Transparency in Debt Crisis *

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Abstract

We study the problem of a sovereign choosing whether to disclose information to international lenders in an Eaton and Gersovitz (1981) environment. The government faces a trade-off: full disclosure ensures that debt is sold at high prices in good times, but hampers new debt issuance in bad times. Conversely, non-disclosure creates an insurance opportunity through adverse selection. The unique equilibrium under no-disclosure is a pooling equilibrium that allows the sovereign to take more debt in bad times at the cost of worse prices obtained in good times. We characterize the sovereign's optimal choice of information disclosure and show that non-disclosure is preferred when deadweight losses from defaulting are small. We argue that our model is consistent with the behavior of the Mexican government before and during the 1994-1995 Mexican Crisis.

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1 Introduction

Financial markets are known to be an environment with intrinsic informational frictions. Those frictions often create distinctions between agents' beliefs and the true realization of economic fundamentals that directly affect asset prices and other economic outcomes. Yet, governments and policymakers can strategically manage market participants' information, especially during financial distress, through varied disclosure policies[1]. In the debt crisis literature, many papers since Cole and Kehoe (2000) have stressed the role of lenders' expectations in default episodes, emphasizing the importance of information management in such situations. This paper examines whether strategic disclosure plays a role in debt crisis, or, more specifically, under what conditions a country opts to withhold information from international lenders.

In 1994 for instance, the Mexican central bank delayed releases of updated information on its US Dollar reserves, creating uncertainty among investors and the IMF regarding its current levels. At the same time, in response to heightened political instability, Mexico initiated the issuance of US Dollar-denominated bonds (*tesobonos*) to mitigate perceived inflation risks in the market. The left panel in Figure (1) shows the evolution of Dollar and Peso-denominated bonds (*cetes*), as well as the volume of reserves held by the Mexican Central Bank in 1994. As the dollar reserves were utilized for debt repayment and to sustain a strengthened peso, the absence of information on current dollar holdings from the *Banco de Mexico* raised investors' concerns about the ability of the country to repay. The right panel in Figure (1) illustrates the lack of awareness among economic agents including the IMF (IMF, 2012). Comments made about *past* reserve values mostly lie in the 45-degree line, while attempts to nowcast current values predominantly fall below the line, highlighting individuals consistently overestimated the Mexico's level of reserves. At the beginning of 1995, Mexico defaulted. In date, an international coalition leaded by the United States, bailed Mexico out.

Our main goal is to describe the trade-offs faced by a government that chooses whether or not to disclose information to the lenders about a privately known state of the world and characterize under which conditions not disclosing information to the lenders is preferred. To that end, we construct a tractable two-period model of sovereign debt inspired by Eaton and Gersovitz (1981), incorporating incomplete information and introducing an

[1] One example of such policies was observed in 2008 during the Emergency Lending Facilities (ELA) program from the Bank of England, in which the identities of institutions in the program remained undisclosed: *"Was secrecy appropriate in 2008? In light of the fragility of the markets at the time ELA is likely to be more effective if provided covertly"* - Ian Plenderleith (former president of the Bank of England), 2012 for the Bank for International Settlements (BIS) Committee on the Global Financial System (2008), page 70.

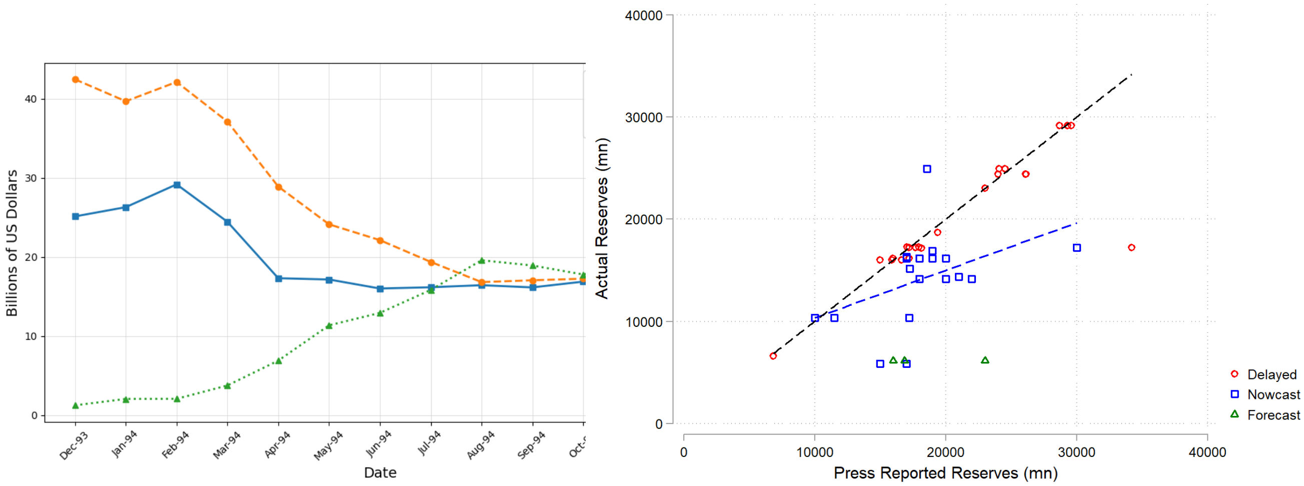


Figure 1: Panel A (left) shows the evolution of Mexican debt and foreign exchange reserves, from Cole and Kehoe (1996). Panel B (right) shows the gap between comments made about the level of reserves by economic agents and the values disclosed Diaz and Carstens (1996)

ex-ante choice of information structure to which the government commits. In this setup, the government faces the decision of whether to fully disclose the true state of the world to international lenders or to withhold information. Committing to non-disclosure allows the sovereign to insure against negative shocks pooling risk, and implicitly transferring resources from high to low realizations of the endowment. Under incomplete information, a sovereign facing a low repayment capacity can strategically mimic its debt choice from periods of high repayment capacity. We show that when the deadweight losses from defaulting are small no-disclosure becomes preferred. Using data on haircuts from Cruces and Trebesch (2013), we argue that the lower haircuts observed in sovereign default episodes of the early 1990s, compared to the 1980s, reflect lower default costs (and low deadweight losses compared to the endowment in bad times), thereby enhancing the government's incentive to withhold information about reserve levels.

We endow the sovereign with the ability to commit to the information structure chosen ex-ante as in Kamenica and Gentzkow (2011). This assumption makes the choice of information structure effectively non-strategic in our environment, that is, the choice of disclosure does not reveal any additional information on the sovereign's type. Lenders take their information as given and set the price for the country's debt. The sovereign then chooses and commits to a disclosure policy considering how it affects the lenders' beliefs (and therefore the price charged). We argue that the independence of the *Banco de Mexico*, established in 1993, supports the commitment assumption, as the central bank was the entity responsible for disclosing information on US Dollar reserves. We then follow Horn et al. (2022) and use ex-post revisions on debt and reserves statistics to highlight the distinction between the ability of the treasury and the central bank to commit to a disclosure policy.

Related Literature. Our paper is related to three strands of literature. The first of these is the theoretical literature on sovereign debt initiated by Eaton and Gersovitz (1981), and Cole and Kehoe (2000), among others. Unlike the aforementioned papers, our model accounts for incomplete information as in Sandleris (2008), Perez (2017), Amador and Phelan (2021), and others. Zabai (2014) and Szkup (2022) also work in incomplete information environments, but differently from the previous papers, they rely on dispersed information to get rid of the equilibrium multiplicity commonly observed under the Cole-Kehoe timing assumption. We differ from this literature by introducing an endogenous choice of disclosure in the sovereign's problem, making lenders' information (or the lack thereof) an endogenous object in our model. Guler et al. (2022) is closer to our work since it analyzes the effects of disclosing debt from non-Paris club lenders in a quantitative model. Their paper, however, compares welfare under two different exogenous information structures, finding that switching from an asymmetric information world to the full information world generates small welfare losses. In our setting, the choice of information structure is endogenous. None of the disclosure policies is unambiguously better, as this choice depends on default costs. Moreover, while most of the incomplete information models of sovereign debt deal with debt hidden from investors' knowledge by the government (Kondo et al., 2021, Horn et al., 2022, Gu and Stangebye, 2023, Gamboa, 2023) we tackle a difference source of information asymmetry: US dollar reserves held by the Mexican central bank.

Second, we contribute to the discussion on information disclosure during crisis episodes. For instance, Gorton and Ordoñez (2020), studies the sustainability of different disclosure policies in equilibrium, and how those policies can be used to manage the crisis. In our model, the decision over the information release is made *ex-ante*, which relates us to a different facet of the literature focuses on how disclosure policies can be used to prevent crises by designing stress tests under a planner's perspective.[2] Goldstein and Leitner (2018) focuses on how different policies can improve risk-sharing between banks, while Faria-e Castro et al. (2017) examine an environment where disclosure can prevent runs. Besides the noticeable differences between banking and sovereign crises, our paper dif-

[2]For a survey on this literature see Goldstein and Yang (2017)

fers from the aforementioned by departing from a setup with multiplicity. However, our paper works through a similar insurance mechanism as the one in Goldstein and Leitner (2018).

Finally, our paper is related to the information design literature: Kamenica and Gentzkow (2011), Bergemann et al. (2015), Inostroza and Pavan (2023).[3] More specifically, we focus on a choice of disclosure in environments with adverse selection, as in Garcia and Tsur (2021), Immorlica et al. (2022), and Dovis and Martellini (2024). Differently from them, we focus on the role of disclosure policies in a debt crisis episode, the Mexican Peso Crisis.

Outline. The rest of the paper is organized as follows. In Section (2) we present our environment and the results. Section (3) provides a background on the Mexican Peso Crisis (1994-1995), and relates our model to the behavior of the Mexican government before and during the crisis. Section (4) concludes.

2 Model

Enviroment. Time is discrete and indexed by $t \in \{0, 1, 2\}$.The economy is populated by two types of agents: a risk-averse sovereign and a continuum of risk-neutral competitive investors. The sovereign derives utility from consuming the only good in the economy at $t = 1, 2$ and discounts the future at a rate $\beta \in (0, 1)$. R is the constant and exogenous risk-free rate. At $t = 0$ the expected payoff of the sovereign is given by:

$$\mathbb{E}\left[u(c_1) + \beta u(c_2)\right]$$

Throughout this section, we will assume $u(x) = \log(x)$. The expectation is taken with respect to the sovereign's second-period endowment θ.

$$\theta = \begin{cases} \theta_L, & \text{with prob. } \pi \\ \theta_H, & \text{with prob. } 1 - \pi \end{cases}$$

At $t = 1$ the sovereign learns its type (θ), consumes using a constant endowment y, and new debt (b) issued at a price q. For simplicity, we assume that the sovereign has no debt

[3] For a detailed survey, see Bergemann and Morris (2019).

due in the first period. Under this assumptions,

$$c_1 = y + qb$$

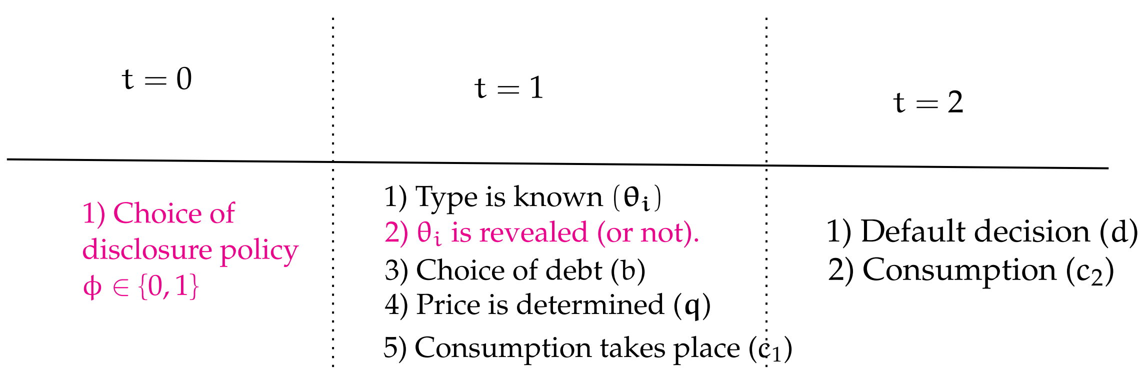
The sovereign cannot commit ex-ante to repay at $t = 2$. In case of repayment, the endowment θ is used to repay the debt and consume. In case of default, the sovereign uses its default endowment y_d to consume.

$$c_2 = \delta \times y_d + (1 - \delta) \times (\theta - b)$$

Where $\delta \in \{0, 1\}$ takes is equal to 1 if the sovereign defaults, and zero otherwise.

Information and disclosure. At $t = 0$ the sovereign commits to a disclosure policy ϕ. At $t = 1$ the sovereign is privately informed about its next period endowment $\theta \in \{\theta_H, \theta_L\}$ and the disclosure policy is realized. Lenders have a well-specified prior, that is, they know the true probability distribution over θ, and update their beliefs about the sovereign's type after observing the sovereign's choice of debt. For now, we restrict our analysis to this extremes: fully revealing θ (full-disclosure) or not revealing it at all (no-disclosure), that is $\phi \in \{0, 1\}$. Figure (2) exhibits a diagram with the timing.

Figure 2: Timing of events



Discussion. Analogously to saying that the sovereign has zero debt due on $t = 1$ one can interpret y as an endowment net of debt repayment. In the Mexican Crisis application, y can be interpreted as the endowment of US dollars held by the Central Bank net of debt due $t = 1$ and the expenditures made to keep the peg, while θ are the $t = 2$ reserves after the new outflow of dollars required by the exchange rate policy. The commitment assumption in our model makes the choice of information essentially non-strategic as in Kamenica and Gentzkow (2011). Although restrictive, we map this assumption to the independence of the *Banco de Mexico* during the Peso Crisis in 1994, in which the central bank was responsible to manage and disclose the dollar reserves.[4]

2.1 Complete Information Benchmark

We start by stating the game's equilibrium under complete information, we then characterize the equilibrium and compute the sovereign's expected payoff under full-disclosure ($\phi = 0$). Under complete information, the payoff of a type-θ, given the default endowment (y_d) sovereign is given by:

$$V_{FD}(\theta; y_d) = \max_{b(\theta)} \Big\{ \log\left(y + q\left(\theta, b(\theta)\right) b(\theta)\right) + \beta \log\left(c_2^*(b,\theta)\right) \Big\} \tag{1}$$

subject to:

$$c_2^*(b,\theta) = \max_{\delta \in \{0,1\}} \delta \times y_d + (1-\delta) \times (\theta - b)$$

Definition 1. *An* ***equilibrium under complete information*** *is a strategy for the sovereign* $\left(\delta^*(b,\theta), b_{FD}^*(\theta)\right)$, *a price schedule* $q_{FD}(b,\theta)$ *such that:*

i) The default policy $\delta^*(b,\theta)$ *maximizes consumption at* $t = 2$

ii) Given $q_{FD}(b,\theta)$, *the choice of debt* $b_{FD}^*(\theta)$ *maximizes the sovereign's lifetime payoff*

iii) Investors make zero profits

$$\frac{1}{R}\Big[\delta(b,\theta) \times 0 + \big(1 - \delta(b,\theta)\big)\Big] - q(b,\theta) = 0$$

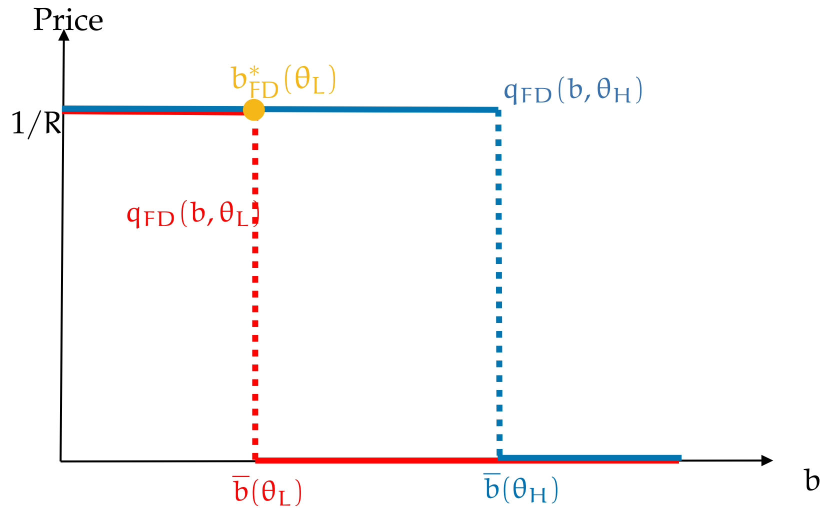
Note that under complete information, the strategies and prices are explicit functions of the sovereign's type. In particular, Figure (3) shows the two price schedules faced by each type of sovereign. We denote the choice of debt of a type-θ sovereign as $b_{FD}^*(\theta)$. Before proceeding with the characterization of equilibrium we state some parametric assumptions:

Assumption 1 (Constrained L-type)**.**

$$y_d > \frac{\beta R}{1+\beta}\left(\frac{\theta_L}{R} + y\right)$$

[4] In Section (3) we show the different patterns in disclosure coming from variables controlled by the central bank and the treasury.

Figure 3: Debt and prices in the FD equilibrium (with Assumption 1)



Assumption (1) ensures that the L-type sovereign chooses as much debt as lenders are willing to lend at the risk-free price $1/R$, as shown in Figure (3). This makes L-type sovereigns indifferent between defaulting and repaying at $t = 2$. When this is the case we say that the L-type is constrained.

Lemma 1. *Define* $\overline{b}(\theta) \equiv \theta - y_d$. *The following strategy is an* ***equilibrium****:*

$$\delta^*(b,\theta) = \begin{cases} 1, & \textit{if } b > \overline{b}(\theta) \\ 0, & \textit{if } b \leqslant \overline{b}(\theta) \end{cases}$$

$$q_{FD}(b,\theta) = \begin{cases} 0, & \textit{if } b > \overline{b}(\theta) \\ 1/R, & \textit{if } b \leqslant \overline{b}(\theta) \end{cases}$$

$$b^*_{FD}(\theta) = \min\left\{\frac{\theta - \beta R y}{1+\beta}, \overline{b}(\theta)\right\}$$

Proof. See Appendix (A.1) □

Finally, we define the expected payoff of a sovereign under complete information induced by a full-disclosure policy, given y_d as:

$$
\begin{aligned}
V_{FD}(y_d) \equiv \pi \quad & \times \underbrace{\Big[u\big(y + q_{FD}(b^*_{FD}(\theta_L), \theta_L) b^*_{FD}(\theta_L)\big) + \beta u\big(\theta_L - b^*_{FD}(\theta_L)\big)\Big]}_{V_{FD}(\theta_L; y_d)} \\
+ (1-\pi) \quad & \times \underbrace{\Big[u\big(y + q_{FD}(b^*_{FD}(\theta_H), \theta_H) b^*_{FD}(\theta_H)\big) + \beta u\big(\theta_H - b^*_{FD}(\theta_H)\big)\Big]}_{V_{FD}(\theta_H; y_d)}
\end{aligned}
\tag{Exp. Payoff of FD}
$$

By choosing and committing to fully disclose its type, the sovereign gets a lottery-like payoff in which price schedules, debt, and default policies as described in Lemma (1) are weighted by the probability of each of the types to be realized.

2.2 Incomplete Information

We now consider a version of the game with incomplete information. In this game the sovereign chooses not to disclose its type to the lenders ($\phi = 1$). Lenders now observe the choice of debt and update their prior π to compute *posterior beliefs* of the sovereign's type. We denote the posterior belief conditioned on an observed debt choice as $\mu(b) \equiv \mathbb{P}(\theta = \theta_L | b)$. The sovereign's problem is given by:

$$
V_{ND}(\theta; y_d) = \max_{b(\theta)} \Big\{ \log\big(y + q\big(b(\theta)\big) b(\theta)\big) + \beta \log(c^*_2(b, \theta)) \Big\} \tag{2}
$$

subject to:

$$
c^*_2(b, \theta) = \max_{\delta \in \{0,1\}} \delta \times y_d + (1 - \delta) \times (\theta - b)
$$

Definition 2. *A **Perfect Bayesian Equilibrium (PBE)** is a strategy for the sovereign* $\big(b^*_{ND}(\theta), \delta^*(b, \theta)\big)$*, a price schedule* $q_{ND}(b)$*, and beliefs* $\mu(b)$ *such that:*

1. *The default policy* $\delta^*(b, \theta)$ *maximizes the sovereign's consumption at* $t = 2$.
2. *Given* $q_{ND}(b)$ *the choice of debt maximizes sovereign's lifetime payoffs.*
3. *Beliefs follow the Bayesian update whenever possible*
4. *Investors make zero profits*

$$
\frac{1}{R} \mathbb{E}_\mu \Big[\delta\big(b, \theta\big) \times 0 + \big(1 - \delta(b, \theta)\big)\Big] - q(b, \theta) = 0
$$

We will look for equilibria in pure strategies[5]. Note that at $t = 2$ as before, the default choice of the sovereign depends only on the amount of debt chosen at $t = 1$ and on the sovereign's type. We will show that the default threshold strategies will be the same as in the full-disclosure equilibrium. This follows from the fact that all action generated by the lack of information in our model happens at $t = 1$, through prices and debt choices. The main conceptual difference in this case follows from the fact that the lender's strategy is not conditioned on types, since those are not observed.

Definition 3. *A **separating equilibrium** is a PBE in which both types pick different levels of debt:* $b^*_{ND}(\theta_L) \neq b^*_{ND}(\theta_H)$

Proposition 1. *Under **Assumption** (1), there is no separating equilibrium.*

Proof. See Appendix (A.2) □

Definition 4. *A **pooling equilibrium** is a PBE in which both types pick the same debt level:* $b^*_{ND}(\theta_L) = b^*_{ND}(\theta_H) = \tilde{b}$

We now turn to the class of PBEs we are interested in. If both types of sovereign choose a pooling level of debt for which the L-type defaults and the H-type repays the lack of complete information induced by the disclosure policy can generate significant changes in the sovereign's payoffs. Define the following debt level:

$$\tilde{b} \equiv \max\left\{\theta_L - y_d, \min\left\{\frac{\theta_H - \frac{\beta R y}{1-\pi}}{1+\beta}, \theta_H - y_d\right\}\right\}$$

Let the belief system, the default policy, and the price schedule be:

$$\mu(b) = \begin{cases} \pi, & \text{if } b \leqslant \tilde{b} \\ 1, & \text{if } b > \tilde{b} \end{cases}$$

$$\delta^*(b, \theta) = \begin{cases} 1, & \text{if } b > \overline{b}(\theta) \\ 0, & \text{if } b \leqslant \overline{b}(\theta) \end{cases}$$

[5]The sovereign will pick one debt level, instead of a probability distribution of possible debt levels.

$$q_{ND}(b) = \begin{cases} 0, & \text{if } b > \theta_H - y_d \\ \frac{1-\mu(b)}{R}, & \text{if } b \in (\theta_L - y_d, \theta_H - y_d] \\ 1/R, & \text{if } b \leqslant \theta_L - y_d \end{cases}$$

Proposition 2. *Suppose that Assumption (1) holds, but $y_d < \frac{\beta R}{1+\beta}\left(\frac{\theta_H}{R} + y\right)$, that is, only the L-type is constrained. There exists π^* such that for $\pi < \pi^*$, the unique pooling equilibrium has a choice of debt: $\tilde{b} = \frac{\theta_H - \frac{R\beta y}{1-\pi}}{1+\beta}$, with beliefs $\mu(b)$, default policy $\delta^*(b, \theta)$, and a price schedule $q_{ND}(b)$.*

Proof. See Appendix A.3 □

To simplify the analysis, we describe a set of conditions that express a limiting knife-edge case.

Assumption 2 (Limiting Case)**.** *Suppose the following parametric restrictions hold:*

1. *The H-type is constrained (chooses the maximum amount of debt it could repay)*

$$y_d > \frac{\beta R}{1+\beta}\left(\frac{\theta_H}{R} + \frac{y}{1-\pi}\right)$$

2. *Low deadweight loss from default*

$$y_d \to \theta_L$$

3. *H-type borrows at all*

$$\pi < 1 - \beta R$$

In the next proposition, we characterize the pooling equilibrium under Assumption (2).

Lemma 2. *Under Assumption (2), $\tilde{b} = \theta_H - y_d$ is the unique debt level sustained in a pooling equilibrium.*

Proof. See Appendix (A.4). □

The above result is important for us to evaluate the sovereigns' disclosure policy as it makes sure that there is a *unique* payoff at $t = 0$ associated with not disclosing the aggregate state θ. We can now define such payoff as follows:

$$
\begin{aligned}
V_{ND}(y_d) \equiv \pi \quad & \times \underbrace{\left[\log\left(y + q_{ND}(\tilde{b})\tilde{b}\right) + \beta \log\left(y_d\right)\right]}_{V_{ND}(\theta_L; y_d)} \\
+ (1-\pi) \quad & \times \underbrace{\left[\log\left(y + q_{ND}(\tilde{b})\tilde{b}\right) + \beta \log\left(\theta_H - \tilde{b}\right)\right]}_{V_{ND}(\theta_H; y_d)}
\end{aligned}
$$

$$
V_{ND}(y_d) = \log(y + q_{ND}(\tilde{b})\tilde{b}) + \beta[(1-\pi)\log(\theta_H - \tilde{b}) + \pi \log(y_d)]
$$

The disclosure policy picks the *sovereign-preferred equilibrium*, that is:

$$
\phi^* = \arg\max_{\phi \in \{0,1\}} \phi \times V_{ND} + (1-\phi) \times V_{FD}
$$

Proposition 3. *Under Assumption (2)* $V_{ND} > V_{FD}$*, that is,* $\phi^* = 0$

Proof. Using the equilibrium outcomes derived, the expression for the payoffs under FD and ND reduces to:

$$
\begin{aligned}
V_{FD} =& \pi \times u(y) + (1-\pi) \times u\left(y + \frac{\theta_H - \theta_L}{R}\right) + \beta u(\theta_L) \\
V_{ND} =& u\left(y + \frac{1-\pi}{R} \times (\theta_H - \theta_L)\right) + \beta u(\theta_L)
\end{aligned}
$$

The result follows from the strict concavity of u. ☐

The above result shows that if there are no deadweight losses from defaulting at the L-state, not disclosing information to international lenders is preferred to disclosing it fully. By committing not to reveal θ, the sovereign can transfer resources from a realization of the H-state to the L-state by playing a pooling equilibrium. In this equilibrium, the L-type takes as much debt as the H-type, at a positive price, and defaults, while the H-type is getting a price lower than $1/R$ even though they would find it optimal to repay. Observe that our results do not critically depend on assuming a logarithmic utility function. Because the high-type sovereign is constrained—meaning it issues the maximum amount of debt that lenders are willing to purchase at a positive price—the sovereign's payoff is equalized across all realizations of the state variable θ. Due to the strict concavity of the utility function, the sovereign prefers this equalized payoff to the risky, lottery-like payoff that would result from a full disclosure policy.

Although restrictive, the limiting assumptions imposed above are useful to illustrate the mechanism that makes not disclosing preferred to the sovereign. Assuming that both the L and H-types are constrained reduces the set of available debt choices, that is $b \in \{\theta_L - y_d, \theta_H - y_d\}$. Considering the limiting case $y_d \to \theta_L$ makes sure that one of such choices is zero, providing a sharp characterization of the mechanism in our model by ruling out the issuance of risk-free debt. Bounding the probability of being an L-type by $1 - \beta R$ is slightly stronger than the $\beta R < 1$ assumption, and makes sure that the H-type prefers to take some positive debt.

Numerical Illustration. Table (1) outlines the parameters used in our numerical exercise.

Table 1: Parameters for the numerical exercise

Parameter	**Value**	**Description**
β	0.92	Discount factor
R	1.02	Risk-free rate
y	1.00	Net endowment at $t = 1$
θ_L	1.25	L-type's endowment at $t = 2$
θ_H	1.75	H-type's endowment at $t = 2$
π	0.15	$\mathbb{P}(\theta = \theta_L)$
γ	{1,2}	CRRA parameter

We now drop the Assumption (2) but still let Assumption (1) hold. This allows for a positive level of risk-free debt since $y_d < \theta_L$. Given that the H-type is not constrained anymore, the risky pooling debt level $\tilde{b}$ is given by:

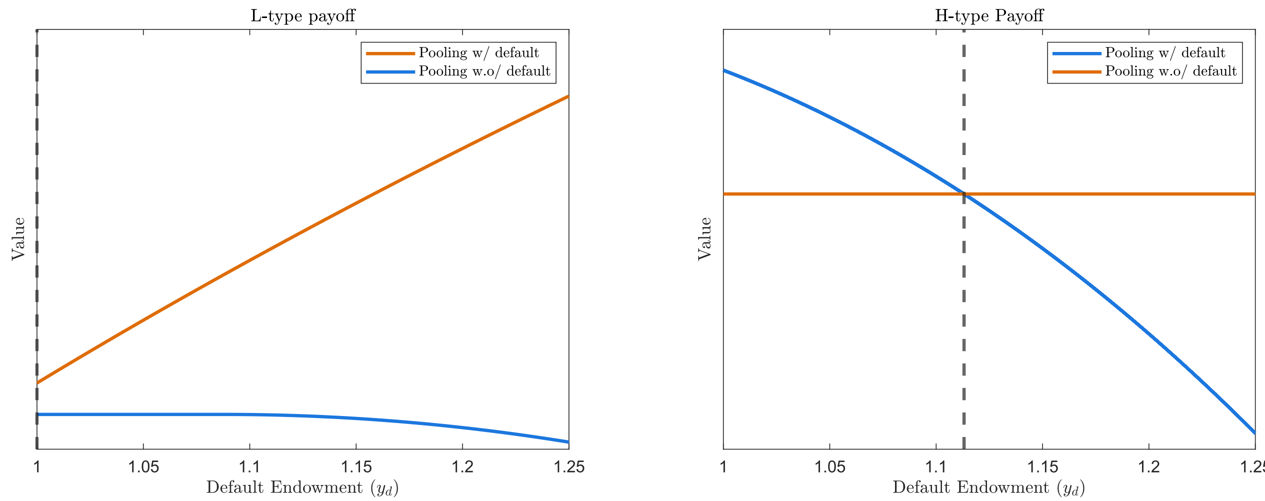
$$\tilde{b} = \frac{\theta_H - \frac{\beta R y}{1-\pi}}{1+\beta}$$

The following inequality must hold for the L-type not to deviate to $\theta_L - y_d$ from risky pooling level of debt $\tilde{b}$:

$$u\left(y + \frac{1-\pi}{R} \times \tilde{b}\right) + \beta u(y_d) > u\left(y + \frac{\theta_L - y_d}{R}\right) + \beta u(y_d) \tag{3}$$

A lower y_d would then increase the risk-free debt taken by the L-type sovereign that remains indifferent between repaying and defaulting in the second period. The left panel of Figure (4) shows that for the chosen parametrization it is optimal for the L-type to choose the debt in the region where debt is "risky" for all values of y_d.

Figure 4: Payoffs for the H/L types by playing the pooling with/without default



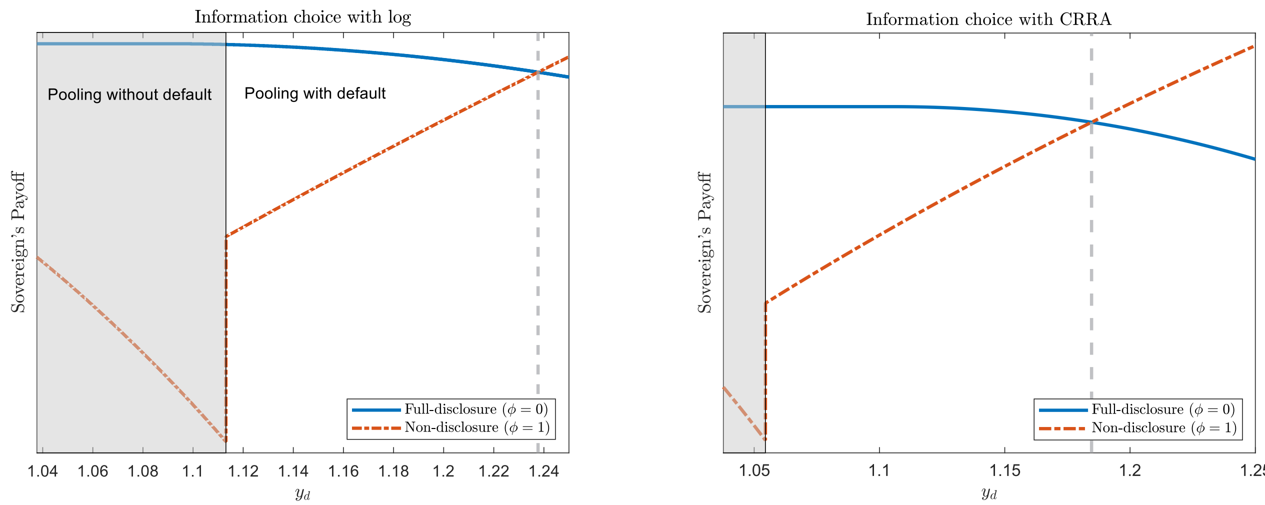
Analogously, for the H-type not to deviate from $\tilde{b}$ we must have:

$$u\left(y + \frac{1-\pi}{R} \times \tilde{b}\right) + \beta u(\theta_H - \tilde{b}) > u\left(y + \frac{\theta_L - y_d}{R}\right) + \beta u(\theta_H - \theta_L + y_d) \tag{4}$$

The right panel of Figure (4) shows that for low levels of y_d, or analogously, higher risk free debt $\theta_L - y_d$ the H-type sovereign prefers to take a restricted action and get a higher price. On the other hand, for high values of y_d, the risk-free pooling debt is small, and the sovereign prefers choosing $\tilde{b}$ even under a lower price.

The H and the L-type sovereigns will pick the maximum payoff between following the risky pooling strategy or deviating to the $\theta_L - y_d$. Since the L-type always prefers to mimic, the risky pooling debt level in the default region is played once the H-type prefers a risky level of debt $\tilde{b}$, after the threshold indicated by the dashed vertical line. The change in the equilibrium played after this threshold explains the discontinuity in the non-disclosure payoff in the left panel of Figure (5). The full-disclosure expected payoffs follow Equation (Exp. Payoff of FD).

Figure 5: Expected payoffs under full disclosure ($\phi = 0$) and no disclosure ($\phi = 1$), for different y_d



3 Mexican Peso Crisis 1994

In this section, we justify the central assumption of our model - that a sovereign can commit to a disclosure policy regarding key fundamentals before borrowing - and explain how the Mexican crisis of 1994 can be analyzed through the lens of our model.

3.1 Brief Historical Background

After the 1982 crisis, Mexico had gone through a profound process of economic modernization. New set of fiscal policies were taken to reduce public expenditure from 45% of the GDP in 1983 to 27% in 1993. At that moment more than 75% of public enterprises were privatized. In addition, the trade liberalization process began in 1983; by 1985 more than 85% of tariffs were gone. Both reforms attracted a huge inflow of foreign capital to Mexico at the beginning of the 1990s, and kept the peso strong against the US dollar.

Until 1994, Mexico's central bank had been successful in accumulating reserves, and maintaining the appreciated peso posed no significant challenge. In 1994, however, a series of events undermined international investors' confidence in the Mexican economy. These events included the declaration of war by the *Ejercito Zapatista de Liberacion Nacional* (EZLN) against the national army and the kidnapping of a potential presidential candidate. Moreover, the anticipated political and institutional stability brought by the announcement of Luis Donaldo Colosio as a candidate for the presidential elections was shattered by his assassination two days later. Subsequently, Mexico faced additional turbulent political events later that year, including the resignation of Jorge Carpizo, the Secretary of State, in late July, and the assassination of Jose Francisco Ruiz Massieu, the elected President of the Congress, in late September.

3.2 Evaluating the Commitment Assumption

Our model's main assumption is a sovereign's ability to commit to a disclosure policy about some fundamental ex-ante. This assumption becomes difficult to justify when the fundamental in question is something that the government itself controls, such as GDP or public debt. In these cases, a lack of commitment to disclosure could lead to future "revelations", that is, if the government decides to alter its previous disclosures, it can do so through data revisions. This is particularly relevant for hidden debt, as highlighted by Horn et al. (2022). By contrast, reserves are managed by the central bank, which operates independently from the treasury. Therefore, the pattern of reserve revelations is expected to differ from that of debt, reflecting the distinct institutional responsibilities between these two entities. In particular, in our model reserve revelations are independent on GDP growth, since the decision on disclosure is taken before knowing the true value of θ.

This section uses data from the World Bank's Global Development Finance and The World Debt Tables [6] on debt and reserve revisions to highlight the difference in the patterns of revelations for those two variables. The International Debt Statistics are based on direct debtor reporting. Therefore, omissions and revisions of data can be traced back to the reporting decisions of sovereign debtor countries. An upward revision implies that a sovereign debtor now reports an asset or liability to the World Bank that it had not previously reported. The ex-post revisions do not reflect fluctuations in the market value of debt, as all debt instruments enter the reports with their face values.

We digitalize information from the *Summary Debt Data* and *Major Economic Aggregates* sections in the vintages published from 1991 to 2002 on Mexican debt and reserve revisions. The variables used are: TOTAL DEBT STOCKS (EBT), Long-term debt (LDOD), Short-term debt, and International reserves (RES).

[6] Before 2013, the International Debt Statistics (IDS) was named Global Development Finance. Publications were available in two volumes: Volume I was the analysis and commentary and Volume II was the summary and country tables. Before 1997, the analysis and statistical tables were published as The World Debt Tables.

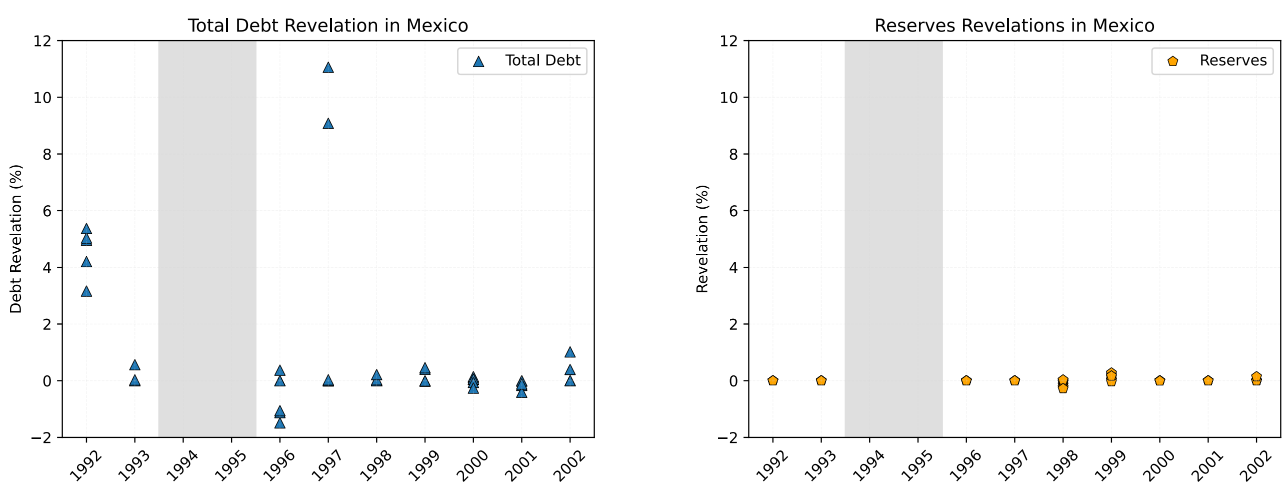
Following Horn et al. (2022), we construct the following variables:

$$\text{Revelation}_{v,t}^{x} = \frac{x_{v,t} - x_{v-1,t}}{x_{v-1,t}}$$

Where $\text{Revelation}_{v,t}^{x}$ is the difference on the reported value for variable $x \in \{\text{Debt, Reserves}\}$, for the calendar year t, in vintage v. The variable used for debt is Total Debt Stocks (EDT), although we complement the analysis with other measures of debt in Appendix (B.1). For instance, suppose in 1996 ($v-1$), the reported reserves for 1995 (t) were Z. In 1997 (v), the reported reserves for 1995 were 1.02Z. This is a 2% revelation on reserves in 1997.

In our model, reserve revelations are uncorrelated with a measure of economic activity. Figure (6) shows a time series for debt (left) and reserve (right) revelations. First, notice that reserve revelations across vintages are small compared to debt revelations. Interestingly, the largest debt revelations in 1997 are related to unreported values in 1993 and 1994, before the Mexican Peso Crisis. Figure (7) provides support to our commitment assumption. While reserve revelations seem to be constant and uncorrelated with detrended log GDP, debt revelations are non-trivial and appear to be positively correlated with the measure of activity.

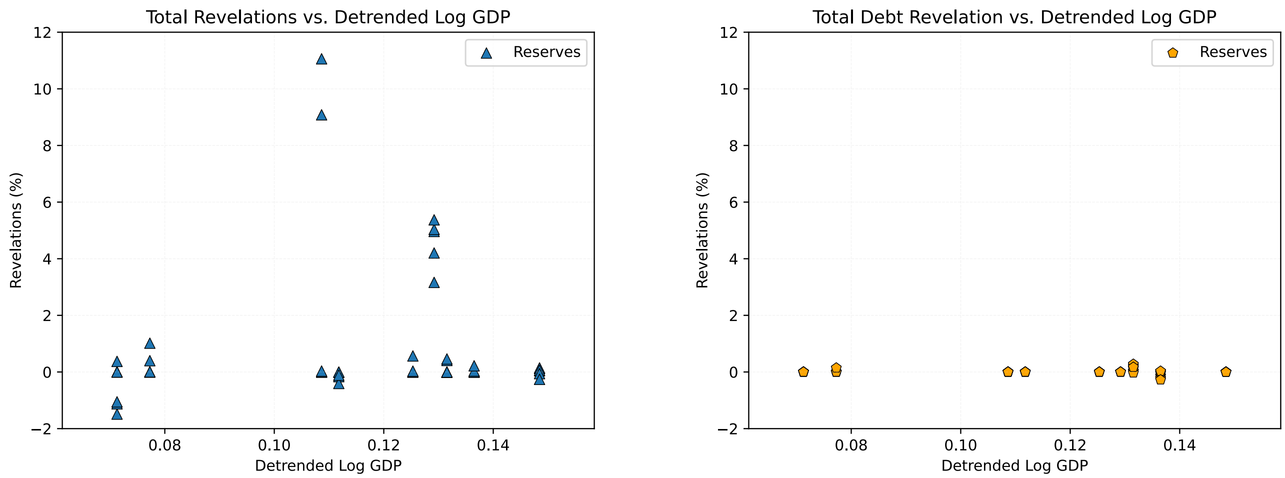
Figure 6: Debt and reserve revelations across time



3.3 Default Endowment and Deadweight Loss

Our main result suggests that as deadweight losses from default are small, or analogously when the default endowment (y_d) is high, the government prefers not to disclose infor-

Figure 7: Revelations vs. Detrended GDP



mation about fundamentals to the lenders. Although measuring default endowment (or default costs) is usually challenging, we know that higher haircuts (or lower recovery rates) are associated with better conditions for the sovereign, and therefore, higher consumption in default states. Importantly, haircuts are often a result of a renegotiation process and are not known ex-ante. In this case, haircuts from previous default episodes can provide useful information to the government about the costs of a possible future default episode.

We use data from Cruces and Trebesch (2013) and compute average haircuts from default episodes in the years before the Mexican Peso crisis, as well as the average haircut from default episodes in the 1980s. The *haircut* measure was first proposed by Sturzenegger and Zettelmeyer (2008) and uses the present value of old defaulted debt, while the *market haircut* uses the face value of old defaulted debt[7]. Table (2) shows that average haircuts from default episodes during the 1980s were considerably lower than the ones from episodes in the first years of the 1990s.

[7] For a detailed discussion of both measures and how they differ see Cruces and Trebesch (2013).

Table 2: Avg. Haircuts from Cruces and Trebesch (2013)

	1980-1989	1990-1993
World		
Haircuts	25.93%	46.30%
Mkt. Haircuts	28.96%	52.26%
Latin America		
Haircuts	22.29%	40.00%
Mkt. Haircuts	24.14%	49.50%

4 Conclusion

We developed a simple default model in the tradition of Eaton and Gersovitz (1981) with incomplete information and an endogenous choice of information structure. We show that when restricted to no-disclosure vs. full-disclosure policies, a sovereign follows a threshold strategy on the default costs. Countries facing low default costs may prefer to choose a no-disclosure policy that allows them to raise debt at a positive price even in bad times, at the cost of getting lower prices in good times. We relate this result to the Mexican Peso Crisis (1994) when updated information on US dollar reserves was not available for international lenders. To support our commitment assumption, we use vintage data on ex-post debt and reserves revisions from the World Bank and show the different patterns for revelations relative to debt and reserves. Moreover, we argue that the higher haircuts on default episodes in the early 1990s when compared to the 1980s is aligned with our non-disclosure result.

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A Appendix

A.1 Proof of Lemma 1

Default decision. At $t = 2$ the sovereign decides whether to default or repay on its debt b to maximize consumption at $t = 2$. We denote the default decision by $\delta^*(\theta, b) \in \{0, 1\}$:

$$\delta^*(b, \theta) = \arg\max_{\delta \in \{0,1\}} \delta \times y_d + (1 - \delta) \times (\theta - b) \tag{5}$$

The default policy at $t = 2$ depends solely on the amount of debt picked at $t = 1$, and the sovereign's type:

$$\delta^*(b, \theta) = \begin{cases} 1, & \text{if } b > \overline{b}(\theta) \\ 0, & \text{if } b \leqslant \overline{b}(\theta) \end{cases}$$

$$y_d = \theta - \overline{b}(\theta)$$

Where $\overline{b}(\theta) \equiv \theta - y_d$ are the upper thresholds for debt levels that make each type indifferent between repaying and defaulting. The default policy determines consumption at $t = 2$:

$$c_2^*(b, \theta) = \delta^*(b, \theta) \times y_d + \left[1 - \delta^*(b, \theta)\right] \times (\theta - b)$$

Lenders' problem. The strategy for the lenders is a price schedule $q_{ND}(b, \theta)$:

$$q_{FD}(b, \theta) = \begin{cases} 0, & \text{if } b > \overline{b}(\theta) \\ 1/R, & \text{if } b \leqslant \overline{b}(\theta) \end{cases}$$

The following expression gives the interior solution for debt:

$$\frac{\theta - \beta R y}{1 + \beta}$$

However, conditional on repayment the sovereign's choice of debt can be a corner solution:

$$b(\theta) = \min\left\{\frac{\theta - \beta R y}{1 + \beta}, \theta - y_d\right\}$$

□

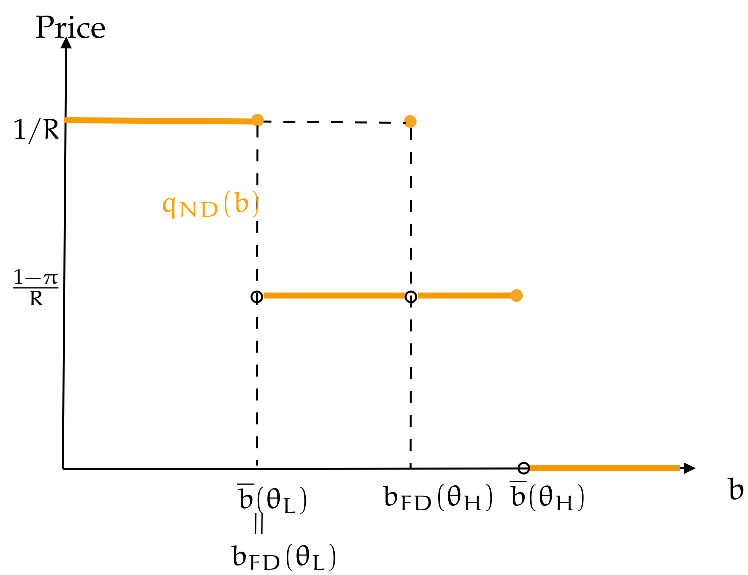
A.2 Proof of Proposition 1

Let $b^*_{ND}(\theta_H)$ and $b^*_{ND}(\theta_L)$ be the separating choices of debt. By definition, in a separating equilibrium, lenders can distinguish between types, and by zero profit condition it must be the case that $q_{ND}\left(b^*_{ND}(\theta_H)\right) = q_{ND}\left(b^*_{ND}(\theta_L)\right) = 1/R$. Let $p \in (0, 1)$ and define beliefs as follows:

$$\mu(b) = \begin{cases} 1, & \text{if } b = b^*_{ND}(\theta_L) \\ 0, & \text{if } b = b^*_{ND}(\theta_H) \\ p, & \text{if } b \notin \{b^*_{ND}(\theta_L), b^*_{ND}(\theta_H)\} \end{cases}$$

$$q_{ND}(b) = \begin{cases} 0, & \text{if } b > \theta_H - y_d \\ \frac{1-\mu(b)}{R}, & \text{if } b \in (\theta_L - y_d, \theta_H - y_d] \\ 1/R, & \text{if } b \leqslant \theta_L - y_d \end{cases}$$

Figure 8: Price schedule for the candidate of separating equilibrium



By **Assumption** (1) the L-type sovereign picks a corner solution for debt, which means that $\theta_L - y_d$ is preferred over any $b < \theta_L - y_d$. It then must be the case that $b^*_{ND}(\theta_L) = \theta_L - y_d$, and the L-type's utility at $t = 2$ is given by $u(y_d)$. If the L-type is constrained at $\theta_L - y_d$, it must be the case that the H-type prefers $\theta_L - y_d$ to any debt level smaller than this.

Our candidate of separating equilibrium must be such that $b^*_{ND}(\theta_H) > b^*_{ND}(\theta_L)$, that is, the H-type's choice of debt is in the default region for the L-type.

$$u\left(y + \frac{\theta_L - y_d}{R}\right) + \beta u(y_d) < u\left(y + \frac{b^*_{ND}(\theta_H)}{R}\right) + \beta u(y_d)$$

We thus conclude that $b^*_{ND}(\theta_H)$ is a profitable deviation for the L-type regardless of the off-equilibrium beliefs $p \in (0, 1)$.

□

A.3 Proof of Proposition 2

Lemma 3. *There exists $\pi_L(y_d)$ such that, for $\pi < \pi_L(y_d)$, the L-type sovereign prefers the risky pooling debt level.*

Proof. It's enough to check L-type's deviation to the *safe pooling*

$$y + \frac{1-\pi}{R}\left[\frac{\theta_H - \frac{\beta R y}{1-\pi}}{1+\beta}\right] > y + \frac{\theta_L - y_d}{R}$$
$$\underbrace{1 - \left[\frac{(1+\beta)(\theta_L - y_d) + \beta R y}{\theta_H}\right]}_{\equiv \pi_L(y_d)} > \pi$$

□

We now check whether the H-type prefers the *risky pooling* over issuing $\theta_L - y_d$ at a risk-free price. Let the payoff of the *risky pooling* be defined as:

$$\mathcal{F}(\pi) \equiv (1+\beta)\log\left(\frac{y + \frac{1-\pi}{R} \times \theta_H}{1+\beta}\right) + \beta \log \frac{\beta R}{1-\pi}$$

Lemma 4. *$\mathcal{F}(\pi)$ is strictly convex. Moreover, at its minimum ρ':*

$$\mathcal{F}(\rho') = \log(y) + \beta \log(\theta_H)$$

Proof. The first order condition of $\mathcal{F}$ is:

$$\mathcal{F}'(\rho') = (1+\beta) \times \frac{-\theta_H^2}{Ry + (1-\rho')\theta_H} + \frac{\beta}{1-\rho'} = 0$$

We then get a critical point $\rho' = 1 - \frac{\beta R y}{\theta_H}$. The second derivative of $\mathcal{F}$:

$$\mathcal{F}''(\pi) = -\frac{[(1+\beta)\theta_H]^2}{[Ry + (1-\pi)\theta_H]^2} + \frac{\beta}{(1-\pi)^2}$$

Evaluating the second derivative at the critical point ρ' we get:

$$\begin{aligned}
\mathcal{F}''(\rho') &= \frac{-(1+\beta)\theta_H^2}{[Ry + (1-\rho')\theta_H]^2} + \frac{\beta}{(1-\rho')^2} \\
&= \frac{-1}{1+\beta} \times \left(\frac{\theta}{Ry}\right)^2 + \frac{1}{\beta} \times \left(\frac{\theta_H}{Ry}\right)^2 > 0
\end{aligned}$$

□

Lemma 5. *The safe pooling payoff for the H-type is decreasing in* y_d.

Proof. We have already showed that when evaluated at ρ', $\mathcal{F}$ attains its minimum and $\mathcal{F}(\rho') = \log(y) + \beta \log(\theta_H)$. We want to know under which conditions the *safe pooling* payoff of the H-type is decreasing in y_d, that is:

$$\begin{aligned}
\frac{-1}{Ry + \theta_L - y_d} + \frac{\beta}{\theta_H - \theta_L + y_d} &< 0 \\
\frac{\beta}{\theta_H - \theta_L + y_d} &< \frac{1}{Ry + \theta_L - y_d} \\
\beta R y + \beta\theta_L - \beta y_d &< \theta_H - \theta_L + y_d \\
\beta R y + (1+\beta)\theta_L &< (1+\beta) y_d + \theta_H \\
\underbrace{\theta_L - y_d}_{b^*_{FD}(\theta_L)} &< \underbrace{\frac{\theta_H - \beta R y}{1+\beta}}_{b^*_{FD}(\theta_H)}
\end{aligned}$$

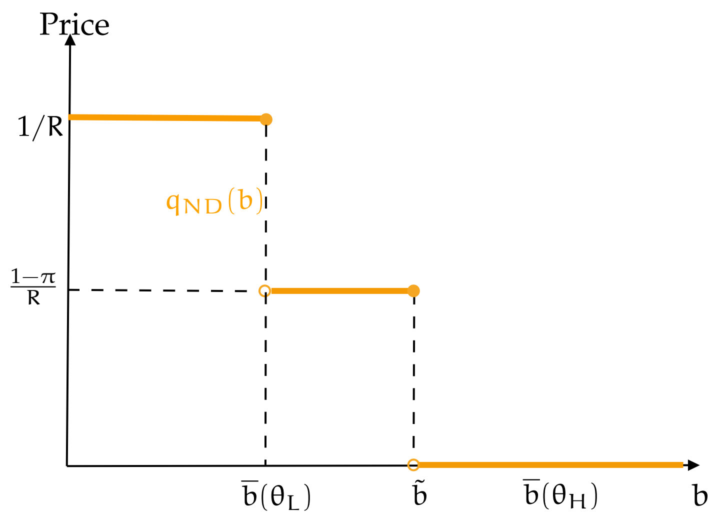
□

Lemma 6. *There exists* $\pi_H(y_d)$ *such that for* $\pi < \pi_H(y_d)$*, the H-type prefers the risky pooling debt level.*

Proof. Note that $\mathcal{F}$ is strictly convex and equal to the safe pooling payoff at its minimum, attained when $y_d = \theta_L$. Also, the safe pooling payoff is decreasing in y_d, which means that for $y_d < \theta_L$, the safe pooling payoff lies above the $\mathcal{F}$ at its minimum. By continuity of $\mathcal{F}$ we get the existence of $\pi_H(y_d)$ that makes the H-type indifferent between the safe and risky pooling outcomes. □

A.4 Proof of Lemma 2

Figure 9: Price schedule for the pooling eq.



Under the suggested belief system, the price schedule is represented in Figure (9). The optimal choice of debt for a H-type sovereign that faces a price $\frac{1-\pi}{R}$ is:

$$\tilde{b} = \max\left\{\min\left\{\frac{\theta_H - R\beta\frac{y}{1-\pi}}{1+\beta}, \theta_H - y_d\right\}\right\}$$

In the limiting case $y_d \to \theta_L$ we thus have:

$$\tilde{b} = \min\left\{\frac{\theta_H - R\beta\frac{y}{1-\pi}}{1+\beta}, \theta_H - \theta_L\right\}$$

Note that the H-type sovereign has positive marginal utility for an extra unit of debt even when debt is in its upper limit. We can thus conclude that there is no profitable deviation for the H-type that would yield the same price, $\frac{1-\pi}{R}$. Since $y_d \to \theta_L$, no debt level can be issued at a risk-free price, which means that autarky is the only candidate for a profitable deviation for the H-type sovereign. For autarky to be preferred to the pooling equilibrium the following inequality must hold:

$$u\left(y + \frac{1-\pi}{R} \times (\theta_H - \theta_L)\right) - u(y) < \beta\left[u(\theta_H) - u(\theta_L)\right]$$

Which holds if $\pi > 1 - R\beta$, a contradiction. On the other hand, L-types' payoff is strictly increasing on debt, conditional on getting a positive price, which means they also will not deviate from $\theta_H - \theta_L$.

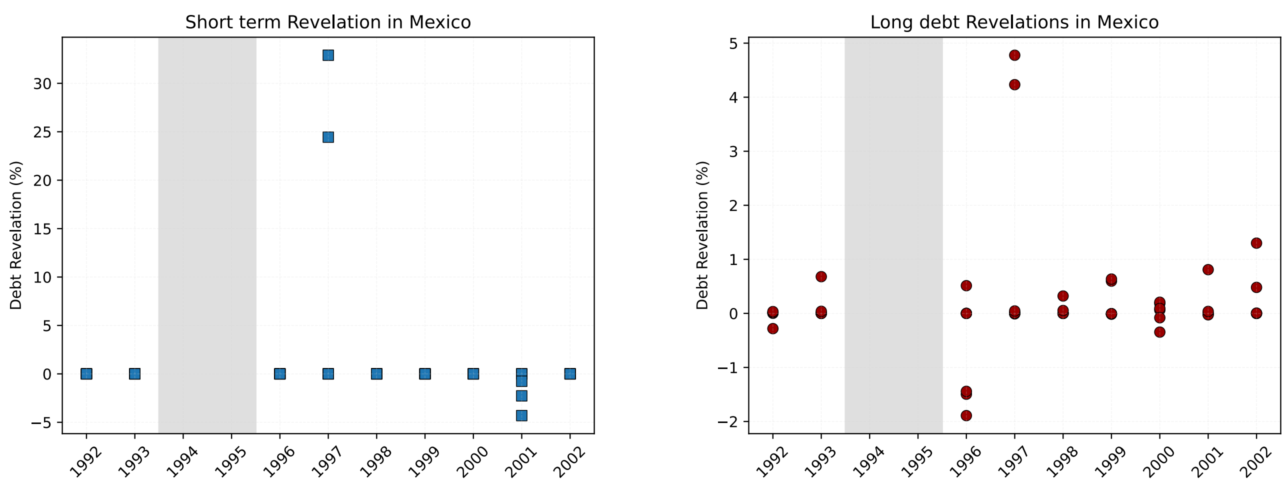
□

B Data Details

B.1 Long/Short term debt revelations

In Figure (10) we decompose the revelations of total debt shown in Figure (6) into short and long-term debt revelations. As in Figure (6), we see that short and long-debt revelations are non-zero and can reach significant levels.

Figure 10: Long vs. Short term debt revelations



In Figure (11) we show the correlation between long and short-term debt revelations and log-detrended GDP, as we did in Figure (7).

B.2 Haircuts

Figure (12) shows the haircuts from all default episodes in the world and Latin America, using the dataset from Cruces and Trebesch (2013). The averages are exhibited in Table (2).

Figure 11: Long and Short term debt revelations vs. Detrended log GDP

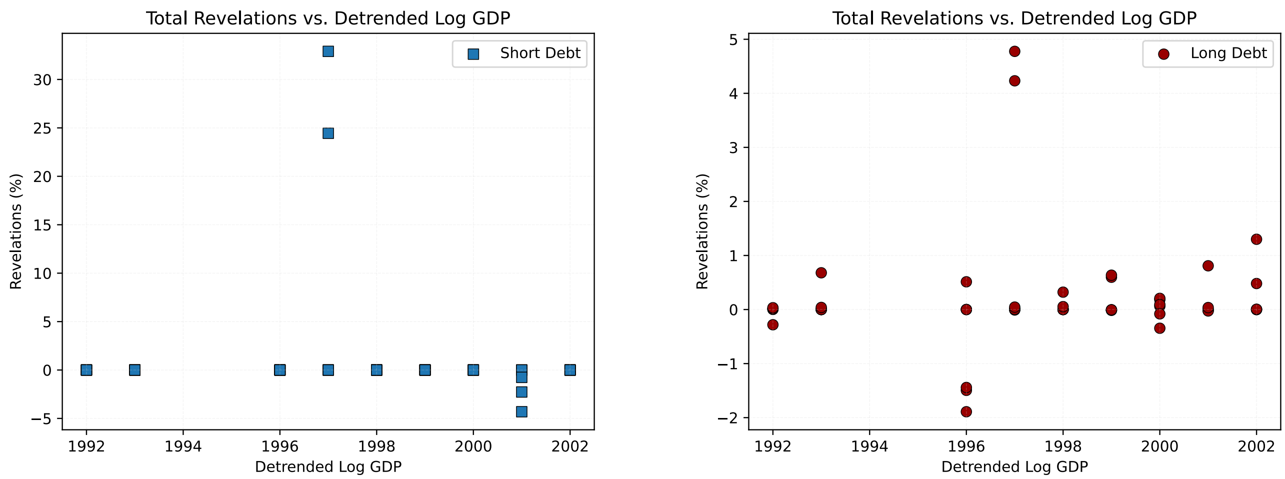


Figure 12: Haircuts for default episodes (LatAm vs. World)