China as a Lender: A Quantitative Assessment

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Abstract

This paper revisits the quantitative sovereign debt literature against the new realities of sovereign lending to developing countries. First, we review the recent stylized facts building on the data and findings from Horn et al. (2021, 2022) complemented with other sources. Countries with histories of chronic debt problems increasingly borrow (and default) from China with less-than-usual-transparent contracts, which are generally characterized by concessional loans with grace periods akin to multilateral lending. In the second part of the paper, we then construct and calibrate a sovereign default model in which Chinese lending reflects the new stylized facts. We find that Chinese loans increase overall default frequency and spreads, albeit small when Chinese lending entails grace periods as in data. This happens because these loans' availability increases indebtedness and the debt dilution problem. We then analyze the robustness of our results to different contract characteristics (such as collateral clauses). We end with a discussion of the assumptions and parameters of the model that need to be updated to explain the debt and default dynamics in countries increasingly borrowing from China

JEL Codes: F, H.

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1 Introduction

The landscape of sovereign borrowing has changed substantially over the past two decades.[1] Developing countries have increasingly met their funding needs from China, which has become one of the main official lenders. Yet little is examined regarding its implications in quantitative sovereign debt literature.[2] Building upon the recent efforts in data collection by (Horn et al., 2020, 2021, 2022; Gelpern et al., 2021) complemented with other sources,[3] we revisit the existing stylized facts on sovereign defaults and reassess the quantitative sovereign debt models against the new realities of sovereign lending.

Focusing on developing countries, we divide nations according to their primary source of borrowing (China, multilateral, or private). We distinguish two periods——pre- and post-rise of China's lending——and document differences across these two episodes in debt/default statistics. The new data highlights that: (i) Countries with histories of chronic debt problems (HIPC) borrow increasingly from China (ii) Recent defaults are usually to China, partial, and not clearly associated with identifiable bad states of nature, (iii) Sovereign states often are able to borrow soon(er) after default to China. (iv) Albeit less-than-usual-transparent contracts, these loans are generally characterized by concessional loans with grace periods akin to multilateral lending.

In the second part of the paper, building on these stylized facts, we construct and calibrate a parsimonious dynamic equilibrium model that focuses on the role of sovereign debt in smoothing consumption intertemporally and recognizes the role of China in competition with other lenders. We introduce several important components and contract characteristics of the China loans, grace periods, which are mostly absent in private debt issued as sovereign bonds but typical of concessional lending. For example, during the grace periods, we assume the sovereign does not make any payments for China loans, but these loans continue to accrue interest, which we model using a stochastic transition between grace and non-grace periods.

In the last section of the paper, extend the model by studying the interaction of China debt and multilateral debt. One important feature of countries China lend to is that multilateral loans is the largest component of the sovereign debt for these countries. Motivated by this fact, we augment the model with defaultable China debt and (senior) borrowing from multilaterals. Using the model, we aim to study how the decision to borrow and pay for the multilateral debt is affected from the existence and level of China debt together with how the terms of

[1] For historical perspectives and overviews of debt crises and stylized facts, see Eichengreen and Portes (1986), Eichengreen and Lindert (1992), Cohen and Sachs (1986), Ozler (1992), Dooley (1994), Kletzer and Wright (2000), Eaton and Fernandez (1995), Sturzenegger and Zettelmeyer (2006), Reinhart and Trebesch (2016), Tomz and Wright (2013), Panizza et al. (2009), Reinhart and Rogoff (2009a), Meyer et al. (2022). See Mitchener and Trebesch (2022) for recent characterization.

[2] Aguiar and Amador (2014), Aguiar et al. (2016), Uribe and Schmitt-Grohé (2017) overview the quantitative debt literature.

[3] Bank of Canada-Bank of England (Beers et al., 2020) sovereign default databases.

China debt are affected from the multilateral debt.

At a general level, the preliminary results have implications for the quantitative models that rely on non-measurable default cost parameters to match the existing moments in the data. In this literature, a precise mapping between data and models has always been challenging for a variety of reasons, including measurement issues and lack of data, conceptual inconsistencies between equilibrium objects and data, and choice of modeling assumptions (Aguiar and Amador, 2014; Panizza et al., 2009; Alfaro and Kanczuk, 2005; Tomz and Wright, 2013; Uribe and Schmitt-Grohé, 2017). We discuss the fit of the standard model and the parameters that need to be updated. Therefore, an important contribution of the paper is to clarify the quantitative importance of fundamental mechanisms and their implications for policy by carefully examining the newly published debt and default data in the context of sovereign default models.

At a micro level, preliminary quantitative results show that the existence of Chinese loans with grace periods, as opposed to standard sovereign bonds, makes these loans more attractive during grace periods and forces the sovereign to accumulate more debt during these periods. Such incentives exacerbate the debt dilution problem present in these models with long-term debt. As a result, in the presence of China loans, the sovereign experiences a higher default rate consistent with the observations in the data.[4] We aim to study the robustness of the results and the role of different contract clauses, such as the role of collateral.

Related literature. Our work adjoins the recently emerging empirical research on Chinese overseas lending with the quantitative sovereign default literature. Some of our results depend crucially on various assumptions that have been at the core of traditional sovereign debt models, such as defaulting costs and exclusion (Bulow and Rogoff, 1988; Eaton and Gersovitz, 1981; Cole and Kehoe, 1995; Alfaro and Kanczuk, 2005; Arellano, 2008; Mendoza and Yue, 2012; Uribe and Schmitt-Grohé, 2017). These assumptions have been known to be crucial for debt sustainability. China has reshaped world trade and international lending in recent decades. Low- and middle-income countries increasingly rely on financing from non-traditional sources, particularly following the Global Financial Crisis (Horn et al., 2021; Alfaro et al., 2019).

The change in the composition of sovereign debt is significant in the context of data gaps in this literature. Bond data has been available since the early 1800s, and important terms such as prices, maturities, and the issuance amount are documented transparently (Meyer et al., 2022). Similarly, loans by the London Club's commercial banks and the Paris Club's member states extended mainly during the 1970s and 1980s are relatively well documented

[4] Despite the attractiveness of China loans during the grace periods, the absence of payments in grace periods makes the price of these loans lower than private bonds and makes them less attractive in normal times, which generates a lower level of Chinese loans compared to private bonds consistent with the data.

(Schlegl et al., 2019).[5] However, considerable shares of these loans have been replaced with Chinese official bilateral loans and Chinese commercial bank lending since the 2000s. They are arguably less transparent and require substantial work to document the loans' terms of the loans (Horn et al., 2021, 2022). Notably, the vast majority of defaults during the 2000s were on these less transparent and sporadically documented loans. Gelpern et al. (2021) highlight the similarities and differences between the terms in China's lending and standard commercial lending and official bilateral loans. The declining number of documented defaults, along with the rising debt during the 2000s, was referred to as a puzzle labeled "missing defaults" in Bredenkamp et al. (2019). After documenting a large set of unreported defaults on China loans during the 2000s, Horn et al. (2022) amended the term to "hidden defaults".

Recent work has begun to document and analyze the effects of China on world financial markets (e.g., Horn et al., 2021; Horn et al., 2020; Agarwal et al., 2019; Clayton et al., 2022) with a emphasis in the interaction against private lenders (see Alfaro and Kanczuk (2022), Guler et al. (2022), Kondo et al. (2024).[6] This paper focuses on its competing role in multilateral and bilateral lending. In contrast to traditional lending, China's lending is official since the loans are extended by the Chinese government, state-owned banks, or other state-owned enterprises. As countries increasingly transition to non-traditional markets and non-atomistic players such as China, the consequences of defaulting may differ from the previous episodes.

The rest of the paper proceeds. Section 2 describes the data and the main stylized facts. Section 3 advances the calibration exercise discussed in Section 4. Section 5 analyzes the robustness of the results. The last section concludes.

2 Sovereign Debt: Recent Developments and Stylized Facts

We review the recent stylized facts building on the data and findings from Horn et al. (2021, 2022, 2020) and complement them with information from Gelpern et al. (2021), World Bank (2022a), and Bank of Canada-Bank of England (Beers et al., 2020) sovereign default databases. The data appendix describes the sources in detail. As explained in the appendix, some of the Horn et al. (2021) revised data ended in 2017 and were updated in Horn et al. (2022), distinguishing further between Chinese banks and government loans. We use this as our main source of data. We complement with other sources from the Bank of Canada, Bank of

[5] Paris Club refers to a group of advanced countries that are significant creditors of official government to government lending. These countries usually conduct collective debt treatments for highly indebted official debtors with payment difficulties. London Club is a similar group composed of commercial banks that extended large loans to low-income countries during the 1970s and 1980s and negotiated the corresponding restructurings. See Das et al. (2012) and references therein for a more detailed discussion on these clubs and their role in sovereign debt restructurings.

[6] This paper also complements previous research that has studied the role of sovereign-to-sovereign capital flows and lending (Alfaro and Kanczuk, 2009; Alfaro et al., 2014; Horn et al., 2020).

England, and World Bank.

The standard definition of restructuring used by credit rating agencies considers all loan term adjustments that resulted in less favorable terms for the creditors (reduced interest rates, maturity changes, write-offs; Cruces and Trebesch, 2013). As noted by Horn et al. (2021, 2022) and Ams et al. (2019), standard default data sets such as World Bank's Debt Reporting System, Standard and Poor Global, and Fitch ratings do not include many of the defaults to China. World Bank Debt Reporting System includes only voluntarily reported data, and missing information likely reflects a lack of reporting. Rating agencies, on the other hand, use a wider set of data sources but do not include defaults on official bilateral loans. A possible reason for "missing defaults" in the rating agencies' data sets, therefore, could reflect the fact that the loans extended by Chinese Banks are considered under official bilateral loans. However, as shown recently by Gelpern et al. (2021), the terms of these loans are usually less favorable than official loans, even in some cases more restrictive than commercial loans. The appendix presents a comparison of the data.

Data for private creditor, bilateral and multilateral debt comes from the bilateral section of the International Debt Statistics database maintained by World Bank (2022a). The sample focuses on public and publicly guaranteed debt of low- and middle-income countries by creditor type as the primary reporting sources focus on these types of countries.[7] Private creditors include bondholders, banks, and other private entities. Paris Club includes twenty-one permanent Paris Club members. Other bilateral includes all other government-to-government debt except China. Government-to-government lending data comes from its bilateral section, aggregated by country.

2.1 Debt Levels—Countries with Histories of Chronic Debt Problems Increasingly Borrow from China

Figure 1 displays the evolution of outstanding public and publicly guaranteed external debt between 2000 and 2019 in billions of nominal USD and about the GNI divided between the debt owed to China and other creditors to low and middle-income countries. The debt to GNI ratio is computed as simple averages to avoid that large country over-proportionally influencing the figures.

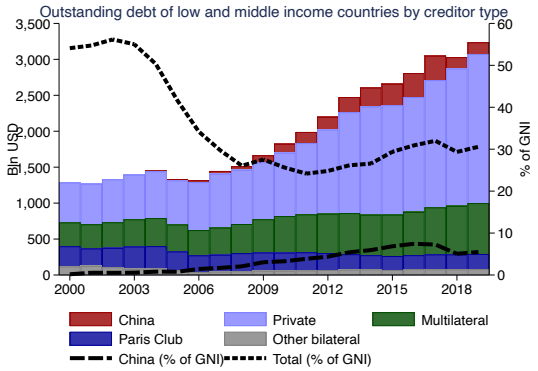
Debt levels have risen sharply since the onset of the financial crisis of 2008-09 across developing countries following easy financial conditions and prolonged periods of low-interests Alfaro et al. (2019). Outstanding debt levels increased by a factor of almost 2.5 from 1 trillion USD (2006) to 2.5 trillion (2017) and close to 3 trillion by 2019. On average, outstanding debt as a percentage of GNI decreased from 55% in 2000 to 28 before the GFC, a reduction

[7] In the appendix, we show the main results to be robust to transitioning middle-income countries to high development levels during the sample period.

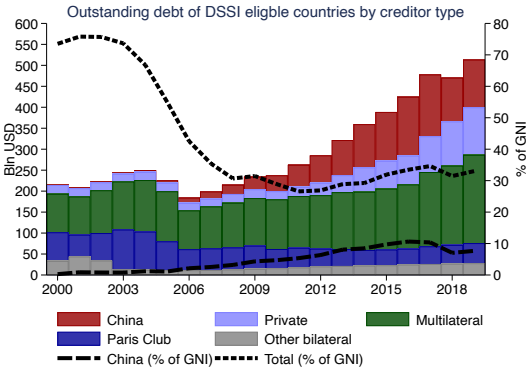
that accounts for several HIPC initiatives. After the GFC, there is an increase to 30 percent of GNI by 2019.[8] This averages, however, mask significant heterogeneity.

Figure 1: Evolution of public and publicly guaranteed debt in low- and middle income countries by creditor type

(a) *All countries*



(b) *DSSI eligible countries*



Notes: Figure 1 displays the evolution of public and publicly guaranteed debt of low- and middle income countries by creditor type. Private creditors include bondholders, banks, and other private entities. Paris Club includes twenty-one permanent Paris Club members. Other bilateral includes all other government-to-government debt except China. Data for private creditor, bilateral and multilateral debt comes from the bilateral section of the International Debt Statistics database maintained by World Bank (2022a). Government-to-government lending data comes from its bilateral section, aggregated by country. The indicator is DT.DOD.DPPG.CD. Gross National Income (GNI) Shares are computed using the supplementary indicator NY.GNP.MKTP.CD from the same database. For the Chinese debt data, we the bilateral data of the database for the period up until 1999 and from 2018 to 2019. From 2000 to 2017, we replace the data with estimates from Horn et al. (2021) if available to account for "hidden" debts.

In the same period, as noted by Horn et al. (2021), there has been a growth in lending from China (many hidden in traditional sources).[9] China expanded its lending volume from a negligible amount before the GFC to 300 billion USD in 2017 and now accounts for 1/5 of outstanding debt relative to GNI.[10] The exposure to Chinese debt is higher today for most countries, with both the volume and number of countries borrowing from China increasing from 2000 to 2017. In 2017, on average, low and middle-income countries had outstanding debt, with China worth 10%

Countries with a history of chronic debt problems increasingly borrow from China, a fact noted by Horn et al. (2021, 2022). Panel B in Figure 1 highlights that most of the lending happens to the 73 countries eligible to receive debt relief via the Debt Service Suspension

[8] We do not account for countries entering and leaving the sample during the period. For instance, Afghanistan only reports debt figures after 2006, while some countries that are now high-income leave the sample over the years. These are primarily Eastern-European countries and countries that graduated like Chile, Trinidad & Tobago, and Uruguay. See appendix for further discussion and analysis.

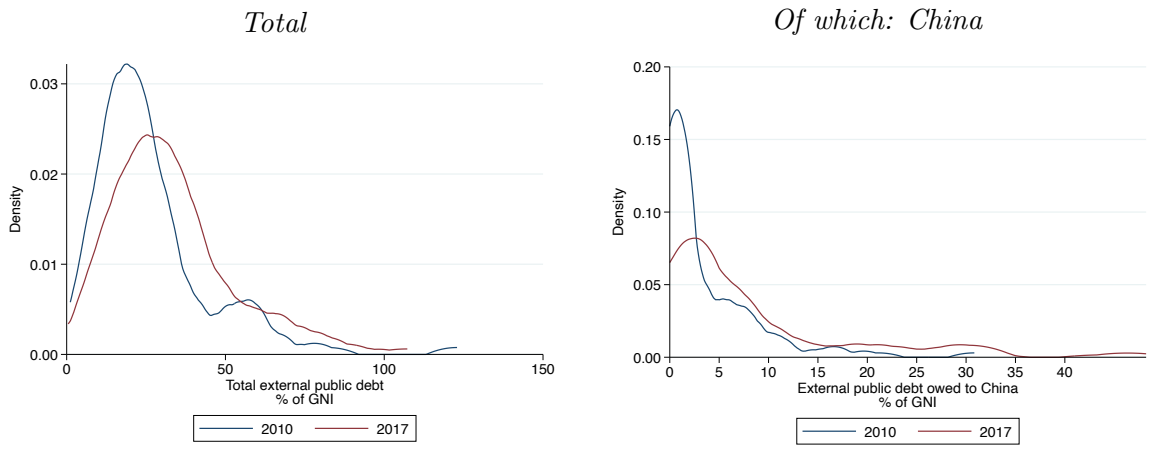
[9] See Figure 18 in Horn et al. (2021).

[10] Note that many countries do not report the debt to China because they do not borrow. However, the sample for outstanding debt with China only comprises countries with outstanding debt, thus effectively excluding many zeros from the sample. The figure represents those countries with outstanding debt with China rather than an average over the whole sample.

Initiative (DSSI). In 2017, $125bn out of $250bn outstanding Chinese debt was lent to these countries, equivalent to 12% of their GDP.[11] In contrast, lending by other bilateral creditors was stagnant over the past 15 years.

Figure 2 compares the distribution of debt levels within the sample between 2010 and 2017. The Epanchnikov kernel densities are computed from all available data in the two years. The left panel displays the distribution of total debt levels, and the right one the levels of debt owed to China. More countries have higher debt levels in 2017 than in 2010, as displayed by the right-shift of the density function. Yet, there is a lower probability mass at its most-right tail. The distribution of debt levels owed to China has shifted to the right, and the right tail, which contains countries that owe more than 10% of their GNI to China, is more pronounced, and some countries even owe 30% and 37% of their GNI to China, respectively.

Figure 2: Kernel density: External public debt, outstanding



Notes: Figure 2 displays the probability density function estimated with an Epanechnikov kernel.

2.2 Restructurings and Default: Recent Defaults are Usually to China

Figure 3 details the default and restructuring count between 1970 and 2019 for each creditor type (private creditor vs. China) by the geographical distribution of defaults. Countries are divided into regions into Sub-Saharan Africa, Latin American & the Caribbean, and other countries, as defined by the World Bank's geographical country classification. Default entry data comes from Horn et al. (2021). Analogous to Reinhart and Rogoff (2009b), default episodes are merged into one if there is only one year between the exit of the first and entry into the next. The same adjustment has not been made for the Chinese default case data.[12]

[11] The Horn et al. (2021) series end in 2017 and the drop in outstanding debt shown in the graph is due to missing or under-reported data in the IDS database.

[12] Implementing this adjustment would reduce the number of default episodes with China over the whole sample by 11. We use different data sets in this exercise, see appendix for robustness.

Table 1: Default statistics

Private debt				
HRT	# of defaults	default rate of defaulters, %	average duration, years	default rate of borrowers, %
Post-2000	20	7.69	2.30	1.10
Pre-2000	140	8.05	4.29	4.76
Pre-2019	160	5.25	4.04	3.17
BOC/BOE				
Post-2000	79	7.90	4.20	4.34
Pre-2000	239	8.05	9.53	8.13
Pre-2019	318	6.17	8.21	6.30
China loans, all				
HRT and BOC/BOE matched, broadly				
Post-2008	34	12.32	1.76	4.29
Post-2000	86	8.96	1.42	6.32
HRT and BOC/BOE matched, narrowly				
Post-2008	26	12.04	1.15	3.28
Post-2000	76	8.64	1.11	5.59
China loans, banks				
HRT and BOC/BOE matched, broadly				
Post-2008	16	11.11	1.63	2.02
Post-2000	21	6.56	1.67	1.54
HRT and BOC/BOE matched, narrowly				
Post-2008	12	11.11	1.25	1.52
Post-2000	16	6.67	1.31	1.18

Notes: Table 1 documents default statistics on private debt and China loans. The sample includes all countries that borrowed from corresponding lenders over the corresponding periods indicated in the first column of the table. Default rate of defaulters is calculated by the total number of defaults divided by the total number observations in a sample that includes all countries that defaulted at least once during the corresponding period (Uribe and Schmitt-Grohé, 2017). Default rate of borrowers reflect the default rate among countries whose debt stock from the corresponding lender reached at least one percent of their GDP during the corresponding period. BOC/BOE refers to Bank of Canada and Bank of England default database by Beers et al. (2020), and HRT refers to the Horn et al. (2022) database. While the HRT data set reports defaults on China's banks and government separately, it omits the duration of defaults. BOC/BOE database, on the other hand, does not distinguish the defaults on China loans, yet reports the duration of defaults. The two default data sets do not overlap completely since they use varying sources to identify defaults and involve judgment calls for symbolic defaults in the case of HRT database. These databases are matched for two reasons: first, to calculate the duration of defaults on China loans separately for banks and government; and second, to reach a consensus on the set of defaults. The narrow approach matches the defaults in the two data sets for each country, if the restructuring of the HRT data occurs within a default episode in BOC/BOE data. The broad approach, instead, matches the defaults in the two data sets as long as the restructuring in the HRT database occurs within five years after the start of the default in BOC/BOE database. The private default statistics are reported separately for BOC/BOE and HRT since duration statistics of defaults on private debt is available in both data sets.

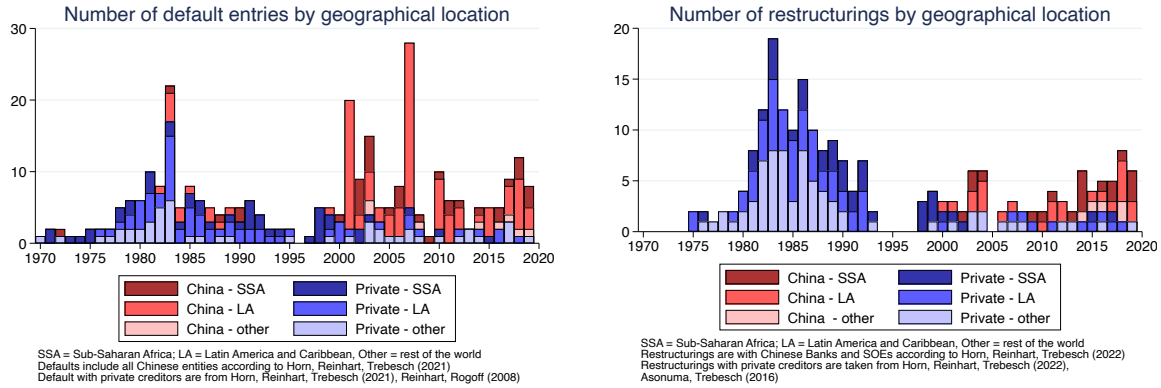
Countries default on Chinese debt more often. As the figure shows, the bulk of defaults in recent times is to China, as documented in Horn et al. (2021, 2022).[13] Defaulting countries to China, concentrated in African and Asian countries, do so with higher frequency.[14]

[13]In Latin America, Ecuador, Venezuela, Argentina, and the small Caribbean states defaulted to private creditors in the 2000s. 'Serial' defaulters with private creditors are Argentina, Peru, Ecuador, Venezuela, and Jamaica.

[14]There are differences among data sets in terms of defaults. See Appendix for a discussion. Among the 68 countries that defaulted on Chinese debt in our sample, 38 did so repeatedly, and 24 defaulted at least 3 times. 39 countries defaulted on Chinese debt in Sub-Saharan Africa, 5 in Latin America, 9 in East Asia, 5 in South Asia, and another 6 in Europe. China's defaults, particularly 'serial' defaults, are concentrated in Sub-Saharan Africa. Countries that default more than four times are Sudan, Gabon, Angola, Zambia, Zimbabwe, and Mozambique, followed by several countries that default 3 times: the Republic of Congo, the Democratic Republic of Congo, Niger, and Chad. Venezuela, Cuba, and countries in China's periphery, Myanmar and Thailand, default with them on other continents.

Figure 3: Number of sovereign defaults and restructurings by geographical region and creditor

Default *Restructuring*



Notes: The figures display the number of defaults (Panel A) and debt restructurings (Panel B) by creditor type and geographical region. "Other" includes countries in Eastern Europe, Central Asia, South and South East Asia, as well as North Africa. Restructurings of "Other" entails the series of defaults in European countries in the 1970s and early 1990s with private creditors. We use the beginning of the restructuring episode with private creditors. The series starts in 1975. We only have the completion dates of debt restructurings with Chinese banks. The series starts in 2000 and the sources are Horn et al. (2021, 2022).

The first wave of defaults that began in the late 1970s and peaked in the 1980s was mostly to private creditors and concentrated in Latin American and African countries with defaults as well in Turkey, Indonesia, the Philippines, and the Eastern European countries in the early 1990s (grouped under "other countries).[15] HIPC initiative took effect in the late 1990s and 2000s. Defaults in Africa until 2007 are closely related to the HIPC initiative.

Countries Default to China At Lower Debt Levels. Figure 4 displays all defaults with private creditors (blue) and China (red) along with their respective outstanding debt levels. The dotted lines show the average debt levels across defaulters over time. While some countries appear to default only when debt is already relatively high, most countries default at debt levels below 50% of GNI.[16] The figure also underscores the frequent defaults in this period.

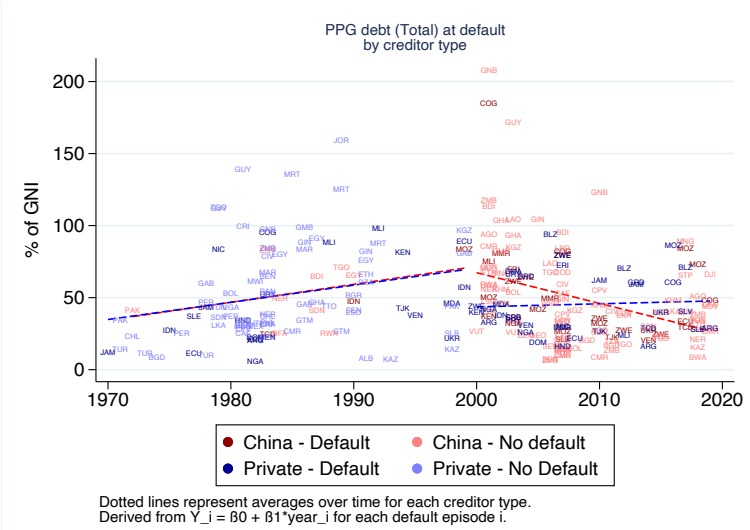
The majority of 'newcomers' default at debt levels between 25 and 75% of GNI.[17] Most countries that default on Chinese debt do not do so on their private creditor debt. Vice versa, countries that defaulted on private creditor debt after 2000 did not do so on Chinese debt, except Ecuador, Zimbabwe, Mozambique, Mali, Myanmar, Kenia, and El Salvador.

[15] On average, 4.1 countries defaulted on private debt between 1970 and 1999.

[16] Debt levels increased in recent years, but so did the variation in debt at default.

[17] Following several HIPC initiatives, the late 2000s and early 2010s were marked by relatively low debt levels across all countries.

Figure 4: Public and publicly guaranteed debt in the year of default entry over time.

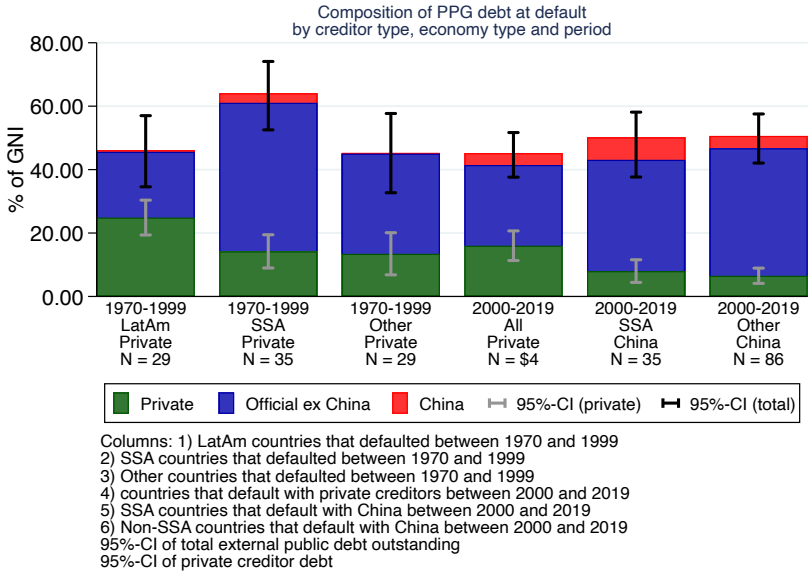


Notes: The figure displays the evolution of the total outstanding public and publicly guaranteed external debt expressed in percent of Gross National Income. The defaulters include all countries that defaulted with private creditors after 2000.

Figure 5 displays the average composition of public external debt in defaulting countries across geographical subgroups by creditor type alongside 95% confidence bounds and Appendix Figure 14 displays the average debt levels in countries across all default episodes by creditor.[18] The figures reveal the exceptionally high share of debt owed to private creditors during the wave of defaults in the 1970s/1980s. Yet, across countries, average debt levels do not differ significantly from the Latin American crisis, often the focus of empirical analyses. On the other hand, on average, countries in Sub-Saharan Africa that default on Chinese debt have 10 percentage points lower levels outstanding than during the wave of defaults on their private debt, and debt owed to private creditors has decreased substantially. Since the first wave of Chinese debt restructuring, associated with debt relief through the HIPC initiative, most countries in 2010 and 2017 have lower outstanding external debt relative to GNI than during their default years (Debt Intolerance, Reinhart et al., 2003).

[18]Some countries do not report data on outstanding debt, most notably Venezuela. No available data for countries in both years indicates that the country never defaulted, e.g., Colombia, Namibia, and Lybia. The averages exclude missing observations. If a country defaulted only once, the level of debt at this default equals its average. There are exceptions, however. In particular, Chad, Niger, Cameroon, Mali, and Sudan.

Figure 5: Composition of public and publicly guaranteed debt in the year of default



Notes: Figure 5 displays the average debt levels and their composition by country type. Countries are divided by geographic subregion and default counterparty.

2.3 Cost of Default and Market Exclusion

2.3.1 Defaulting to China is Not Associated with Identifiable Bad States of Nature

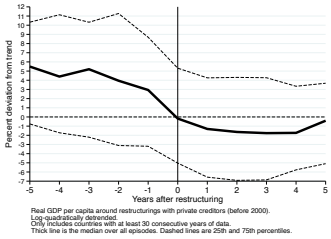
Following Uribe and Schmitt-Grohé (2017), Figure 6 displays the evolution of real GDP per capita around the beginning of the restructuring episode with private creditors or the completion of restructurings with Chinese creditors. Real GDP per capita is log-quadratically de-trended.[19] We complement the analysis by replicating the findings from Borensztein and Panizza (2009) using the same regression design on a country-year-augmented dataset (see Appendix for further details). Defaulting to China does not appear to be associated with clear output cost. Only 16% of today's defaults with China happened during a recession in the 2000s default (compared to 39% of private creditor defaults).[20]

[19] De-trended series using the Hodrick-Prescott filter yields similar quantitative results.

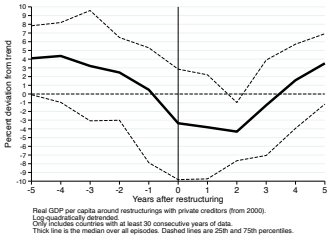
[20] Recession is defined as a year with negative real GDP growth. Even after excluding cases that involved countries that received debt relief through the HIPC initiative, the share is only 14%. Costs of default might be lower, thus reducing the incentive to commit to debt service until an outright crisis occurs. See Asonuma and Trebesch (2016); Trebesch and Zabel (2017) who studied the output cost of sovereign default and found that "pre-emptive" (AT) or "soft" (TZ) defaults are associated with lower output costs.

Figure 6: Evolution of real GDP per capita around debt restructurings

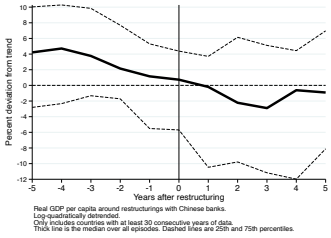
(a) *with private creditors, 1970 - 1999*



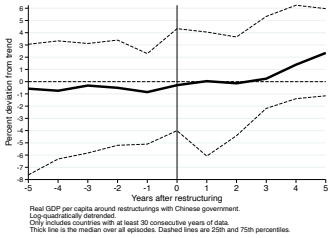
(b) *with private creditors, 2000 - 2019*



(c) *with Chinese banks, 2000 - 2019*



(d) *with the Chinese government, 2000 - 2019*



Notes: Figure 6 displays the evolution of real GDP per capita around the beginning of the restructuring episode with private creditors or the completion of restructurings with Chinese creditors. Real GDP per capita is log-quadratically detrended. The median is computed from countries with more than thirty years of GDP data. We use the indicator NY.GDP.PCAP.KN from the World Development Indicators database maintained by World Bank (2022b).

2.3.2 Sovereign States Often can Borrow Soon(er) after Defaulting to China

We next look at the length of market exclusion in the modern period. To define market access, we make use of instrument-level datasets provided by Refinitiv Eikon (bonds) and Horn et al. (2021) and define market access as every year in which a debtor country successfully takes on debt with the respective creditor type.[21] Similar to Cruces and Trebesch (2013); Gelos et al. (2011), we restrict the market access to cases in which the debt level outstanding with the respective creditor type increases.[22] We define the length of market exclusion as the time between the *beginning* of the default episode and the subsequent debt issuance that meets the criteria above. In Figure 7, the definition of market access restricts the amount issued to be at least 1% of GDP.

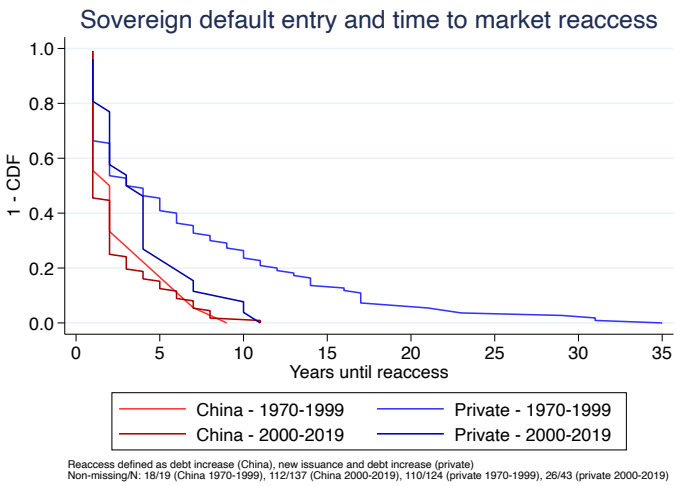
When defaulting to China, the exclusion of defaulting debtors from new loan commitments

[21] In the case of China, we use the year of loan commitment. However, we know that disbursements may vary by contract, as pointed out by Horn et al. (2021).

[22] In particular, we use the information from IDS for the bond data. The indicators DT.NTR.PBND.CD and DT.NTR.PCBK.DT provides the net transfers of debt for bonds and banks, respectively. For the Chinese data, we use a dummy that takes 1 if the debt level at the end of the current year is higher than in the previous year, based on the estimates by Horn et al. (2021).

in terms of average and median exclusion length is shorter (See Figure 7).[23] The median country enters a loan agreement with China after only two years of market exclusion, while it takes four years to borrow from private creditors after defaulting on its debt. Exclusion lengths for private creditors are higher.[24] The cumulative distribution of market exclusion length is much more right-tailed for private creditors.[25]Many countries maintain or even increase their debt exposure to China even after defaulting several times, (Figure 5).

Figure 7: Market access after default



Notes: Figure 7 displays the cumulative distribution of market exclusion length after default entry by creditor type and sample period.

2.4 Terms of Chinese lending: less transparent but with grace periods

This section draws on a number of papers describing the terms and conditions of distressed debt restructurings with Chinese creditor entities, especially Acker et al. (2020), Horn et al.

[23]There are two important limitations to keep in mind. We define market access ex-post; we only consider the event of issuing successfully. However, governments may be able to issue debt sooner but refrain from doing so due to debt sustainability concerns. We measure market access via the demand side, forgoing over supply-side issues, e.g., factors that shift the availability of funds in the market to access. Lastly, as a gross issuance measure, our market access dummy might capture debt issuances that follow a debt restructuring. In this case, the issuance may not reflect access properly as investors might abstain from lending new funds. While it may be possible to disentangle these two on the bond level, we do not have sufficient information on the terms of Chinese loans. However, it is unclear to what extent restructurings might involve new debt components.

[24]Gelos et al. (2011) had find that countries regain partial market access after 4.7 years (our total estimate: 5.2), while Cruces and Trebesch (2013) are substantially higher with an estimated exclusion length 13.1 years.

[25]However, this might be caused by our sample limitation. Restructuring debt with China might be much more efficient and payment difficulties easier to resolve, thus enabling a country to reenter debt agreements earlier.

(2021), and Horn et al. (2022) who compare the characteristics of Chinese debt restructurings with private creditors and Paris Club credit events.[26]

Table 2 displays summary statistics of the loans' main characteristics in the dataset by loan type: Annual volumes, interest rates, maturities, and grace periods. The commitment amount is available for all loans in the dataset, except for four zero-interest loans. Hence, the values for volumes in the last two columns serve as a benchmark for assessing the data availability of the remaining variables. For instance, out of 554 commercial loans in the dataset, information on interest rates is available for 232 loans (41% of the observations), equivalent to 27.8% of the total loan volume. Thus, smaller loans are overrepresented in the statistics for interest rates. Data availability is generally better for concessional loans. No interest rate data is available if there is no information on the loan type. In the dataset, commercial loans account for the lion's share of the total volume granted by Chinese creditors. The total volume we cover is $346bn, or 72% of all loans. They have the most significant amounts, charge higher interest rates, and have shorter maturities than the other loan types.

Table 2: Summary statistics of Chinese loan-level data

Loan type	variable	mean	std. dev	median	min	max	Vol. nonmissing	N loans / % volume nonmissing
Commercial	Volume	624.6	1,671.7	114.9	2.0	20,000.0	346,029.7	554 / 100%
Concessional	Volume	154.3	268.9	74.9	1.0	4,001.0	67,577.5	438 / 100%
Zero-Interest	Volume	20.7	50.2	8.0	1.0	429.0	1,569.8	76 / 100%
Unknown	Volume	212.8	358.1	91.2	0.5	2,700.0	74,903.7	352 / 100%
Commercial	Interest rate	5.2	1.5	5.0	0.0	7.1	96,374.8	232 / 27.8%
Concessional	Interest rate	2.1	0.5	2.0	0.0	4.0	52,872.7	299 / 78.2%
Zero-Interest	Interest rate	0.0	0.0	0.0	0.0	0.0	1,569.8	80 / 100%
Unknown	Interest rate							0 / 0%
Commercial	Maturity	11.5	4.7	15.0	2.0	27.0	160,272.7	257 / 46.3%
Concessional	Maturity	19.3	3.8	20.0	8.0	40.0	50,433.3	304 / 74.6%
Zero-Interest	Maturity	16.8	6.1	20.0	10.0	30.0	110.9	15 / 7.0%
Unknown	Maturity	17.2	4.4	20.0	10.0	30.0	6,567.8	34 / 8.7%
Commercial	Grace period	3.7	1.3	4.0	1.0	8.0	114,287.1	219 / 33.0%
Concessional	Grace period	6.0	1.6	5.0	0.0	11.0	42,017.2	262 / 62.1%
Zero-Interest	Grace period	9.2	1.9	10.5	6.0	11.0	67.4	10 / 4.2%
Unknown	Grace period	4.6	0.7	5.0	3.0	6.0	4,457.7	29 / 5.9%

Notes: Table 2 documents summary statistics of the Chinese loans based on the Chinese loan database by Horn et al. (2021). Summary statistics are computed based on all available data points for the respective variable. The category "Unknown" represents all observations for which no information about the loan type is available. The column "No.miss. total" gives the total volume of overall observations for which data for the variable is available. N refers to the number of available observations. "volume nonmissing" refers to the percent of the total volume for which information is available by loan type. The total number of observations is 1,443. Volumes are in mln. Interest rates are in annual percent. Maturity and grace periods are expressed in years.

Additional analysis breaks down the lending volumes at the annual level for each loan type (available upon request). Commercial and concessional loans were at par with the

[26]The authors gather detailed information on restructurings of debt owed to banks and SOEs and debt owed to the government separately. The authors find that restructurings of debt owed to the Chinese government are mostly "symbolic" and concern tiny amounts. Most debt is canceled and written off as part of China's development aid program.

Table 3: China loans vs private debt

2000-2019	Grace Period, years	Maturity, years	Interest Rate, %
China loans			
Commercial	3.72	11.50	5.21
Concessional	5.95	19.30	2.10
Zero-Interest	9.19	16.77	0.00
Total	4.32	13.37	4.07
Private debt	3.84	12.30	4.76
Official debt	5.89	24.12	2.18
US 3-year rate			2.34
EMBI Global			4.13
1970-1999			
Private debt	2.16	9.43	8.01
Official debt	6.44	25.89	4.2
US 3-year rate			7.83

Notes: Table 3 documents summary statistics of the Chinese loans based on the Chinese loan database by Horn et al. (2021). Summary statistics are computed based on all available data points for the respective variable. Private and official loan terms are calculated using simple averages across debtor countries in the International Debt Statistics of the World Bank. Interest rates are in annual percent. Maturity and grace periods are expressed in years. US 3-year rate refers to the average Treasury rate for the given maturity during the corresponding period. See Appendix for a detailed description of the data sources.

respective number of loans granted. However, starting in 2015, the number of concessional loans decreased.[27] Zero-Interest loans were only granted in exceptional cases, and non was granted in 2016-17. Each year, the total volume granted on commercial terms far exceeds those of the remaining types. The number of countries to which loans were granted increased over the 2000s and peaked between 2009 to 2014, when up to 79 received loans from China.

Concessional loans consistently had average maturities of around 20 years attached to them, while loans with commercial terms had a maturity of around 8 to 12 years. Zero-interest loans varied between 10 and 30 years; however, data availability is minimal. Unknown type loans, on average, had maturities between 12 to 25 years. Concessional loans were typically granted with an interest of around two percent, while commercial term loans, on average, had an interest rate of about 3 to 6 percent attached to them. Coverage generally is much lower for interest rates than maturities, both in terms of the number of loans and the volumes granted. As expected, loans on commercial terms have even more sparse data. In some years, we only have information on interest rates for loans equivalent to 5 to 20% of the total volume lent. Loans of unknown types are not displayed in the table because almost no information is available regarding interest rates.

[27] The volume and number of loans for which we do not have any information about the loan type are similar to the concessional loans.

Table 4: Major borrowers, 2000-2019

Country	Default rate		σ_y	σ_c	$\sigma_{TB/y}$	σ_c/σ_y	ρ_y	$corr(c,y)$	$corr(TB/y,y)$	Debt to GDP			Interest rate		Maturity		EMBI Spread	$\Delta y_{t:D_t=1}$		$y^c_{t:D_{t+1}=1}$	
	Private	China								Private	China	Total	Private	China	Private	China		private	China	private	China
Major borrowers of private debt																					
Argentina	10.0	0.0	9.4	10.6	4.1	1.12	0.78	0.87	-0.42	21.9	0.4	29.6	6.5	3.5	12.6	13.7	6.9	-4.2		-4.2	
Brazil	0.0	0.0	5.9	4.5	1.8	0.76	0.78	0.91	-0.45	6.8	0.3	9.6	6.0	4.0	11.6	12.0	4.2				
Colombia	0.0	0.0	4.6	3.3	1.6	0.71	0.85	0.69	0.11	10.8		18.4	6.5		13.9		3.1				
Egypt, Arab Rep.	0.0	0.0	3.1	3.4	2.2	1.12	0.80	0.53	-0.26	2.9	0.3	22.9	4.0	4.1	10.7	7.6	3.2				
Mexico	0.0	0.0	2.4	3.2	0.7	1.31	0.72	0.82	-0.40	14.1		16.4	4.4		21.8		2.4				
Philippines	0.0	0.0	1.8	1.9	2.8	1.07	0.68	0.61	-0.21	10.6	0.1	23.4	5.5	2.3	14.2	17.9	2.7				
Turkey	0.0	0.0	4.6	4.4	2.9	0.96	0.60	0.94	-0.70	11.2	0.0	14.9	5.9	3.8	10.9	8.6	3.8				
Mean	1.429	0.000	0.045	0.045	2.303	1.008	0.745	0.768	-0.332	11.190	0.226	19.321	5.471	3.547	13.743	11.982					
Mean ex ARG	0.0	0.0	3.7	3.5	2.0	0.99	0.74	0.75	-0.32	9.4	0.2	17.6	5.4	3.6	13.9	11.5	3.2				
Major borrowers of China loans																					
Angola	0.0	5.0	14.9	12.2	10.9	0.82	0.97	0.30	0.46	23.6	7.1	39.5	5.1	3.9	8.6	13.9	6.4		-5.8		-4.5
Cameroon	0.0	5.0	4.3	3.1	1.9	0.73	0.89	0.93	0.70	1.3	2.7	28.5	3.5	2.2	9.6	18.2			0.8		5.3
Ecuador	5.0	5.0	5.4	4.8	2.4	0.89	0.80	0.81	-0.09	15.1	2.4	30.5	6.2	5.3	9.6	12.1	8.5	4.6	-0.5	-0.1	-1.9
Ethiopia	0.0	5.0	6.4	7.2	3.3	1.12	0.74	0.78	0.22	4.9	3.0	36.6	3.5	2.3	12.2	18.2			4.9		0.8
Sri Lanka	0.0	10.0	4.0	3.2	2.4	0.78	0.87	0.54	-0.58	8.6	2.7	38.4	5.0	3.0	9.1	18.2	5.1		5.3		1.1
Mozambique	15.0	5.0	1.7	5.5	11.0	3.24	0.27	0.66	-0.25	4.9	4.5	48.6	2.2	1.8	16.1	19.4		3.0	0.5	2.0	-2.0
Senegal	0.0	5.0	2.8	2.4	2.4	0.87	0.65	0.37	-0.11	4.0	2.1	35.6	5.4	1.8	11.5	19.7	4.7		-1.4		-0.4
Mean	3.750	5.625	0.070	0.062	6.530	1.140	0.821	0.604	0.163	8.310	3.222	35.976	4.341	2.738	11.448	17.271					

Notes: Debt levels, interest rates, and maturities were computed based on the sample 2000-2019 for all countries in the group. The sum of private and China debt may differ from total debt since the total includes other debt components such as official bilateral and multilateral loans. Interest rates and maturities of country-year pairs in which no borrowing from the respective creditor took place were excluded. Interest rates and maturities refer to newly disbursed debt. y, c are log-quadratically detrended GDP and consumption, and TB/y is the trade balance. σ denotes standard deviation and $corr()$ the correlation. Default rates are computed as the share of years in which countries sought to restructure their outstanding debt. We use JPMorgan's EMBI+ Index to compute the spreads during non-restructuring years- all years in which a country does not negotiate a debt restructuring. Columns $\Delta y_{t:D_t=1}$ displays the contraction in real per capita GDP in the year a country seeks a restructuring. Columns $y^c_{t:D_{t+1}=1}$ display the percent deviation from the trend in a country in the year before it sought to restructure its debt. It reflects the position in the business cycle. All indicators that refer to restructuring episodes specifically are averaged over all episodes for which data is available if a country restructured its debt multiple times during the sample period.

Taking Stock: Changing Landscape. Tables 4 and 5 compare the main characteristics of countries generally used in calibration exercise (Argentina, Brazil, Mexico, etc.), which have generally defaulted to private creditors in the 80s and 90s, against the new set of countries defaulting to China in this century. As the table shows, the major borrowers of private debt and China loans differ significantly. Interestingly, most of the serial defaulters of the 80s and '90s, subject to calibration in baseline studies, have not defaulted anymore in the past twenty years. Yet, a new list of serial defaulters emerges, especially those defaulting on China loans.

To sum up, the analysis reveals the following stylized facts: recent default episodes are typical to China with no clear identification of adverse income shocks. When defaulted in China, recovery episodes are quicker than traditional lending standards.

Table 5: Major borrowers, 1975-1999

Country	Default rate		σ_y	σ_c	$\sigma_{TB/y}$	σ_c/σ_y	ρ_y	$corr(c,y)$	$corr(TB/y,y)$	Debt to GDP			Interest rate		Maturity		Spread	$\Delta y_{t:D_t=1}$		$y^c_{t:D_{t+1}=1}$	
	Private	China								Private	China	Total	Private	China	Private	China		private	China	private	China
Major borrowers of private debt																					
Argentina	12.0		6.6	7.2	3.0	1.09	0.78	0.85	-0.63	19.6	0.0	25.1	9.5	0.0	8.9	0.5	5.9	-3.9		0.7	
Brazil	20.0		4.8	6.4	2.7	1.32	0.78	0.64	0.21	16.6		22.1	10.1		8.4		7.9	0.6		1.2	
Colombia	0.0		3.5	4.9	3.7	1.40	0.85	0.59	-0.34	9.6		21.7	9.0		9.7		4.5				
Egypt, Arab Rep.	0.0		5.1	3.0	3.3	0.59	0.80	0.80	-0.29	8.0	0.2	62.7	7.5		11.1	21.1					
Mexico	20.0		5.8	5.2	3.6	0.90	0.72	0.52	0.05	21.5	0.0	27.1	8.8	8.9	7.7	1.9	5.2	-1.6		2.5	
Philippines	16.0		6.3	2.9	3.0	0.45	0.68	0.48	-0.23	13.5	0.0	33.2	9.0	7.5	11.0	24.7	4.3	1.1		1.4	
Turkey	8.0		4.4	8.2	2.1	1.86	0.60	0.72	-0.18	11.7	0.0	23.7	8.3	7.3	8.0	9.7	5.0	5.2		-3.8	
Mean	10.9		5.2	5.4	3.1	1.09	0.74	0.66	-0.20	14.3	0.1	30.8	8.9	5.9	9.3	11.6	5.5	0.3		0.4	
Mean ex ARG	10.7		5.0	5.1	3.1	1.09	0.74	0.62	-0.13	13.5	0.1	31.8	8.8	7.9	9.3	14.3	5.4	1.3		0.3	
Major borrowers of China loans																					
Angola	0.0		10.5	15.1	6.7	1.45	0.97	0.46	-0.36	90.0	0.4	122.9	7.2	6.0	5.5	5.0					
Cameroon	4.0		19.2	17.4	2.9	0.91	0.89	0.97	-0.22	8.5	0.9	44.2	9.8		9.1	20.5		4.7		24.8	
Ecuador	20.0		2.8	3.9	3.0	1.42	0.80	0.39	-0.04	27.8	0.0	44.2	9.7		7.6	20.0	8.7	-2.1		2.5	
Ethiopia	4.0		9.9	8.8	1.8	0.89	0.74	0.94	-0.03	5.0	0.5	77.9	7.1	1.7	9.7	16.6		-0.9		11.6	
Sri Lanka	0.0		2.4	2.2	5.1	0.93	0.87	0.87	-0.46	6.7	0.5	45.8	8.2	3.1	11.2	21.9					
Mozambique	4.0		8.2	5.6	6.3	0.68	0.27	0.76	0.85	3.6	0.6	144.0	7.0	1.1	11.5	20.6					
Senegal	16.0		4.0	5.7	3.7	1.43	0.65	0.84	-0.32	4.4	0.6	39.7	8.9	3.6	7.0	19.9		-0.7		1.2	
Mean	6.9		8.1	8.4	4.2	1.10	0.74	0.75	-0.08	20.8	0.5	74.1	8.3	3.1	8.8	17.8	8.7	0.3		10.0	

Notes: Debt levels, interest rates, and maturities were computed based on the sample 1975-1999 for all countries in the group. The sum of private and China debt may differ from total debt since the total includes other debt components such as official bilateral and multilateral loans. Interest rates and maturities of country-year pairs in which no borrowing from the respective creditor took place were excluded. Interest rates and maturities refer to newly disbursed debt. y, c are log-quadratically detrended real per capita GDP and consumption, and TB/y is the trade balance. σ denotes the standard deviation and $corr()$ the correlation. Default rates are computed as the share of years in which countries sought to restructure their outstanding debt. We use JPMorgan's EMBI+ Index to compute the spreads during non-restructuring years- all years in which a country does not negotiate a debt restructuring. Columns $\Delta y_{t:D_t=1}$ displays the contraction in real per capita GDP in the year a country seeks a restructuring. Columns $y^c_{t:D_{t+1}=1}$ display the percent deviation from the trend in a country in the year before it sought to restructure its debt. It reflects the position in the business cycle. All indicators that refer to restructuring episodes specifically are averaged over all episodes for which data is available if a country restructured its debt multiple times during the sample period.

3 Quantitative model

In this section, we construct an endogenous sovereign default model with Chinese loans, which entail significant grace periods, as the data suggests. We consider the quantitative implications of the model in the in the next section.

Time is discrete and the economy is populated by a sovereign government and two types of infinitely many lenders. The sovereign maximizes welfare of its citizens by making consumption and borrowing/saving decisions in the face of fluctuating endowment. We assume the sovereign has sufficient instruments to implement the desired consumption allocations for its citizens, so we abstract from individual's problem living in the economy. The sovereign's economy is a small open economy, and the risk-free interest rate for borrowing and saving, r, is assumed to be exogenous.

Preferences: The sovereign is infinitely lived and the preferences of the sovereign over aggregate private consumption $\{c_t\}$ is given by

$$\mathbb{E}_t \sum_{t=0}^{\infty} \beta^t u\left(c_t\right),$$

where $\mathbb{E}$ is the expectation operator and β denotes the subjective discount factor. We assume $u' > 0$ and $u'' < 0$.

Endowments: The sovereign receives a stochastic endowment y_t in each period and we assume the log of the endowment follows the following process:

$$\log(y_t) = (1-\rho)\,\mu + \rho \log(y_{t-1}) + \varepsilon_t,$$

with $|\rho| < 1$ is the persistency of the endowment and $\varepsilon_t \sim N\left(0, \sigma_\varepsilon^2\right)$ is a white noise.

Financial Markets: There are two types of lenders and the sovereign can borrow from both types of lenders simultaneously.

The first type of lenders are capturing standard creditors (bond holders) assumed in sovereign debt models: infinitely many risk-neutral, deep pocket, competitive lenders. Following Hatchondo and Martinez (2009), we assume that in every period δ fraction of bonds mature in every period and the sovereign needs to pay back the matured loan balance together with the interest payments. This structure makes all bonds symmetric and the expected maturity of a bond becomes $\frac{1}{\delta}$. Then, we can represent the evolution of the non-contingent debt as follows:

$$b_{t+1} = (1-\delta) b_t + i_t,$$

where i_t is the number of non-contingent bonds issued in period t.

The bonds are non-contingent and the sovereign has the option to default on the bonds. Default has two types of costs. First, the sovereign incurs a loss of endowment in default periods. This cost is proportional to the level of endowment and is assumed to be a convex function of the endowment and represented by the function $\phi(y)$. The second cost of default is exclusion from international financial markets. Following the literature, we capture this in a simple fashion. Starting from the first period after the government defaults, with time-invariant probability ξ, the government is presented with the opportunity to end the default. In order to end the default, the government needs to exchange the bonds that are in default with bonds that promise to pay $\alpha < 1$ times the payments promised by the exchanged bonds. The government may choose to not restructure the debt and continue in default, in which case its debt level will still be α times the debt level before the restructuring opportunity (thus, the government can obtain a lower recovery rate at the expense of a longer default period). During default, the government's payment obligations grow at the exogenous risk-free interest rate r.

The second type of lenders is capturing China. For tractability, we also assume that the second type of lenders are also infinitely many, risk-neutral, deep pocket and competitive lenders. However, following the evidence provided in Section 2.4, we assume that Chinese loans have grace periods. We capture the grace periods of the Chinese loans by modelling it as a Markov process, where $g \in \{0, 1\}$ captures the state of grace period with $g = 1$ denoting the grace periods and $g = 0$ denotes the other periods. Our formulation of grace periods closely follows Hatchondo et al. (2022) except that grace periods do not stipulate risk aversion premium on lenders. In grace periods, the sovereign does not make any coupon payments but the interest applies to the loan principle. In non-grace periods, the sovereign makes the standard coupon payments. So, the evolution of Chinese debt becomes:

$$\begin{aligned} b^c_{t+1} = &\quad (1-\delta_c)b^c_t + i^c_t \quad \text{if} \quad g = 0 \\ b^c_{t+1} = &\quad b^c_t\,(1+r) \qquad\qquad \text{if} \quad g = 1 \end{aligned} \tag{1}$$

Chinese bonds are also defaultable and they are priced similar to the bonds; taking into account the default probability given the observables of the sovereign. However, default is not selective, i.e. when the sovereign chooses to default, they need to default on both loans. When the sovereign in default state gains access to financial markets, they also gain access to both loans at the same time.

3.1 Recursive Formulation of Sovereign's Problem

Let $s \equiv (y, g)$ denote the vector of exogenous states. The government can be in one of two states with regards to access to markets: (1) have access to both financial markets (2) has

no access to financial markets. Let $V(b, b_c, s, f)$ denote the value function of a government after the default decision, where $f \in \{0, 1\}$ representing the default states for the government. When $f = 1$, the government has access to both markets and can default on any of the loans. When $f = 0$, the government has no access to financial markets.

We use $\hat{f}(b, b_c, s, f)$ to represent the default decision and use $\tilde{V}(b, b_c, s, f)$ to represent the value for the government before the default decision is made. When $f = 1$, the government has two options regarding the default/repay decision, i.e. $\hat{f} \in 0, 1$ where $\hat{f} = 1$ representing repaying both bonds, $\hat{f} = 0$ representing defaulting on private bond. When $f = 0$, both loans are in default state.

When the government has access to both markets, $f = 1$, the value function becomes

$$\begin{aligned} V(b, b_c, s, 1) = \quad & \max_{i \geq 0, i_c \geq 0, c \geq 0} \left\{ u(c) + \beta \mathbb{E}_{(s'|s)} \tilde{V}(b', b'_c, s', 1) \right\} \\ \text{subject to} \quad & \\ c = \quad & y - \kappa b - (1-g)\, \kappa_c b_c + q(b', b'_c, s, 1) i + q_c(b', b'_c, s, 1) i_c \\ i = \quad & b' - b(1-\delta) \\ i_c = \quad & b'_c - (1-g)\, b_c(1-\delta_c) - g b_c\, (1+r) \\ b' > \quad & b(1-\delta) \\ b'_c > \quad & (1-g)\, b_c(1-\delta_c) + g b_c\, (1+r) \end{aligned} \tag{2}$$

where $g = 1$ if the Chinese loan is in grace period and $g = 0$ otherwise.

When the government has no access to financial markets, $f = 0$, the value function becomes:

$$V(b, b_c, s, 0) = u(y - \phi(y)) + \beta \mathbb{E}_{s'|s} \left(\xi \tilde{V}(\alpha b, \alpha_c b_c, s') + (1-\xi)\, V\left(b(1+r), b_c(1+r), s', 0\right) \right) \tag{3}$$

where ϕ represents the cost of default which depends on the endowment level of the sovereign.

3.2 Lender's problem

Lenders need to take into account the default likelihood when pricing the loans. The price will not only depend on the default probability of lender's own bond, but also on the other loan the sovereign might have. Given the assumption that coupon payments include the interest payments and maturing portion of outstanding balance ($\kappa = r + \delta$), the price of a risk-free bond needs to be 1. However, in the presence of default option for both loans, the price of the bond needs to reflect it and will be lower than 1.

Under the perfect competition and risk-neutral assumption, the price of the non-contingent bond when the sovereign has access to both financial markets, $f = 1$, will be

$$q(b', b'_c, s, 1) = \frac{1}{1+r}\mathbb{E}_{s'|s}\left((\kappa + (1-\delta)q(b'', b''_c, s', 1))I(\tilde{f} = 1) + q(b', b''_c, s', 0))I(\tilde{f} = 0)\right), \quad (4)$$

where $\tilde{f} = \hat{f}(b', b'_c, s')$ is the decision rule for defaulting and I is the indicator function which takes the value of 1 of the expression that follows it is true and 0 otherwise.

When the private bond is in default state, $f = 0$, the price of the private bond needs to take into account the probability of gaining access and possible recovery of part of the outstanding balance. In this state, the expression for the private bond price becomes:

$$q(b', b'_c, s, 0) = \frac{1}{1+r}\mathbb{E}_{s'|s}\left(\xi\alpha(1+r)q(\alpha b'(1+r), b''_c, s', 1) + (1-\xi)q(b'(1+r), b''_c, s', 0)\right), \quad (5)$$

3.3 Recursive Equilibrium

A *Markov Perfect Equilibrium* is characterized by

1. rules for default $\hat{d}$, non-contingent borrowing $\hat{b}$, and China debt borrowing $\hat{b}_c$
2. and bond price function q for non-contingent debt

such that:

i. given the bond price functions q and q_c, the policy functions $\hat{d}$, $\hat{b}$, and $\hat{b}_c$ solve the Bellman equations (2) and (3).

ii. given policy rules $\left\{\hat{d}, \hat{b}, \hat{b}_c\right\}$, the bond price function q satisfies conditions (4) and (5).

4 Calibration of the Quantitative Model

We calibrate the benchmark model with China debt to match salient features of the data post 2000 as shown in Table 4. A period in the model is set to 1 year.

Preferences: The utility function displays a constant coefficient of relative risk aversion, i.e.,

$$u(c) = \frac{c^{1-\gamma} - 1}{1-\gamma}$$

We set the risk aversion parameter, γ, following the standard assumption in the literature,

Endowment: Endowment is stochastic and follows an AR(1) process as in equation 3, with persistency ρ and standard deviation to innovations σ_ϵ. Using the set of countries

labeled as "major borrowers of China loans" in Table 4, we estimate equation 3 after log-quarterly detrending the GDP per capita for each country, and use the average of the estimated coefficients, and set $\rho = 0.82$ and $\sigma_\epsilon = 0.07$ as shown in columns 4 and 8 of Table 4. μ is the average of the log-endowment and is set to $0.5\sigma_\epsilon^2$ to normalize the average of endowment to 1 as normalization.

The income cost of defaulting is given by $\phi(y) = \max\{0, \lambda_0 y + \lambda_1 y^2\}$ (as in Bianchi et al. (2018), see also Uribe and Schmitt-Grohé, 2017 for a discussion on the role of output costs). Having two parameters in the cost of defaulting allows us to match the average level of the debt and spread in the data.

Financial parameters: The risk free interest rate is set to 4 percent. The average maturity of bonds after 2000 is around 10 years. Since $1/\delta$ captures the average maturity of bonds in the model, we set $\delta = 0.1$. We also set the maturity of Chinese loans to the same value to isolate the grace period as the only difference of Chinese loans from private bonds. Cruces and Trebesch (2013) report the average recovery of bonds after default in the neighborhood of 0.3 to 0.7. We chose the mid-point of this estimate as the recovery rate of private bonds and set $\alpha = 0.5$. As reported in Figure 7, average duration of financial autarky after default is 4 years. We set $\xi = 0.25$. Lastly, we set $\pi_{01} = 0.2$ to replicate the fact that it takes on average 5 years for grace period to end for Chinese loans.

The remaining parameters, the discount factor (β), parameters governing the income cost of default (λ_0 and λ_1) and probability of grace period start (π_{10}) to match four moments: (1) level of private debt as 28 percent of GDP, (2) level of Chinese loans as 7 percent of GDP, (3) default rate of 4 percent, and (4) average spread of 3 percent for private bonds. Table 6 presents the benchmark values given to all parameters in the model.

5 Preliminary Quantitative Results

Table 7 shows the fit of the model for the calibrated moments. The model reasonably matches the targeted moments. What explains the success of the model to match both the level of private debt and the Chinese debt? The only difference between the private bonds and Chinese loans is the existence of grace period for the Chinese loans. Since grace period includes period of no payment, this makes the present discounted value of China loans lower than private bonds, which is reflected as a lower price for China loans as depicted in Figure 8b. The lower prices for China loans make them less likely to be rolled over during periods of crisis and increase the default probabilities in these loans as depicted in Figure 8a. This higher default probability serves as another reason for lower bond prices for China loans.

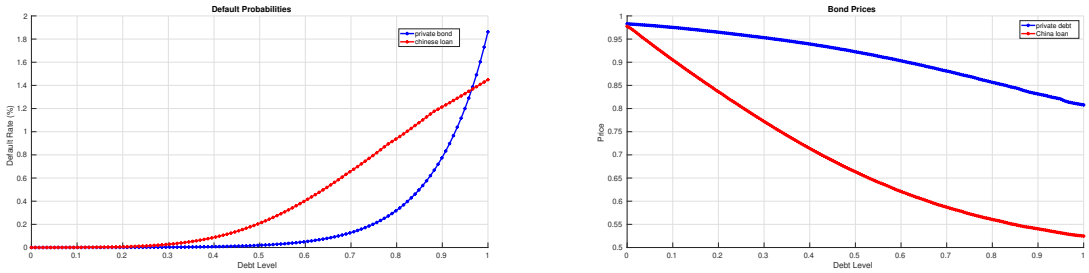
The price difference endogenously arising due to no payments in grace periods for China loans is the main reason for lower demand for China loans in normal periods. However, in

Parameter Explanation	Parameter	Value	Source
Risk-free rate	r	4%	literature
Risk aversion	γ	2	literature
Endowment persistency	ρ	0.82	Data
Std of endowment innovations	σ_ϵ	7%	Data
Mean log endowment	μ	$(-1/2)\sigma_\epsilon^2$	Normalization
Recovery rate	α	0.5	Data
Debt duration	δ	0.1	Data
Probability of exiting grace period	π_{01}	0.2	Data
Cost of defaulting	λ_0	-0.90	Default Rate
Cost of defaulting	λ_1	1.18	Average Spread
Discount factor	γ	0.965	Private Debt
Probability of entering grace period	π_{10}	0.01	Chinese Debt

Table 6: Calibrated parameter values. See the text for explanations.

	Data	Moment
Mean private debt/y (%)	28	28.1
Mean China debt/y (%)	7.0	7.5
Mean private debt spread (%)	3.0	3.1
Default Rate (%)	4.0	4.3

Table 7: The Table shows the fit of the model for the calibrated moments.

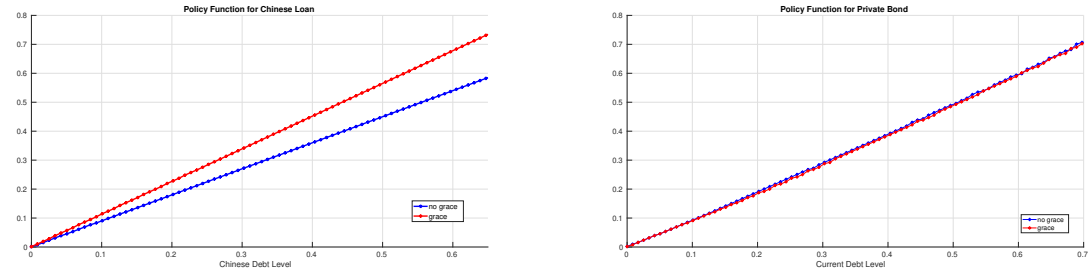


(a) Default Probabilities

(b) Bond Price

Figure 8: Private Bond vs China Loan. The left panel compares the default probabilities of private bonds and China loans for a sovereign with average endowment in non-grace periods. The right panel compares the corresponding bond prices for private bonds and Chinese loans.

grace periods, the absence of payments for China loans increases the attractiveness of these loans. Figure 9a shows that in grace periods, the demand for China loans is significantly higher than non-grace periods.



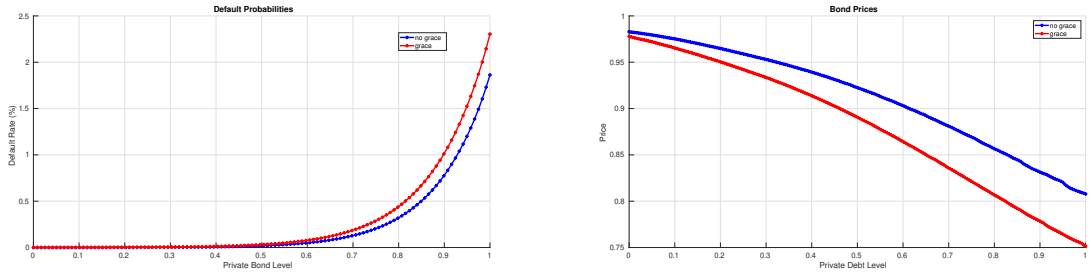
(a) Private Bond

(b) China Loan

Figure 9: Policy functions: These figures plot the policy functions for private bonds and China loans as a function of current debt levels across grace and non-grace periods. Both figures are plotted for a sovereign with average endowment. In both figures, the other debt level is set to its average level in the economy.

However, as shown in Figure 9b, the demand for private bonds in grace periods is slightly lower. So, the overall debt level of the sovereign is higher in grace periods and this makes private bonds riskier in grace periods compared to non-grace periods. This is shown in Figure 10a, which compares the default probabilities of private bonds as a function of current private debt level for a sovereign with average endowment and mean level of Chinese loan. Private loans have higher default probabilities in grace periods than in non-grace periods. The increase in default probabilities in grace periods also lowers the price of private bonds in grace periods as depicted in Figure 10b.

This flight to China loans in grace periods is also reflected in simulations. Figure 11 plots the evolution of prices and debt levels for a particular history of shocks for the sovereign. We chose a series of endowment shocks for 50 periods without default incidence. The shaded regions are the non-grace periods. As depicted in the left panel, in grace periods, the sovereign



(a) Default Probabilities

(b) Bond Price

Figure 10: Grace vs Non-Grace periods: The left panel compares the default probabilities of private bonds in grace and non-grace periods as a function of current private bond level. The right panel compares the corresponding bond prices for private bonds. In both figures the endowment and China loan levels for the sovereign are set to their average levels in the simulations.

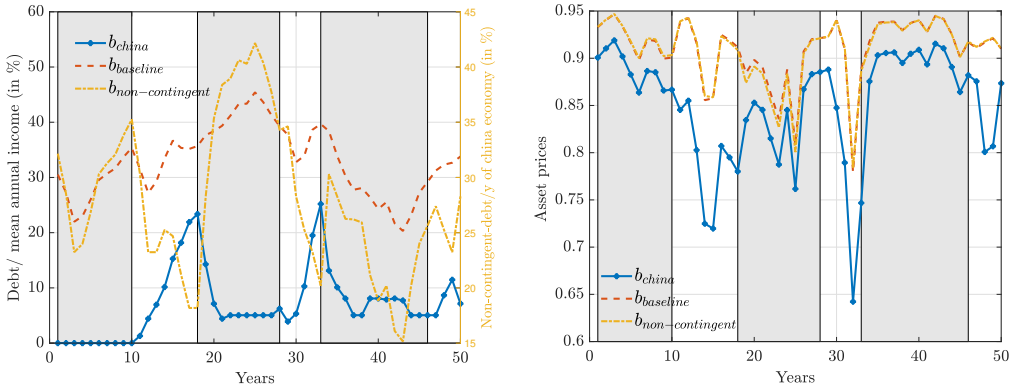


Figure 11: Portfolio and price dynamics. Shaded regions denote periods with no grace period.

significantly increases the China debt level and decreases the level of private loans. This pattern is reversed in non-grace periods. As shown in the right panel, this flight to China loans during grace periods happens despite the lower prices of China loans. Also, since the overall debt level of the sovereign increases in grace periods, the price for both loan decreases in these periods.

To highlight the significance of China loans, we solve the model without the China loans.[28] Table 8 presents the comparison of both economies. The exclusion of China debt not only lowers the demand for private bond, but also decreases the default rate and average spread for private bonds. The reason for lower debt level is the existence of time commitment problem. In the presence of China loans, the sovereign becomes more indebted during grace periods, which then increases the debt burden overall to rollover the high debt levels.

[28] In this counterfactual we keep the same parameter values for the rest of the model.

	With China debt	Without China debt
Mean debt/y (%)	28.1	24.4
Mean China debt/y (%)	7.5	*n.a.*
Mean spread for private bonds (%)	3.1	1.6
Default rate	4.3	1.9

Table 8: The Table compares the simulated moments for economies with and without China loans. The parameters of the model are kept the same across these two experiments.

5.1 The Role of Contract Clauses

To Be Added

6 China Debt and Multilateral Debt

To Be Added

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A Appendix

A.1 Data sources

A.1.1 Refinitiv Bond data

We obtain data for sovereign bond issuances[29] between 1970 and 2019 bond-by-bond for 73 countries from Refinitiv Eikon. The initial dataset contains 24,559 domestic and foreign bonds with more than one year of maturity. We drop all domestic bonds from our sample. We classify bonds as domestic using the following information: (i) market of issue, (ii) governing law[30], (iii) the ISIN, and (iv) the country of issue. If more than two of those are domestic, we code a bond as domestic.[31] Omitting the domestic bonds leaves us with 1,791 foreign bonds issued by 61 governments.

A.1.2 The HRT China loan dataset

We base our estimates on principal and interest payments of debtor countries to China for the period 2000 to 2017 on the loan-level dataset provided by Horn et al. (2021). In contrast to HRT, which assigns uniform values to missing observations for the interest rate, the maturity, and the grace period by loan and lender type, we adopt a four-step procedure. If one of the critical variables is missing, we subsequently replace it with (i) the average of the non-missing observations in the respective country-year-loan type group, (ii) the average of the non-missing observations in the country-loan type group, (iii) (if the loan type is missing) with the average of the non-missing observations in the country-year group. Values that are still missings are filled under the convention adopted in HRT.

The first extensive dataset on restructurings of Chinese debt was published in Horn et al. (2021). In the meanwhile, the dataset was updated and refined. The recent version was published along Horn et al. (2022). The updated version entails more relevant information that allows us to analyze the heterogeneity in debt restructurings. The paper distinguishes between "distressed" restructurings that often treat bank and SOE debt, "symbolic" debt restructurings, and restructurings associated with the DSSI initiative launched in 2020 at the outset of the COVID pandemic. The authors define "symbolic" as debt relief frequently granted as part of a development aid program. Relief was usually announced during official visits to the respective countries, and they are rather independent of the current economic situation in the debtor country. The drawback of the new dataset is that it only provides information about Chinese restructurings after 2000, while the 2021 database also contains a few restructurings in the 1970s and 1980s. In addition, we obtain information about the amount of debt owed to official Chinese creditors from Beers et al. (2020) and the counterparty-level data section in World Bank (2022a).

We use these data to code default variables based on outstanding arrears. In particular, we code the first year with positive amounts of total outstanding debt in arrears vis-à-vis Chinese creditors as the entry into the default episode and the last year with positive amounts as the

[29] Sovereign includes bonds issued by the central government and the central bank.

[30] In some cases, a bond is administered under multiple governing laws, primarily the domestic one and an international one. We code it as foreign if the international one is either United States (New York) or the United Kingdom.

[31] In most cases, all four variables meet the criteria. Loosening the threshold to two of them ensures that we capture all domestic bonds for which up to two variables are missing.

exit year for each database. Thus, we obtain four different default datasets with information about defaults on Chinese debt. Different to Horn et al. (2021) and Horn et al. (2022), deriving the default variable from outstanding arrears allows us to code the start of the default episodes. In contrast, the former two datasets only code completed restructuring, which often marks the end of an episode. However, as Horn et al. (2022) notes, relying purely on the arrears datasets to obtain default episodes would likely underestimate the number of default spells we would omit preemptive restructurings. In addition, due to transparency issues in reporting, we would likely miss distressed episodes altogether.

Comparisons The most crucial methodological difference between the arrears data sets is that the World Bank IDS statistics are based on reports of the debtor countries to the World Bank via the Debt Reporting System (DRS). In contrast, the BoC-BoE Database relies on similar academic sources as HRT and extent the data with country reports by the World Bank, the IMF, and other publicly available media. Thus, we expect the BoC-BoE database to be closer to the restructuring datasets provided in HRT (2021, 2022).

We first compare the coverage of the datasets for the period 2000 up to 2020 and conduct a robustness check to see if systematic differences exist in the main variables that might be caused by either the difference in coverage or the coding approach. Figure 12 displays the full set of countries and default variables from 2000 to 2020. Importantly, arrears-based variables are set at the end of the arrear episode, i.e., the last period with positive outstanding arrears on debt owed to Chinese official creditors[32], to make it consistent with the coding in Horn et al. (2022) and Horn et al. (2021). Indeed we find that the end of the default episodes identified with the IDS database lags the restructuring episodes or stands alone. We rarely find that the restructuring years coincide with the years in which arrears are dissolved. A reason could be that either no restructuring agreement has been reached or not all arrears have been treated in the restructuring process. We also find that a large fraction of the restructurings captured in the first version of the HRT database (2021) were related to the cancellation of government-to-government debt, thus, rather symbolic. This fact especially concerns those cases in the early 2000s related to the HIPC initiative.

B Cost of Default

B.1 Growth of real GDP per capita at default (Borensztein, Panizza 2009)

In this section, we replicate the estimations in Borensztein and Panizza (2009). Specifically, we run the following regressions:

$$\begin{aligned} GROWTH_{i,t} =& \alpha + \beta X_{i,t} + \psi DEFAULT_CH_{i,t} + \gamma DEFAULT_{i,t} + \\ & \sum_{s=0}^{3} \delta_s DEFAULT_B_{i,t-s} + \sum_{s=0}^{2} \phi_s DEFAULT_E_{i,t-s} + \epsilon_{i,t} \end{aligned} \tag{6}$$

[32] Official creditors include the government and state-owned entities such as the ExIm bank.

Figure 12: Comparison of default resolutions identified in the databases

Notes: Figure 12 displays the time series of arrears and restructuring events defined as the last year with outstanding arrears or the completion of the restructuring.

where $X_{i,t}$ is a vector of control variables commonly used in growth regressions.[33] $GROWTH_{i,t}$ is the real GDP per capita growth in the country i and year t. $DEFAULT_{i,t}$ is a dummy that takes 1 if the country i is in default vis-à-vis private creditors in year t, $DEFAULT_CH_{i,t}$ is a dummy that takes 1 if the country i defaults on debt vis-à-vis China, $DEFAULT_B_{i,t-s}$ is a dummy that takes 1 if the country i enters an episode of default vis-à-vis private creditors in year $t-s$, and $DEFAULT_E_{i,t-s}$ is a dummy that takes 1 if the country i exits an episode of default vis-à-vis private creditors in year $t-s$. The dataset is an unbalanced panel with up to 104 countries spanning 1971 - 2017 (the last year in which the Civil Liberties Index is available). We cluster the standard errors at the country level. Our results are robust to a demeaned specification.

Main findings

- Default with private creditors relates to a 1% to 2% lower real GDP per capita growth
- Countries that enter default with private creditors exhibit a strong decline in real GDP per capita growth (2.9 to 3.2%) that persists over one year (lagged coefficient is -1.7 and 1.95).

[33] In contrast to Borensztein and Panizza (2009), we exclude the share of the population with a secondary degree and the change in terms of trade due to limited data availability. However, in their regression, both controls are not significant.

- Higher government consumption spending is associated with lower real GDP per capita growth
- Entering default with China is associated with a (weakly significant) higher real GDP per capita growth

The findings are generally consistent with Borensztein and Panizza (2009). They find a highly significant decline in real GDP growth by 1.2 percentage points which lies at the lower end of our results. Yet, in their estimation, the magnitude declines at default entry are somewhat lower (-1.3% vs. our 2.6%) and exhibit no persistence. Our findings are robust to a specification that restricts the sample to the Borensztein and Panizza (2009) period. One reason might be that our sample composition differs from theirs. Those shifts themselves are endogenous to our outcome variable. In particular, World Bank (2022a) only publishes data for those countries that fall under the definition of Low or Middle-Income countries at the time of publication. Hence, countries that were considered as belonging to this category might by now be omitted from the sample. These countries generally fared well over the past twenty to thirty years, e.g., the Eastern European transition economies. Left in our sample, as compared to the Borensztein and Panizza (2009), are the "bad cases," i.e., those stuck in the middle-income trap because they have either lesser average or far more explosive growth. Thus, it is no surprise that our estimates for default yield economically stronger point estimates. The estimates are robust to a fixed-effects regression and using restructuring events.

However, the picture changes significantly if we only look at defaults to China in the modern period from 2000 onwards. Almost all coefficients lose significance, indicating that default episodes to China are not readily associated with output cost in terms of economic growth. In particular, the only significant coefficients related to default are the lags of entry and exit (See Table 9).

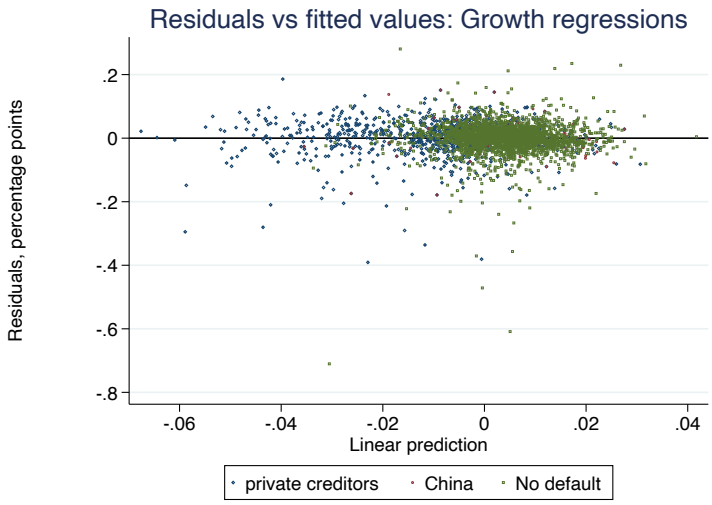
We also repeat the exercise, but uses the restructuring data from Horn et al. (2022) instead of the defaulted data provided by Horn et al. (2021), available upon request.

Table 9: Borensztein, Panizza 2009 growth regressions–Defaults

	(1)	(2)	(3)
	def4_pre2000	def4_post1999	def4_all
Population growth	-30.59	-37.64*	-35.10
	(28.776)	(18.525)	(19.109)
Log of Population, total	-0.188	0.254**	0.0720
	(0.151)	(0.093)	(0.089)
Log of GDP per capita (constant 2010 USD)	0.173	-0.521**	-0.140
	(0.243)	(0.154)	(0.158)
L.General government final consumption expenditure (% of GDP)	-0.0923**	-0.0896***	-0.0931***
	(0.032)	(0.021)	(0.020)
CL_FH	-0.287*	-0.334**	-0.258**
	(0.145)	(0.116)	(0.093)
Trade (% of GDP)	0.000669	0.00903*	0.0102*
	(0.008)	(0.004)	(0.004)
Systematic Banking Crisis	-1.279	-2.020*	-1.696**
	(0.716)	(1.017)	(0.627)
Sub-Saharan Africa	-0.494	-0.872*	-0.357
	(0.709)	(0.431)	(0.388)
Latin America & Caribbean	-0.984	-0.658	-0.567
	(0.718)	(0.399)	(0.420)
Europe and Central Asia	-3.645*	0.942*	-0.641
	(1.393)	(0.449)	(0.541)
Gross fixed capital formation (% of GDP)	0.0834*	0.115***	0.0974***
	(0.036)	(0.022)	(0.026)
In default with private creditors	-1.969***	0.0516	-1.470***
	(0.384)	(0.572)	(0.336)
1 if country enters default vis-à-vis China	1.728	0.333	0.859*
	(2.322)	(0.357)	(0.413)
1 if country enters default vis-à-vis private creditors	-3.724***	-1.188	-3.146***
	(0.927)	(1.007)	(0.715)
L.1 if country enters default vis-à-vis private creditors	-1.363	-2.011*	-1.816**
	(0.728)	(0.934)	(0.566)
L2.1 if country enters default vis-à-vis private creditors	-0.525	-0.851	-0.844
	(0.700)	(0.583)	(0.521)
L3.1 if country enters default vis-à-vis private creditors	0.676	0.242	0.471
	(0.568)	(0.544)	(0.455)
Last year of default episode,	1.913**	0.102	1.443**
	(0.701)	(0.791)	(0.521)
L.Last year of default episode,	-0.186	1.199*	0.332
	(0.552)	(0.491)	(0.399)
L2.Last year of default episode,	-0.142	0.889*	0.357
	(0.731)	(0.369)	(0.482)
Constant	5.807	2.665	2.740
	(3.220)	(2.158)	(1.902)
Observations	1755	1718	3473
Adjusted R^2	0.102	0.141	0.106
F	9.984	13.57	17.74
df_m	20	20	20
df_r	88	97	97

Notes: Table 9 displays the results of the growth regression (Equation 6) for (1) for the period before 2000, (2) the period after 2000, and (3) the whole sample. Standard errors are clustered at the country level. Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Figure 13: Residuals vs. Fitted: Growth Regression



Notes: Figure 13 plots the residuals vs fitted values obtained from the regression in Column (4) of Table 9. Labeled outliers are predicted errors larger than absolute ten percentage points.

C Additional Robustness

C.1 Default entries

We examine the frequency of default across country groups. Specifically, we compute the share of default entry episodes for each creditor type in the percent of the whole subsample. Each sample includes the complete set of country-year observations regardless of whether a country is already in default in a given year. Thus, we potentially understate the crisis frequency under the condition that a country might default several times within one episode.

Main findings

- Heavily Indebted Poor Countries (HIPC) default more frequently on Chinese debt than on private creditor debt.
- A lower income level is associated with a higher likelihood of defaulting on Chinese debt than private creditor debt.
- Countries with higher income volatility default more often on Chinese debt.
- Default on Chinese debt is more than twice as likely in the period beginning in 1995 than it was before. However, the likelihood of default decreased in 2009 - 2019 compared to 1995 - 2008.
- Defaults on Chinese debt are concentrated in East Asia & Pacific and Sub-Saharan Africa, while defaults with private creditors appear globally more uniformly, except for Latin American countries.

Table 10: Private creditor and Chinese bank debt restructurings

Private creditors, 1975-2019

Country	Number of restructurings 1975-2019	Probability of Default All Years	Probability of Default Years not in default
Congo, Dem. Rep.	7	0.156	0.184
Jamaica	7	0.156	0.184
Nicaragua	6	0.133	0.154
Nigeria	6	0.133	0.154
Ecuador	6	0.133	0.154
Brazil	5	0.111	0.125
Uruguay	5	0.135	0.156
Argentina	5	0.111	0.125
Mexico	5	0.111	0.125
Ukraine	4	0.089	0.098
Philippines	4	0.089	0.098
Chile	4	0.108	0.121
Mozambique	4	0.089	0.098
Madagascar	4	0.089	0.098
Senegal	4	0.089	0.098
Peru	4	0.089	0.098
Mean	5	0.114	0.129

Chinese banks and SOEs, 2000-2019

Country	Number of restructurings 2000-2019	Probability of Default All Years	Probability of Default Years not in default
Seychelles	6	0.429	0.750
Zimbabwe	5	0.250	0.333
Venezuela, RB	4	0.200	0.250
Tonga	3	0.150	0.176
Ukraine	2	0.100	0.111
Sudan	2	0.100	0.111
Serbia	2	0.100	0.111
Congo, Rep.	2	0.100	0.111
Sri Lanka	2	0.100	0.111
Tajikistan	2	0.100	0.111
Kyrgyz Republic	2	0.100	0.111
Mean	2.909	0.157	0.208

Notes: Ten countries with the highest number of restructurings.

Table 11: Private creditor debt restructurings, 20th vs 21st century

Private creditors, 1975-1999

Country	Number of restructurings 1975-2019	Probability of Default All Years	Probability of Default Years not in default
Congo, Dem. Rep.	7	0.280	0.389
Jamaica	7	0.280	0.389
Nigeria	6	0.240	0.316
Mexico	5	0.200	0.250
Nicaragua	5	0.200	0.250
Ecuador	5	0.200	0.250
Brazil	5	0.200	0.250
Chile	4	0.160	0.190
Philippines	4	0.160	0.190
Peru	4	0.160	0.190
Senegal	4	0.160	0.190
Madagascar	4	0.160	0.190
Uruguay	4	0.160	0.190
Mean	4.923	0.197	0.249

Private creditors, 2000-2019

Country	Number of restructurings 2000-2019	Probability of Default All Years	Probability of Default Years not in default
Belize	3	0.150	0.176
Mozambique	3	0.150	0.176
Ukraine	2	0.100	0.111
Argentina	2	0.100	0.111
Chad	2	0.100	0.111
Côte d'Ivoire	2	0.100	0.111
Moldova	2	0.100	0.111
Grenada	2	0.100	0.111
Uruguay	1	0.083	0.091
Ecuador	1	0.050	0.053
Liberia	1	0.050	0.053
Seychelles	1	0.071	0.077
Mongolia	1	0.050	0.053
Dominica	1	0.050	0.053
Dominican Republic	1	0.050	0.053
Nicaragua	1	0.050	0.053
Congo, Rep.	1	0.050	0.053
Mean	1.588	0.083	0.092

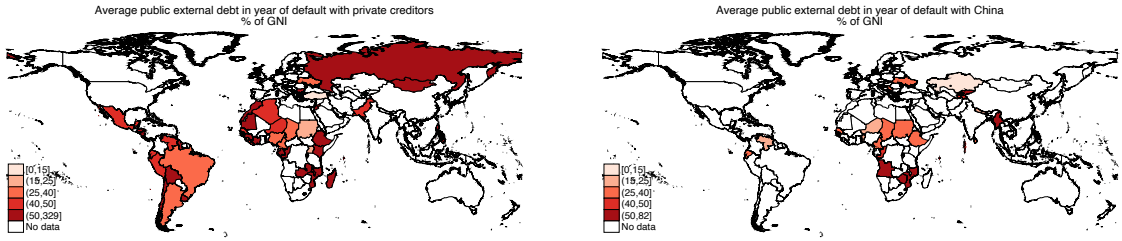
Notes: Ten countries with the highest number of restructurings.

C.2 Debt at default entry

We compare the amount and composition of public and publicly guaranteed (PPG) debt at times of default with tranquil periods across country groups. Specifically, the table lists the composition and totals of PPG debt to private and official creditors and compares default and non-default episode group averages from 1970 - 1999. For the period following the year 2000, we use the dataset on hidden debt owed to China by Horn et al. (2021) to compute the "true" amount of outstanding debt. Therefore, we subtract the official bilateral debt figures for the debt owed to China from the official debt statistics of the World Bank and add the estimates by HRT to obtain the total debt level for each country. We stick to the official World Bank figures if a data point is missing in the HRT dataset.
The average debt levels are computed using all available data at period t. Hence, sample size varies with data availability. Furthermore, we do not account for differences in market access. Thus, the averages are biased downwards because countries that do not have market access towards a specific creditor type, hence 0 debt outstanding this creditor, enter the calculation.

While debt levels generally are lower today, countries on average default at lower levels. The difference in average total debt today stayed relatively constant. (14pp , 11pp, 15pp in the respective groups). Countries that default with private creditors have substantially higher debt levels than non-defaulters (15 % vs. 6.5 %), yet debt levels with China are also higher. Countries that default on Chinese debt do not have higher private debt levels outstanding and only marginally higher debt owed to China than non-defaulters. However, the defaulting group's debt owed to official creditors is significantly higher. Low-Income and HIPC countries that default on private creditor debt have multiples of the debt level outstanding to China compared with non-defaulters. Countries with higher income volatility default at higher debt levels owed to China, irrespective of the counterparty they default upon. Generally, the picture over the global regions is rather mixed. Countries that default with China have higher total debt levels in East Asia & Pacific, Europe & Central Asia, Latin America & North Africa, and lower levels in Sub-Saharan Africa.

Figure 14: Average debt level in the year of default by country and creditor, 1970-2019



Notes: The figure displays the average level of external public debt in the year of default. It is computed as the average overall default episodes with the respective creditor over the whole sample.

D List of sovereign default episodes

Table 12: Default episodes, 1975 - 2019

Country	Private creditors	China	
Sample period	1975-2019	2000-2019	
		Banks & SOEs	Government
Afghanistan			2004
Albania	1991-1995		
Algeria	1990-1992, 1993-1996		
Angola		2016	2007, 2009, 2017
Argentina	1982-1985, 1985-1987, 1988-1993, 2001-2005, 2019-2020		
Bangladesh			2002, 2010, 2011
Belize	2006-2007, 2012-2013, 2016-2017		
Benin		2004	2002, 2007, 2011
Bolivia	1980-1988, 1988-1993		2003, 2008, 2017
Bosnia and Herzegovina	1992-1997		
Botswana			2008, 2018
Brazil	1982-1983, 1983-1984, 1984-1986, 1986-1988, 1989-1994, 1989-1992		
Bulgaria	1990-1994		
Burundi			2001, 2007
Cabo Verde			2001, 2007, 2016
Cambodia			2002, 2010, 2016
Cameroon	1985-2003	2019	2001, 2002, 2007, 2010
Central African Republic			2001, 2007, 2017, 2019
Chad	2014-2015, 2017-2018	2017	2007
Chile	1983, 1983-1984, 1984-1986, 1986-1987, 1990		
Comoros			2001, 2005, 2017
Congo, Dem. Rep.	1975-1980, 1982-1983, 1983-1984, 1984-1985, 1985-1986, 1986-1987, 1987-1989		2002, 2007
Congo, Rep.	1983-1988, 1988-2007, 2018-2021	2018, 2019	2001, 2007
Costa Rica	1981-1983, 1984-1985, 1986-1990		
Côte d'Ivoire	1983-1998, 2000-2010, 2011-2012		2002, 2007, 2011
Djibouti		2019	2007
Dominica	2003-2004		
Dominican Republic	1982-1986, 1987-1994, 2004-2005, 2004-2005		
Ecuador	1982-1983, 1983-1984, 1984-1985, 1986-1995, 1999-2000, 2008-2009	2018	
Equatorial Guinea			2001
Eritrea			2001, 2007, 2016
Ethiopia	1990-1996	2018	2001, 2007
Fiji			2017
Gabon	1986-1987, 1989-1994		
Gambia, The	1984-1988		2017
Georgia			2006
Ghana			2002, 2007, 2019
Grenada	2004-2005, 2013-2015		
Guinea	1985-1988, 1991-1998		2001, 2005, 2007

Table 12: Default episodes, 1975 - 2019, continued

Country	Private creditors	China	
Sample period	1975-2019	2000-2019	
		Banks & SOEs	Government
Guinea-Bissau			2001, 2016
Guyana	1982-1992, 1993-1999		2003, 2007
Honduras	1981-1989, 1990-2001		
Jamaica	1977-1978, 1978-1979, 1980-1981, 1983-1984, 1984-1985, 1986-1987, 1987-1990		
Jordan	1989-1993		
Kazakhstan		2014	
Kenya	1992-1998		2001
Kyrgyz Republic		2003, 2014	2007
Lao PDR			2003, 2006
Lebanon			2017
Lesotho			2001, 2007, 2018
Liberia	1980-1982, 2009		2007
Madagascar	1981, 1982-1984, 1985-1987, 1987-1990		2001, 2007
Malawi	1982-1983, 1987-1988		
Maldives		2019	2003
Mali			2001, 2007, 2012
Mauritania	1992-1996		2007
Mauritius			2016
Mexico	1982-1983, 1984-1985, 1984-1985, 1986-1987, 1987-1988, 1988-1990		
Moldova	2001-2004, 2002		
Mongolia	2017		2002, 2008, 2016
Morocco	1983-1986, 1985-1987, 1989-1990		
Mozambique	1983-1991, 2007, 2015-2016, 2016-2019	2018	2001, 2007, 2016, 2017
Myanmar		2004	2003, 2006
Nepal		2017	
Nicaragua	1978-1980, 1981, 1982, 1983-1984, 1985-1995, 2007		
Niger	1983-1984, 1984-1986, 1986-1991	2018	2001, 2007
Nigeria	1982-1983, 1982-1983, 1983-1984, 1986-1987, 1987-1988, 1988-1989, 1989-1991		2003
North Macedonia	1992-1997		
Pakistan	1998-1999, 1999		
Panama	1984-1985, 1987-1996, 1987-1994		
Papua New Guinea			2008
Paraguay	1986-1993		
Peru	1976-1978, 1979-1980, 1983, 1984-1997		
Philippines	1983-1986, 1986-1987, 1988-1990, 1990-1992		
Poland	1986, 1986-1988, 1988-1989, 1989-1994		
Romania	1981-1982, 1983, 1986		
Russian Federation	1991-1997, 1998-2000, 1998-1999, 1999-2000		
Rwanda			2001, 2007
Samoa			2006
Senegal	1981-1984, 1985, 1990, 1992-1996	2011	2006
Serbia	1992-2004	2003, 2009	

Table 12: Default episodes, 1975 - 2019, continued

Country	Private creditors	China	
Sample period	1975-2019	2000-2019	
		Banks & SOEs	Government
Seychelles	2008-2010	2000, 2001, 2003, 2004, 2006, 2011	
Sierra Leone	1980-1995		2007, 2016
Somalia			2005
South Africa	1985-1987, 1989, 1992-1993		
Sri Lanka		2010, 2016	2005
Sudan	1975-1985	2012, 2015	2001, 2007, 2010, 2011, 2017
São Tomé and Principe	1984-1994		2017
Tajikistan		2002, 2011	2000
Tanzania	1981-2004		2001, 2007, 2011
Togo	1987-1988, 1991-1997		2001, 2007, 2012, 2016
Tonga		2013, 2014, 2018	2016
Trinidad and Tobago	1988-1989		
Tunisia			2010
Turkey	1976-1979, 1976-1979, 1981-1982, 1981		
Uganda	1979-1993		2001, 2007
Ukraine	1998, 1998, 1999, 2000, 2015-2016, 2015	2014, 2017	
Uruguay	1983, 1985-1986, 1987-1988, 1989-1991, 2003		
Vanuatu		2019	2000, 2003, 2005, 2013
Venezuela, RB	1983-1986, 1986-1987, 1989-1990	2014, 2015, 2016, 2018	
Vietnam	1982-1997		2003
Yemen, Rep.	1983-2001		2002, 2003, 2017
Zambia	1983-1994		2001, 2006, 2007, 2011, 2019
Zimbabwe		2003, 2004, 2007, 2010, 2012	2015

Notes: Table 12 documents the years in which the countries in our sample entered a default episode. We do not have completion dates for the private restructurings in Liberia (2009), Mozambique (2007), and Nicaragua (2007). We treat them as if they ended in the year they began.
Source: Horn et al. (2021).

D.1 Classification of countries by group

Full dataset The sample includes all countries that defaulted at least once vis-à-vis private creditors or China within our sample period. Countries marked with ‡ restructured their debt with private creditors at least once from 1975 to 2019. Countries marked with ¶ restructured their debt with Chinese banks at least once from 2000 to 2019. Countries marked with § restructured their debt with the Chinese government at least once from 2000 to 2019. Data on distressed debt restructurings comes from Horn et al. (2022).

Table 13: Countries by income volatility group

Group	Countries

Minerals, ore, and metals export dependence Table 14 lists the countries which are dependent on mineral, ore, or metals exports according to the UNCTAD State of Commodity Dependence Report 2021.

Table 14: Countries that are dependent on minerals, ore and metal exports

Group	Countries
Minerals	Armenia, Bolivia, Botswana, Burkina Faso, Burundi, Chile, Congo, Dem. Rep., Eritrea, Ghana, Guinea, Guyana, Jamaica, Kyrgyz Republic, Lao PDR, Liberia, Mali, Mauritania, Mongolia, Montenegro, Niger, Papua New Guinea, Peru, Rwanda, Sierra Leone, Tajikistan, Uzbekistan, Zambia, Zimbabwe

Fuel export dependence Table 15 lists that countries which are dependent on oil or fuel exports according to the UNCTAD State of Commodity Dependence Report 2021.

Table 15: Countries that are dependent on fuel exports

Group	Countries
Fuel	Algeria, Angola, Azerbaijan, Cameroon, Chad, Colombia, Congo, Rep., Equatorial Guinea, Gabon, Iran, Islamic Rep., Kazakhstan, Mozambique, Nigeria, Russian Federation, St. Vincent and the Grenadines, Togo, Turkmenistan, Venezuela, RB, Yemen, Rep.

Belt and Road Initiative Table 16 lists that countries which are part of China's Belt and Road Initiative. The data is taken from the Horn et al. (2021) dataset.

Table 16: Countries that are part of China's Belt and Road Initiative

Group	Countries
Belt-and-Road-Initiative	Afghanistan, Albania, Armenia, Azerbaijan, Bangladesh, Belarus, Bhutan, Bosnia and Herzegovina, Bulgaria, Cambodia, Djibouti, Egypt, Arab Rep., Georgia, Hungary, India, Indonesia, Iran, Islamic Rep., Jordan, Kazakhstan, Kenya, Kyrgyz Republic, Lao PDR, Lebanon, Malaysia, Maldives, Moldova, Mongolia, Montenegro, Myanmar, Nepal, North Macedonia, Pakistan, Philippines, Romania, Russian Federation, Serbia, Sri Lanka, Syrian Arab Republic, Tajikistan, Tanzania, Thailand, Timor-Leste, Turkey, Turkmenistan, Ukraine, Uzbekistan, Vietnam, Yemen, Rep.

Heavily Indebted Poor Countries Table 17 lists the countries that are classified as heavily indebted developing countries (HIPC) according to the World Bank 2020 classification.

Table 17: Heavily indebted poor countries

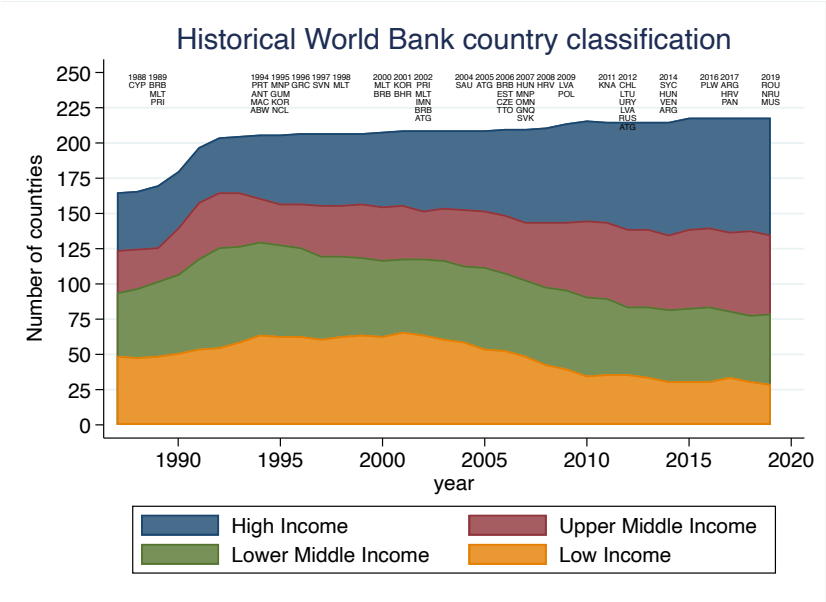
Group	Countries
HIPC	Afghanistan, Benin, Bolivia, Burkina Faso, Burundi, Cameroon, Central African Republic, Chad, Comoros, Congo, Dem. Rep., Congo, Rep., Côte d'Ivoire, Eritrea, Ethiopia, Gambia, The, Ghana, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Nicaragua, Niger, Rwanda, Senegal, Sierra Leone, Somalia, Sudan, São Tomé and Principe, Tanzania, Togo, Uganda, Zambia

Small states Table 18 lists the countries that are classified as pacific or Caribbean small states.

Table 18: Small states and islands

Group	Countries
Small state	Belize, Dominica, Fiji, Grenada, Guyana, Jamaica, Samoa, Solomon Islands, St. Kitts and Nevis, St. Lucia, Tonga, Trinidad and Tobago, Vanuatu St. Vincent and the Grenadines

Figure 15: Number of countries by World Bank income group



Notes: The figure plots the number of countries in each income group defined by the World Bank income thresholds. The countries listed above have been reclassified as "High Income" in the respective year. Countries that appear several times have exited the "High Income" bracket. Income classifications are set each year on July 1 for all World Bank member economies and all other economies with populations of more than 30,000. These official analytical classifications are fixed during the World Bank's fiscal year (ending on June 30); thus economies remain in the categories in which they are classified irrespective of any revisions to their per capita income data. The historical classifications shown are published on July 1 of each fiscal year.