantify some of the comparative statics described above. Given that the real interest rate of much developing country sovereign debt is 5%, we set the discount rate of the debtor at 0.05 and we take this to characterize the Exchange bondholder too, i.e. δ_D=0.05=δ_X.

As a benchmark, let the Holdout be equally impatient, so δ_H=0.05=δ_X. In this case, at any perfect Bayesian equilibrium, agreement occurs at t=0 and $s_X = s_H = \frac{1}{3}$ where s_D=0.5 denotes the debtor's share.

We vary the discount rate of the Holdout creditor and, in the Table 1 below, report the second-best delay $\hat{T}$, the maximum delay $\tilde{T}$, the share of the Exchange bondholder S_X, the share of the Holdout S_H as well as the share of the debtor S_D.

These results are illustrated in Figure 2 with the debtor's share measured on the vertical axis, Exchange bondholder's to the right and that of the Holdout to the left.

The points all lie on a simplex whose corners indicate outcomes most favorable to each of the participants in turn. The outcome with no creditor heterogeneity is shown in the middle of the simplex with the label 0 to indicate zero delay.

11 For the purpose of discussion, we leave on one side the role of third parties, like the IMF.

12 The assumed proportion of creditors of each type need not be a half. It can be shown that reducing the proportion of holdouts will reduce their shares; but not the delay.

Table 1: Calibration of the benchmark waiting time and creditor shares.

	$\hat{T}$	$\tilde{T}$	S_H	S_X	S_D
δ_H=0.05	0 year	0 year	0.33	0.33	0.33
δ_H=0.045	2 years	2.5 years	0.36	0.32	0.32
δ_H=0.04	4.5 years	5.5 years	0.38	0.31	0.31
δ_H=0.035	7 years	10 years	0.42	0.29	0.29
δ_H=0.03	10 years	17 years	0.45	0.275	0.275
δ_H=0.025	14 years	28 years	0.5	0.25	0.25
δ_H=0.015	24 years	80 years	0.625	0.1875	0.1875
δ_H=0.005	46 years	460 years	0.8333	0.08333	0.08333

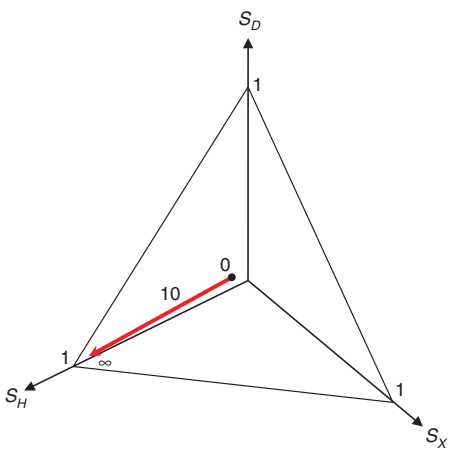

Figure 2: Debtor and creditor shares for increasingly patient holdout.

The effect of increased patience on the part of the Holdout is shown by the arrow heading towards the lower left corner, with the second-best delay times in years indicated by the numbers 0, 10, …, ∞. Evidently, the Holdout gains at the expense of both the Exchange bondholder and Debtor as heterogeneity is increased; and, in the limit, the Holdout takes all.

Numerically, we see from the Table 1 that as δ_H drops below 0.05 to 0.045, for example, the shares of the Exchange bondholder and debtor both fall to 0.32; the Holdout gets 36% of the bargaining surplus and agreement with the Debtor occurs after a delay of 2 years in the "second-best" setting. The "maximum" equilibrium delay resulting from coordination failure between the debtor and the Holdout creditor over agreeing when to settle in this case, as shown in the Table 1, is 2.5 years; as the gap between the two is not too large, the failure to coordinate on the second best will result in small welfare losses.

But as the Holdout creditor becomes more patient relative to the Exchange bondholder and the debtor, their shares drop monotonically and agreement between the debtor and the Holdout creditor occurs after a longer period of second-best delay. As the gap between the latter and the maximum delay also increases, moreover, failure to coordinate on second-best could lead to larger welfare losses.

To generate a second-best delay of 10 years (which corresponds to the lock law passed by the Argentine parliament in 2005 when the first batch of exchange holders settled), we would need to assume δ_H=0.03. As δ_H drops towards zero, the second-best delay increases exponentially (as does the gap between it and maximum equilibrium delay) and the share of the Exchange bondholder and the Debtor falls towards zero with share of the Holdout increasing towards one.

Two key insights emerge from the calibration exercise. First, the Holdout creditor gains at the expense of both other participants.[13] Second, the more patient the Holdout, the greater are the *signaling costs* of handling creditor heterogeneity, i.e. the delay before the second swap. (The gap between the second best and the maximum delay also increases, indicating greater welfare losses from failing to coordinate on the second-best benchmark.)

3 An Important Caveat

3.1 When Heterogeneity is Endogenous

So far the heterogeneous composition of the creditor group has been taken as exogenous: there just happen to be these differences in discount rates between holdouts and the rest. Taking these differences as predetermined, we have looked for the constrained-efficient outcome.

But what if the participation of the holdouts is *endogenous*? In the context of the simple model outlined above, suppose, to begin with, that there are two Exchange bondholders. A straightforward implication of the bargaining model presented above is that there will be immediate settlement and both Exchange bondholders will obtain s_X. Now, suppose a more patient fund manager approaches one of the Exchange bondholders (the debtor does not know which one) and offers $s_X+\varepsilon$ (where $\varepsilon>0$ can be negligibly small) before bargaining begins. Then, the Exchange bondholder will sell its claim to the fund manager who now

13 This finding seems consistent with Judge Griesa seeing the value of holdouts for the maintenance of creditor rights in general, as discussed in Miller and Thomas (2007); but it offers small comfort to the Exchange bondholder, who loses out.

takes its place in the bargaining game as a Holdout creditor. As the calibration exercise shows, with the presence of the Holdout, there is constrained-efficient delay $\hat{T}$ and a fall in the shares of both the other parties.

In bargaining where patience is power, endogenous entry of patient creditors generates negative externalities. So, in the bargaining situation we describe, there may be a good case for dissuading late entry by those seeking to profit from what is a zero-sum game by causing delay.

Note, however, that those late entrants commonly referred to as "vulture funds" appear to operate with a different business model. According to Martin Kanenguiser (2014, chap. 7: p. 130), in a recent account mainly critical of the Argentine government:

> *The vulture funds, like many other investor funds, bought Argentine bonds a little before and a little after the default at a very low price. But, unlike the other investors who buy these bonds cheap to make some profit when the country does better, the mission of the vultures is to litigate so as to recover 100% of the value of the debt. For this reason they focus on maintaining a team of expert lawyers rather than economists and prefer to wait and collect rather than on negotiating a write-down.*

How appropriate this description may be can be checked by examining the past activities of these funds. The account given in chapter 7 of Kanenguiser's book (of a "business model" of buy and collect by determined litigation) is plausible for least for two of the principal funds involved. That patient holdouts will indeed wait for full recovery (plus legal fees and accrued interest) is also documented in Trebesch et al. (2012) and Singh (2003).[14]

If the motivation and methods of these funds is as described – to buy bonds in order to collect full repayment at whatever cost in terms of delaying the restructuring and to pursue this objective with exigent and expensive litigation – this implies far greater negative externalities; and a strong case for dissuading them from buying distressed bonds in the first place. The principal device to limit the negative externalities a vulture fund may impose is to enable the other creditors to outvote them on proposed restructuring – and to eliminate the gain they would otherwise make from delay. This and other measures are discussed below.

3.2 Changing the Rules to Block So-called "Vulture Funds"

The principal response by the key institutions directly involved has been to enhance the operation of the CACs now commonly included in sovereign debt

14 Litigation continues to be high and increasing, though the "principal funds" referred to above do change names over time [see the annex of Singh (2003) on recovery values].

contracts. To block the strategy of vulture funds who (to avoid being "crammed down" by others) acquire super-majority holdings of individual series of bond issues, *"aggregation" clauses* have been proposed which allow a super majority of *all bond holders* to over-rule intransigent holdouts in accepting a restructuring. A boiler-plate for CACs modified in this respect has been prepared by ICMA, endorsed by the International Monetary Fund (IMF), see IMF (2014), and has already been included in new bond issues by significant sovereign borrowers such as Mexico.

Another response might be the use of *substitutes for US-law bonds* now subject to the precedent of Judge Griesa's recent *pari passu* ruling. These could be dollar bonds issued in other familiar jurisdictions, such as London or Paris. Should the UK or France be reluctant to challenge the US ruling in this way, however, new entrants like Shanghai may be ready to do so (as J. Stiglitz has suggested). It might also involve the issue of dollar bonds under local law (as proposed by S. Soler).

Various further initiatives may be considered. The first of these is *institutional change at a regional level* – e.g. European Treaty changes which could "immunize within the confines of the Eurozone the assets of a Eurozone country receiving ESM bailout assistance from attachment by litigious holdout creditors," as proposed by Buchheit et al. (2013) and discussed in Miller and Thomas (2013). The second is to revive the idea of a *Sovereign Debt Restructuring Mechanism* at a global level, an initiative being explored by the UN. Finally there is the development of "*soft law*" where anti-social practices are branded as such, with attendant reputational costs – and possible reverse discrimination.

4 Conclusion

In the Rubinstein model of bargaining, only relative patience matters in dividing up the bargaining surplus between the debtor and its creditors: yet settlement is reached without delay. With heterogeneous creditors and asymmetric information, however, we find that delay is necessary for the more patient creditors to signal their claim to a greater share: and we indicate how the extra share and the length of delay may be assessed at the time of the first swap.

We conclude, however, by indicating how the bargaining scenario we have outlined might also be useful as a basis for finding an *ex post* compromise with holdouts. Two principles would guide such a compromise. First that *holdouts be given compensation for the extra delay they have experienced*, with the compensation calculated at their own subjective rate of discount (i.e. their cost of waiting). Second that this compensation be added to the settlement made with

the exchange bond holders *at the time of the first swap*, with appropriate up-rating to cover the fall in the value of the dollar since then.

Were such principles were to be applied in the case of Argentina, currently in dispute, the resulting settlement would surely be a great deal more than the sovereign debtor has said it is willing to pay; but a good deal less than what the vulture funds have been claiming. This is because it replicates the outcome of bargaining procedures designed to reward patience but not aggressive legal tactics. This may be useful for an adjudicator charged with finding a "just accord."[15]

In future research, we plan to extend the bargaining model studied here to the case where the bargaining surplus itself evolves over time; and to a more general distribution of creditor types.

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Appendix 1 Alternating Offers: Technical Detail

In Appendix 1, as well as showing that any perfect Bayesian equilibrium of the debt restructuring game involves delay, we point out the existence of other perfect Bayesian equilibria, we provide additional technical detail to some of the comparative statics reported in the main text, with Osborne and Rubinstein (1994) as recommended background reference.

With creditor heterogeneity, any perfect Bayesian equilibrium must involve delay and the minimum delay compatible with a pure strategy Bayesian equilibrium is the one studied in the main text

We show that any perfect Bayesian equilibrium must involve delay. At any perfect Bayesian equilibrium with immediate agreement, both the exchange bond holder and the holdout creditor must choose to settle at $t=0$ with probability one (although only one of the two is selected to bargain with the debtor) and in the

15 This is what they want, according to Robert Shapiro (a spokesman for creditors still holding out): "For more than a decade we have been seeking what any other creditor seeks after sovereign default: the chance to negotiate a just accord." Kanenguiser (2014: p. 150).

alternating offers bargaining subgame must immediately agree to the offer made by the debtor. Let S denote the offer made to the exchange bondholder in the alternating offers bargaining subgame with immediate agreement. As both creditor types must accept the offer immediately, the offer made must make the holdout creditor indifferent between accepting and rejecting and therefore, as $\Delta t \to 0$, it follows that $S \to s_{\max} = \frac{\delta_D \delta_H}{\delta_D(\delta_H + \delta_H) + \delta_H \delta_H} = \frac{\delta_D}{2\delta_D + \delta_H}$. Therefore, for every $\epsilon' > 0$, there exists $\epsilon_1 > 0$ such that when the gap between any two rounds of bargaining is Δt, $0 < \Delta t < \epsilon_1$, $S \geq s_{\max} - \epsilon'$. Let s equal the offer made to the exchange bondholder by the debtor when the debtor believes with probability one that the creditor he faces is the exchange bondholder in the bargaining subgame. At the continuous time limit as $\Delta t \to 0$, by construction, s_X (expression derived in the main text) is the minimum offer that the exchange bondholder is willing to accept so that $s \to s_X$ as $\Delta t \to 0$ and for every $\epsilon'' > 0$, there exists $\epsilon_2 > 0$ such that when $0 < \Delta t < \epsilon_2$, $s \leq s_X + \epsilon''$. At a perfect Bayesian equilibrium with immediate agreement, the debtor must attach a probability $\frac{1}{2}$ that the creditor who is chosen to bargain with him is the exchange bondholder. By construction, $s_{\max} > s_X$ so that there exists $\epsilon_3 > 0$, $\epsilon' > 0$, $\epsilon'' > 0$ such that when $0 < \Delta t < \epsilon_3$, $S \geq s_{\max} - \epsilon' > s_X + \epsilon'' \geq s$. But then there is a value of $\epsilon > 0$ such that the debtor can make an offer which is ϵ less than S: the offer made at $t=0$, is accepted by the exchange bondholder and not the holdout (who would prefer to wait Δt and bargain with the debtor to obtain S). In this way, the debtor obtains a higher share of the bargaining surplus. Therefore, for $\epsilon_3 > 0$ such that when $0 < \Delta t < \epsilon_3$, there is no perfect Bayesian equilibrium with immediate agreement: any perfect Bayesian equilibrium must separate the two types of creditors. It follows that, at the continuous time limit as $\Delta t \to 0$, the minimum delay compatible with a pure strategy perfect Bayesian equilibrium is the second-best benchmark derived in the main body of the paper above.

Other Perfect Bayesian Equilibria with Longer Delay Due to Lack of Coordination between the Debtor and Creditor

At the *second-best equilibrium*, $T = \hat{T}$ (the constrained-efficient RUFO clause); but, as discussed in the text, there are other equilibria with longer delay which satisfy the second-best incentive compatibility constraints (although these can be ruled out on efficiency grounds). There are other PBE as well, however, as when neither the debtor nor either creditor chooses to settle before a $T' > 0$ quantum of time has elapsed. Then, at T' periods, the debtor settles with the Exchange bondholder; and, after a further $T \in [\hat{T}, \tilde{T}]$ periods, settles with the Holdout creditor. By construction such equilibria involve longer delay than the second-best RUFO clause.

Comparative Statics in δ_H

As $T \to \infty$, $e^{-\delta_H T} \to 0$ and $e^{-\delta_H T}$ is decreasing and continuous in T, there exists $\tilde{T} > 0$ such that whenever $T \leq \tilde{T}$, $s_H e^{-\delta_H T} \geq s_X$ with equality when $T = \tilde{T}$. Further, as $0 < \delta_H < \delta_X$, it follows that $s_H e^{-\delta_X T} < s_X$. Let $\hat{T}$ be the solution to the equation $s_H e^{-\delta_X T} = s_X$. Clearly, $\hat{T} < \tilde{T}$. Therefore, at an equilibrium, the waiting time $T \in [\hat{T}, \tilde{T}]$. Moreover, for each $T \in [\hat{T}, \tilde{T}]$, given the strategies of the two creditors, the debtor cannot gain by deviating: any deviation on part of the debtor can only involve further delay which, given $\delta_D > 0$, the debtor dislikes. As $\frac{s_X}{s_H}$ is decreasing in δ_H, it follows that $\hat{T}$ is increasing in δ_H. As both $\frac{s_X}{s_H}$ and $e^{-\delta_H T}$ are decreasing in δ_H, $\tilde{T}$ is increasing in δ_H. Therefore, as $\delta_H \to 0$, both $\hat{T}$, $\tilde{T}$ are both increasing.

Appendix 2 Good Cases Make Bad Law: The Argentine Debt Swaps

As is well-known, Argentina did implement a RUFO clause – one that expired at the end of 2014. But there were two subsequent developments at variance with the simple bargaining model we propose: (a) a delayed – and relatively successful – swap was effected in 2010, well before the expiry of the RUFO clause; and (b) despite the expiry of the clause – meaningful negotiations with the remaining holdouts have never really started; and at the time of writing there is no resolution yet in sight.[16] How to account for these developments?

(a) Bargaining Surplus Evolved Over Time (Allowing for Another Swap before RUFO Expiry)

For analytical convenience we assumed the surplus to be constant; but in practice the bargaining surplus can, and does, evolve over time.

In Argentina's case, this had the effect that, as the economy recovered from recession, it increased greatly the value of the *GDP warrants* included in the

16 It is widely expected, however, that fresh efforts to find a settlement will be made following the change of President in December 2015.

initial settlement in 2005 and accepted by the first round of exchange bondholders. As these warrants turned out to be unexpectedly generous (see Amicus brief by Prat-Gay, 2013) so, consistent with the RUFO clause, a second settlement could be reached with the majority of holdouts in the second swap of 2010, i.e. well before the date of expiry.

(b) Closing of Final Settlement with Remaining Holdouts

After this intra-RUFO swap in 2010, however, any further opportunities to settle were closed by the debtor. The Argentine government apparently believed that, by getting the support of more than 93% of holders, they had defeated the vulture funds once and for all. Consequently it was made clear to the creditors – and to the US judge – that there would never be any payment made to the remaining holdouts, no matter how long they waited.[17]

(c) The *Pari Passu* Ruling by Judge Griesa

The final development was that the US judge concerned, taking this as a direct challenge to the authority of his court, came up with a decision that backed the claim by one of the holdouts. His novel interpretation of the *pari passu* clauses included in the debt contracts meant the debtor would have to pay the holdout before the exchange bond holders; and that the payments would have to cover all costs of waiting (in the form of accrued interest and legal costs). On this basis, transfers to the holdouts could be far greater than the face value of their initial holdings – perhaps double.

As a principle for governing the conduct of debt restructuring in general, this judgment was immediately challenged, not only in academic circles but also by key policy-actors in *amicus curiae* briefs presented to the court – including that submitted by the US Treasury. The reason is, of course, that, far from checking the externality imposed by holdouts, the judgment looks set to increase it. If all the waiting costs of acting as a holdout are to be compensated and the full face value of the debt is guaranteed, all creditors will act like them. As Lee Buccheit is reported as saying: "You could almost say that being a holdout has become a true

17 In a hearing in November 2013, "(Judge) Griesa showed Carmine Bocuzzi (representing Argentina) reports including various underlined phrases of Christina Fernandez de Kirschner and Hernan Lorenzino saying that *they would never pay the vulture funds, whatever Griesa ruled*." Burgueno (2013: p. 160), italics added.

path to prosperity. It could take some time, but it's a most promising business." Burgueno (2013: p. 210).

Risk-sharing through swaps and restructuring will become impossible – at least for those sovereign debts issued under US law. Not only would there be no international bankruptcy court for sovereigns: there would be no restructuring through negotiation either.

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