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HIDDEN DEBT[‡]

Undisclosed Debt Sustainability[†]

By LAURA ALFARO AND FABIO KANCZUK*

China's development has reshaped the world economy. Strong domestic growth and the related demand for natural resources led China to search for markets abroad. Countries in Africa, East Asia, and Latin America were natural partners, with an abundance of commodities and a need for infrastructure development.

In addition to redefining trade patterns, China's venturing abroad has reshaped international lending. Low- and middle-income countries have increased their reliance on financing from nontraditional sources. It has been suggested, for example, that over the last decade, China has financed more than 3,500 projects in Africa worth almost \$300 billion in official financing. As a result, China has become the region's largest creditor, accounting for 15 percent of sub-Saharan Africa's total debt stock (Coulibaly 2018).

China, as a nonmember of the Paris Club, does not report on its official lending, and there are no comprehensive data on Chinese overseas financing (Horn et al. 2020). China's increased presence in international financial markets and the lack of information on the actual extent of its investments have attracted the attention of multilateral institutions and international investors. Pre-COVID non-Paris Club (NPC) debt accounted for about 13 percent of low-income countries' public debt in 2016, but given the lack of official data, these are estimates compiled from different sources.

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In fact, the absence of consistent statistics highlights a critical issue across NPC borrowing and lending: limited transparency. Unlike usual sovereign debt, lending arrangements by NPC creditors are not public. As such, they increase funding costs from the original international creditors, who reassess the probability of being repaid. Increased exposure to NPC members and commercial creditors may pose coordination challenges for debt resolution, making the consequences of debt distress even more disruptive.

Multilateral agencies have highlighted debt transparency as a critical issue. At a 2018 International Monetary Fund (IMF) meeting, Christine Lagarde urged borrowers and their new creditors to be transparent about their liabilities: "A key challenge is preventing 'debt surprises,' which can be driven by poor governance, off-balance sheet borrowing, and weak debt recording and reporting" (Spink 2018). Horn, Reinhart, and Trebesch (2021) point out:

[T]hese hidden overseas debts pose serious challenges for country risk analysis and bond pricing, that debt sustainability metrics are poorer than generally perceived, especially so in about two dozen developing countries that borrowed heavily from China during the boom decade of 2003–2013.

This paper studies how undisclosed debt affects debt sustainability. We transform the now traditional sovereign debt and default model (see Aguiar and Amador 2014) to include incomplete information arrangements. In addition to the usual traditional "international investors" (Paris Club) credit market, the sovereign may borrow an undisclosed amount of debt from an NPC investor. The traditional international investors thus have to assess NPC debt to adequately charge for their lending. Lending from nontraditional sources also requires rethinking

the costs associated with defaulting, including potential exclusions from different capital markets. In the benchmark case, we assume a government that defaults on its debts to be temporarily excluded from borrowing in the market in which it defaulted.

We calibrate our model to the Angolan economy. With an estimated debt of over US\$25 billion, Angola is one of the African countries most indebted to China. We solve our model for the current environment, where there is incomplete information about the NPC debt level, and for a hypothetical case where there is disclosure of NPC debt and information is transparent. We obtain that NPC undisclosed lending results in a reduction in the original investor's debt sustainability, but there is a substantial increase in the recipient country's welfare. We also find that disclosure of NPC debt level results in even higher welfare gains for the recipient country, but it also implies a significant reduction in the NPC debt sustainability.

I. Model

We model an economy populated by a continuum of private households, a benevolent government, a continuum of risk-neutral international investors, and an NPC investor that is also assumed to be risk neutral. The continuum of risk-neutral investors is meant to represent the international credit market, which is composed of private investors, governments, and multilateral banks. Although heterogenous and not fully competitive, this market is assumed to have a constant (marginal) lending rate and must disclose the amount loaned. We similarly model the NPC investor by setting a lending rate meant to represent its opportunity cost. In contrast with the "international investors," the NPC investor does not release information about the amount loaned.

Preferences are concave, implying that households prefer a smooth consumption profile. To smooth consumption, the benevolent government may choose optimally to default on its commitments. A government that defaults on its debts is assumed to be temporarily excluded from borrowing in the market in which it defaulted. That is, if the government defaults on international investors' debt, it is temporarily excluded from borrowing from them but can

still borrow from the NPC investor. Similarly, if the government defaults on NPC debt, it can still borrow from international investors.

The timing of the decisions is as follows. In the beginning of each period, the government starts with debt levels B_t and D_t (respectively owed to international investors and to the NPC) and observe income y_t . It faces the price schedules $q^B(y_t, B_t, B_{t+1})$ and $q^D(y_t, B_t, B_{t+1}, D_t, D_{t+1})$, which are endogenously determined and are dependent on the state of the economy as well as the government's decisions. Note that while q^D depends on both types of debt, q^B is a function only of the debt B , as we assume that international investors do not have information about D . Taking these schedules as given, the government chooses (i) whether to repay its debt obligations to international investors; (ii) whether to repay its debt obligations to the NPC investor; (iii) if it decided not to default on the international investors, the next level of debt B_{t+1} ; or, (iv) if it decided not to default on the NPC investor, the next level of debt D_{t+1} . With this timing of events, there is no possibility of default at settlement and no rollover crisis (or "sunspot equilibrium").

The model described is a stochastic dynamic game with incomplete information. We focus on the Perfect Bayesian Equilibrium, whereby the government does not have commitments and players act sequentially and rationally. This equilibrium concept is similar to the traditional (Markov perfect) equilibrium used in sovereign default models, adapted to accommodate the fact that international investors have incomplete information about the sovereign debt to the NPC investor. In addition to the strategies, the equilibrium includes a system of beliefs, a probability distribution over the nodes in the information set that determines in which node of the information set players believe they are playing. In the present case, international investors need to have a belief about the level of the NPC debt; that is, a probability distribution of D_t , $\varphi(D_t/y_t, B_t)$. Strategies and beliefs satisfy (i) sequential rationality and (ii) consistency (each belief should be updated according to the strategies and Bayes' rule).

We calibrate our model to Angola, one of the largest countries in Africa, with a gross domestic product (GDP) of US\$125 billion. Since NPC lending is a recent phenomenon, we first calibrate the model without D type debt, making the

parameters consistent with the historical means of observable variables. We assume each period corresponds to one year and use Angola's GDP to calibrate the endowment process parameters. The parameters for output costs and intertemporal factor are chosen jointly to match Angola's average debt level and average interest spread. To calibrate the output cost of defaulting on the NPC debt, we resort to Angola's international trade information and use China's share of total Angola's trade. The working paper version contains details about the model and its calibration.

II. Simulation Results

We solve three versions of our model, representing past, present, and perhaps future environments: (i) the sovereign has access only to the international investors' market (no NPC investor), that is, the environment before the Belt and Road Initiative; (ii) the current situation, with both types of investors and incomplete information about the NPC debt; and (iii) an environment with complete information, in which the NPC debt is disclosed. Table 1 reports various results for the (invariant distribution) equilibria of these three economies.

Version 1 (shown in the top lines of the table) is mainly used for calibration. Since the NPC investor is not present, there are only two possible market access conditions: the sovereign either has access to the international investor market (column 1) or does not have access to any market (column 5). As the table shows, the probabilities of these two conditions occurring are 96.7 percent and 3.2 percent, respectively. Conditional on having market access, a sovereign's average debt is 42.5 as a percent of GDP, which is consistent with Angola's average debt during the last 16 years. We normalize the sovereign welfare level, measured by consumption, to zero.

Version 2 of the model represents the current situation and warrants more discussion. There are four market access conditions: (i) the sovereign has access to both types of investors (columns 3 and 4); (ii) the sovereign has access only to international investors (it has defaulted on the NPC debt) (column 1); (iii) the sovereign has access only to the NPC market (it has defaulted on the international investors) (column 2); and (iv) the sovereign does not have access to any credit market (it has defaulted on both types of debts) (column 5).

TABLE 1—DEBT AND WELFARE CALCULATIONS: INVESTORS TYPES AND INFORMATION ASSUMPTIONS

Market access	International	Non-Paris Club (NPC)	Both		None
	B	D	B	D	—
<i>Version 1. Without NPC investors.</i>					
<i>Welfare: 0%</i>					
Debt (% GDP)	42.5	—	—	—	—
Prob. (%)	96.7	—	—	—	3.2
<i>Version 2. With NPC investors, incomplete information.</i>					
<i>Welfare: 7.2%</i>					
Debt (% GDP)	24.7	6.7	20.3	9.6	—
Prob. (%)	27.5	11	24.7		36.8
<i>Version 3. With NPC investors, complete information.</i>					
<i>Welfare: 9%</i>					
Debt (% GDP)	38.5	0.1	16.5	1.0	—
Prob. (%)	62.2	2.5	32.5		2.8

With access to only one type of investor, the model's solution is similar to that of an economy with only international investors (version 1). The sovereign can take two actions: default or accept the next-period debt level. Default is more likely at higher levels of original debt and in low-endowment states. Next-period debt is an increasing function of this-period debt and of the endowment; that is, even though the sovereign wants to borrow more in tough periods, it is too expensive to do so (see Alfaro and Kanczuk 2004, 2009). When the sovereign has access to both credit markets, it can decide on four actions: whether to default on the international investors; whether to default on the NPC investor; and, conditional on not defaulting, whether to accept debt for the next period from international investors and NPCs. We find that these four policy options have exactly the same properties as before: (i) default (on a certain type of debt) is more likely with higher debt levels, (ii) default is more likely with lower output endowment, (iii) next-period debt (of a certain type) is higher with higher this-period debt (of the same type), and (iv) debt is higher for lower endowments.

As expected, what drives the novel results of our model is that it depicts how defaulting on one type of debt relates to the level of the other type of debt. Model simulations show that defaulting on international investors is more likely with higher NPC debt. (Similarly, the decision to default on NPC has the same characteristics.) The reason is that after having

defaulted, the sovereign can still use the NPC debt to smooth consumption and can do so more powerfully when it has higher debt (especially because the sovereign can default on NPC debt as well). Because the cost of defaulting on international investors is ameliorated by accepting higher NPC debt, it happens more often.

This is an important intuition that determines much of the debt sustainability results. There is some complementarity between the two types of debt. As a consequence, one should expect that the advent of NPC investors would reduce international investors' debt sustainability. The question is whether this is quantitatively relevant or not. Going back to Table 1, the second and third rows report the invariant distribution information for versions 2 and 3 of the model. It is easier to first analyze version 3 of the model, as this is more similar to version 1. Comparing version 3 with version 1, one can notice that the inclusion of NPC markets reduces the sustainability of the international investor's debt. When only international markets are lending, the average debt is 38.5 percent of GDP, which is close to the average debt in version 1. But its frequency drops from 96.7 percent to 62.2 percent, as the sovereign now has more options. The state with both credit markets operative occurs 32 percent of the time, but debt levels are small. The state in which both credit markets are closed occurs 2.8 percent of the time, less often than in version 1.

Notice that the NPC is more like a substitute than a complement to the international investor. But it is not a perfect substitute, as the sovereign uses this additional option to achieve more consumption smoothing. Another observation from version 3 is the asymmetry between the NPC investor and the international investors. Under full information, the only reason for asymmetry between the two types of lending is the different output costs from defaulting. Lower output costs from defaulting on NPC debt implies that the sustainability of this type of debt is much smaller than the international investor's debt.

Version 2 introduces another asymmetry between the two types of debt by assuming that NPC debt is not observable to international investors. As international investors reassess the probability of default, they cannot price debt with the same precision, and the sovereign benefits from this market are reduced. Consequently, as

in models of credit rationing, the equilibrium displays smaller amounts of international investors' debt. Note in Table 1 that the average debt is 24.7 percent when only the international investors' market is open, but this state happens only 27.5 percent of the time.

Another consequence of the incomplete information is that of increased NPC debt sustainability. This is expected if one sees the two types of debt as (imperfect) complements. With the increase in international investor debt price, the sovereign opts to borrow more from the NPC investor. Average NPC debt increases to 9.6 percent and 6.7 percent of GDP, respectively, in the states with both debts and those with only NPC debt. These numbers are much higher than they are in their correspondents in version 3, but they are smaller than the international investors' numbers (version 2). Thus, even though incomplete information reduces the difference in debt sustainability between the two types of debt, its effect is not strong enough to render NPC debt more sustainable than international investors' debt. In other words, incomplete information is not as strong a device to increase debt sustainability as default output costs are.

A final observation of Table 1 refers to welfare (reported as percent GDP). As expected, sovereign welfare increases from version 1 to 2 and from version 2 to 3. This calls for reflection and speculations about the present and future of undisclosed sovereign debt. Our results indicate that the welfare gains from tapping into the NPC credit market are substantial. Another present-day issue is the lack of transparency of NPC lending. Multilateral banks have expressed concern about this lack of transparency, listing it as a top priority. The IMF, in particular, is urging creditors to disclose more information.

III. Conclusion

By uniquely presenting a hypothetical scenario in which NPC lending and borrowing is fully disclosed, we illustrate that transparency has potential effects of decreased debt sustainability for investors such as China and significant welfare gains for recipient countries. We caveat the results by showing how they depend on the relationships between borrowers, traditional investors, and NPC investors.

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