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25-20 How China Collateralizes

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ABSTRACT

This paper is the first comprehensive analysis of the secured lending practices of Chinese creditors in emerging market and developing economies (EMDEs). We present a new dataset and detailed case studies of collateralized public and publicly guaranteed (PPG) loans from Chinese state-owned institutions in EMDEs between 2000 and 2021. Almost half of China's total PPG loan portfolio in EMDEs is effectively collateralized—amounting to $420 billion in collateralized debt across 57 countries. We document that Chinese lenders use techniques adapted from export and project finance to build multi-layered legal safety nets, which help ensure that risky EMDE loans will be repaid. As security, they use liquid, easily accessible assets, such as cash in bank accounts located in China. They rarely take infrastructure project assets as collateral, but often rely for repayment on established commodity revenue streams unrelated to the project. Typically, EMDE governments and state-owned enterprises commit to route foreign currency proceeds from commodity sales through bank accounts controlled by the lender. The cash balances in these accounts can be very large; in low-income, commodity-exporting countries, they average more than 20 percent of annual PPG debt service to all external creditors. The same revenue source can secure multiple successive borrowings over many years. Our findings reveal a previously undocumented pattern of revenue ring-fencing, where a significant share of commodity export receipts never reaches the exporting countries. Revenues routed overseas secure priority repayment for the creditor; they remain out of public sight and largely beyond the borrower's reach until the secured debts are repaid. These findings raise new concerns about debt transparency, fiscal management, fiscal autonomy, and the quality of macroeconomic surveillance, particularly in commodity-exporting EMDEs.

JEL codes: F34, G15, H63, H81, K12
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1 Introduction

The rapid expansion of China's global lending portfolio over the past two decades has attracted significant academic and policy interest. A particularly controversial but poorly understood aspect of China's cross-border lending activities is the use of secured (collateralized) debt. A common claim is that Chinese creditors rely heavily upon strategic assets—such as seaports, airports, and electricity grids—as collateral in cross-border lending and seize these assets in the event of default. For example, in 2018, Moody's Investor Service warned that "[c]ountries rich in natural resources, like Angola, Zambia, and Republic of the Congo, or with strategically important infrastructure, like ports or railways [...], are most vulnerable to the risk of losing control over important assets in negotiations with Chinese creditors" (Moody's Investor Service 2018). Governing elites in the developing world have popularized this view, with multiple presidents and prime ministers arguing that their governments would have to surrender strategic physical assets if they failed to pay their debts to China (e.g., AFP News 2018; Standish 2021). Our findings suggest that this popular narrative mischaracterizes the facts.

We present the first comprehensive analysis of Chinese creditors' secured lending practices in emerging market and developing economies (EMDEs), based on a new dataset of 620 collateralized public and publicly guaranteed (PPG) debt transactions between 2000 and 2021. The dataset represents the known universe of these transactions over the 22-year period. PPG debt accounts for nearly three-quarters of Chinese lending to EMDEs.

In an earlier study, we identified several features that set the sovereign debt contracts of Chinese creditors apart from those of their official and private counterparts, one of which was the use of cash deposits in escrow accounts (Gelpern et al. 2023). This paper builds and expands upon earlier work (see also Horn et al. 2021; Dreher et al. 2022) by (i) measuring the nature and incidence of collateralization across the full set of China's PPG loans to the developing world, rather than a small subsample; (ii) describing the design and operation of the security arrangements based on newly identified (escrow) account agreements; (iii) documenting how export revenues from the debtor country are routed through offshore bank accounts, which are typically controlled by the lender; (iv) providing new data on the locations of the accounts, their funding sources, minimum cash balance requirements, and actual cash balances; and (v) developing and applying a collateral classification template that can be extended to official and commercial collateralization practices in any part of the world.

The summary results of our analysis are as follows:

- First, collateralization is surprisingly prevalent, geographically widespread, and a central feature of overseas lending by state-owned institutions in China. Almost half of all PPG loan commitments extended by these institutions over the 22-year period of study are collateralized, with a total volume of nearly $420 billion (in constant 2021 US dollars) for 158 borrowers in 57 countries in Africa, Asia, Europe, Latin America, and the Middle East. Nonetheless, there are pronounced differences among Chinese creditors,

consistent with findings in our earlier work: while China Development Bank (CDB) secures 68% of its EMDE lending portfolio, the average share is only 23% for China Eximbank and 32% for state-owned commercial banks.

- Second, Chinese creditors in our dataset exhibit a strong preference for security that is observable, accessible, and liquid—as close as possible to cash collateral. A typical security package supporting a Chinese PPG credit includes one or more escrow accounts at a bank located in China, funded by revenues from the borrowing country, along with contract and property rights in the cash flows. Foreign currency revenues routed through bank accounts controlled by Chinese lenders secure 79% of the collateralized lending volume in our dataset. In many cases, the account is at the creditor bank, which can monitor the cash flows, limit withdrawals, and exercise set-off rights under Chinese law. In rare instances, we find evidence that Chinese creditors have secured their exposures with local currency revenues and bank accounts in the borrowing country, or with physical assets such as land or equipment.

- Third, more than 60% of the collateralized PPG lending portfolio of Chinese creditors in EMDEs, relies on collateral unrelated to the stated purpose of the debt. This means that the bank accounts securing Chinese infrastructure project loans are not typically funded from project revenues. Instead, most of the cash flows come from sales of the borrowing country's leading commodity export, such as oil in Angola, gas in Indonesia, copper in the Democratic Republic of the Congo (DRC), or cocoa in Ghana. A borrowing country state-owned enterprise (SOE) typically agrees to sell commodities under an offtake agreement with a Chinese SOE, and both SOEs agree to deposit the proceeds directly into bank accounts that secure unrelated infrastructure finance.

- Fourth, the dataset reveals a pattern of cross-collateralization and pooling collateral. For nearly half of all collateralized PPG lending in our dataset, the same asset or pool of assets secures more than one debt. In some cases, the same commodity revenue stream deposited in a single bank account serves as collateral for dozens of loans made over fifteen or twenty years, and remains encumbered until the last loan is repaid.

- Fifth, the secured debts in our dataset are more likely to rely on effective control over assets ("quasi-collateral") than on formal grants of security interest or property rights in the collateral. Formal security mechanisms, such as liens, pledges, and fixed and floating charges, may require registration or other public notice of the creditor's interest. In contrast, quasi-collateral relies on contracts, payment routing, and set-off rights to give creditors the practical ability to monitor, seize, and realize the value of an asset to pay the debt. In a weak enforcement environment with inter-creditor competition, creditors may prefer practical access over contingent property rights in the debtor's assets, and debtors and creditors alike may prefer to avoid publicity.

- Sixth, Chinese creditors in our dataset use multiple, overlapping security mechanisms over the life of the loan, from the initial disbursement to the last repayment. They typi-

cally layer cash flow control and collateralization tools adapted from export finance and infrastructure project finance, increasing the likelihood of repayment of risky EMDE loans. Priority access to dedicated revenue streams, beginning at their source, is at the core of this approach. It can ensure timely debt service during the life of the loan and maximize recovery in the event of default. Access to borrower revenues can simultaneously function as a source of repayment, information, and additional leverage in the debtor-creditor relationship.

Taken together, the secured lending practices we observe create large, ring-fenced revenue streams from EMDE governments and state-owned enterprises to bank accounts in China that are out of public sight. We find that the sums accumulating in these restricted accounts at Chinese banks can be very large. In a sample of 14 mostly low-income, commodity-producing EMDEs for which detailed information exists, the cash balances in such accounts represent more than 20% of total annual external PPG debt service in the average borrowing country. Some of these revenues remain offshore, beyond the control of the borrowing government, for many years.

Ring-fenced revenues are not available for other government expenditures, including for payments to unsecured creditors. They can severely limit fiscal space and autonomy. Our findings also raise concerns about the efficacy of fiscal monitoring in countries that rely on this collateralization mechanism.

We do not claim that the practices we observe are unique to Chinese creditors. On the contrary, many of them adapt elements of other official and commercial creditor practices. For instance, forward sales of commodities, revenue pledges, and ring-fenced revenue in offshore bank accounts are familiar pre-export finance tools, commonly used to support commodity export development (Kuhn et al. 1995: 2, 21-22; Lui and Chen 2021: 9-10; Jones Day 2024). However, using these tools to secure unrelated infrastructure loans is unusual, and potentially distortive, especially in countries with chronic governance challenges (World Bank and IMF 2020)[1]. Similarly, creditors' security in limited-recourse project finance frequently includes control over cash flows during construction and operation, as well as assignment of project assets, revenues, contracts, operating rights, and shares in the project company that can be seized in default. This reflects the fact that their recovery depends on the success of the project, which might never be built or generate revenues (Yescombe 2013:382-383). In our dataset, Chinese creditors use the same tools to encumber revenues from reliable and predictable commodity exports, not speculative infrastructure projects, to secure unrelated debts.

It is possible that other creditors combine and adapt the same transaction structures, either on

[1] A high-profile antecedent involved the use of oil export revenues by Indonesia's state-owned oil company Pertamina to secure funding for unrelated domestic projects, such as a steel mill and housing construction, from banks in high-income countries. Pertamina stopped paying its foreign creditors and went bankrupt in 1975. The Indonesian government eventually assumed and renegotiated Pertamina's liabilities to the banks. Pertamina's insolvency and the accompanying scandals raised widespread financial stability concerns and led to the creation of a new IMF facility (e.g., Crittenden 1977; Congressional Record 1978: 4428-4430).

their own or learning from Chinese lenders. In a competitive lending market, one might even expect to see a broader shift towards collateralization of sovereign debt, including by official creditors in other countries (e.g., IMF 2020; Shalal 2022; Maslen and Aslan 2022; Cotterill 2025). But data for other creditors are scarce and disclosure is rare. Secured sovereign lending merits far more research and policy attention than it receives.

It is difficult to assess whether and how debtors, creditors or the public benefit from the collateral arrangements in our dataset. The thicket of interlocking debt, sales, security, and construction contracts, implicating multiple institutions in China and the borrowing country, makes it hard to gauge the costs or benefits of any given aspect of the relationship. Awkward drafting and complex transaction structures that span multiple jurisdictions add to enforcement uncertainty. Although some of the restricted bank accounts accrue interest, the rates are rarely disclosed. Renegotiation and enforcement take place out of the public eye. Future research should address these information gaps and disentangle convoluted deal structures to estimate their effect on borrowing costs for the debtor and default risk for the creditor.

Opacity is a central challenge that follows from our findings, as public information about collateralization remains limited, fragmented, and contested. Hardly any of the underlying contracts are publicly available; those that are, suggest a pattern. Familiar market practices, mostly from limited-recourse project finance, are adapted to capture unrelated commodity export revenues, or transposed into a novel context, such as full-recourse sovereign debt. The IMF and the World Bank have recently cited lack of transparency and the use of unrelated assets as particularly problematic practices in collateralized sovereign borrowing (World Bank and IMF 2020, 2023; World Bank 2025; Mihalyi et al. 2022). The institutions have also repeatedly emphasized the risks of poorly designed secured financing for the borrower, the lender, and for development finance more broadly (World Bank and IMF 1995, 2003, 2020, 2023). Cross-collateralization, cash collateral pooling, and other complex and layered structures moreover can hide fragilities, transmit risk, and make it harder to manage debt distress.

Our paper adds a new perspective to the large literature on repayment and seniority in sovereign debt, an environment of weak contract enforcement that has long fascinated scholars (e.g., Bulow and Rogoff 1989; Tirole 2003; Bolton and Jeanne 2009; Panizza et al. 2009; Chatterjee and Eyigungor 2015; Schlegl et al. 2019; Flandreau et al. 2024; Mitchener and Trebesch 2024). The textbook view in this literature is that sovereign debt differs from corporate debt in that it is harder to enforce and not backed by collateral; most of the sovereign's assets are inside their country and are therefore difficult to seize and sell in default (Aguiar and Amador 2014; Schumacher et al. 2021; Gopinath et al. 2025). [2] Contrary to a core assumption of this literature, we show that collateralization is far from "negligible" (Bulow and Rogoff 1989: 43) in international sovereign lending. Instead, collateralization and related practices, such as control over cash flows, have been standard practice in one of the largest

[2] In a seminal paper, Bulow and Rogoff (1989: 43) state that "[w]hereas domestic loans are generally supported by substantial collateral, the assets that can be appropriated in the event of a sovereign's default are generally negligible. For this reason one must look beyond collateral to find incentives for repayment."

global lending booms of the past 150 years—China's post-2008 EMDE lending program and the closely related Belt and Road Initiative (BRI).

We provide the most comprehensive analysis yet of Chinese secured lending practices abroad. In this way, we contribute to a small but growing literature on China's overseas lending and expanding footprint in global finance (Brautigam 2009; Agarwal et al. 2020; Coppola et al. 2021; Horn et al. 2021, 2022, 2023; Dreher et al. 2022; Liu 2023; Chen 2024; Kondo et al. 2025; Alfaro and Kanczuk 2022; Clayton et al. 2023, 2025). Our earlier study suggested that China's policy banks used future cash flows and escrow accounts to secure their loans far more often than other official or commercial creditors (Gelpern et al. 2023).[3] In this study, we shed light on the methods followed by these banks and a broader set of Chinese state-owned creditors.

The remainder of the paper is structured as follows. Section 2 summarizes the key features of the dataset and the sources and methods that we used to construct it. Section 3 draws upon the dataset to document the collateralized lending practices of Chinese creditors in EMDEs since the turn of the century. Section 4 zooms in on Chinese lenders' use of escrow or restricted accounts to control borrower cash flows while the debt is outstanding. Section 5 reports on two unusual cases of collateralized sovereign infrastructure lending: Kenya's Standard Gauge Railway, financed by China Eximbank and secured by freight fees deposited in local escrow accounts, and Ghana's road development financing program with Sinohydro, backed by expected revenues from refined bauxite, which did not materialize. Section 6 concludes.

2 A new dataset of collateralization by Chinese creditors: Definitions and measurement criteria

This section describes our newly compiled How China Collateralizes (HCC) Dataset (Version 1.0), which provides detailed information on how Chinese lenders have collateralized their public sector and publicly guaranteed credit exposures in EMDEs. To construct the dataset, we expanded the 3.0 version of AidData's Global Chinese Development Finance (GCDF) dataset with 27 new variables that document collateral sources and types, cross-collateralization and the use of cash collateral pools for multiple loans, and minimum cash balance requirements and actual cash holdings in escrow accounts.[4]

[3] Low- and middle-income countries are not normally required to disclose whether their PPG debts are supported by collateral or quasi-collateral (IMF 2020:12). External creditors do not systematically disclose negative pledge clause waivers or determinations that such waivers are unnecessary. Gelpern et al. (2023) evaluate 100 loan contracts between Chinese state-owned creditors and government borrowers as well as 142 loan contracts between 28 non-Chinese (commercial, bilateral, and multilateral) creditors and government borrowers in EMDEs. Only 3 (2%) of the non-Chinese loan contracts (one from AfDB, one from Commerzbank, and one from Agence Française de Développement) in their sample include collateral provisions.

[4] The 3.0 version of the GCDF dataset captures grant and loan commitments from official sector PRC donors and creditors worth $1.34 trillion (in constant 2021 USD) across 165 low- and middle-income countries over a 22-year period (Dreher et al. 2022; Custer et al. 2023). A smaller subset of these countries received loan commitments that qualify as public and publicly-guaranteed (PPG) debt. We document the pruning procedures that were used to assemble the How China Collateralizes (HCC) Dataset (Version 1.0) in Appendix A.

Our data collection and coding approach builds on AidData's Tracking Underreported Financial Flows (TUFF) methodology (Custer et al. 2023). We first used the TUFF methodology to retrieve thousands of official and non-official sources that provide information about Chinese creditors' methods of securing repayment, including collateralization, of loans that qualify as public and publicly-guaranteed (PPG) debt.[5] These sources include (a) the annual reports, financial statements, stock exchange filings, and bond prospectuses of borrowing institutions; (b) IMF Article IV reports and World Bank-IMF debt sustainability analyses (DSAs); (c) loan agreements, account agreements, mortgage agreements, share pledge agreements, account charge agreements, assignment of receivables agreements, deeds of security, and deeds of covenant; (d) official correspondence between lenders and borrowers; and (e) media reports.

We then drew upon these sources to systematically code security arrangements on a loan-by-loan basis. All variables in the *How China Collateralizes (HCC) Dataset (Version 1.0)* were manually coded by a trained research team using a transparent, standardized, and replicable set of protocols (see Appendix B). Each source was reviewed in full, with all of the relevant information entered into a coding template that reflects the legal form and the economic function of the collateralization arrangements.

Defining collateralization: To identify and code collateralized debt transactions, we followed the World Bank and IMF 2020 guidance note, "Collateralized Transactions: Key Considerations for Public Lenders and Borrowers" and its 2023 update (World Bank and IMF 2020, 2023). The World Bank-IMF definition of collateralized lending is broad in that it includes (a) arrangements in which the borrower formally grants a security interest to a creditor in an asset or cash flow stream (the collateral), and (b) "quasi-collateral" arrangements that do not entail a formal grant, but "can have a similar economic effect," for instance, by giving the creditor effective control of payment streams or bank accounts, or the right to set off or withdraw funds from such accounts ahead of other creditors (World Bank and IMF 2023: 4).[6] The broad definition goes to the economic effect of the various legal arrangements, and highlights their fiscal, financial, and other public policy implications.

All debt transactions in our dataset involve a sovereign or a majority state-owned entity from an EMDE granting a Chinese state-owned creditor a security interest in, or effective control over, certain assets. The creditor can usually seize these assets to pay the debt without going to court if the debtor misses a payment. For most transactions in the dataset, the security arrangements operate throughout the life of the loan, and are not limited to events of default. The creditor can observe and access the collateral in different forms throughout

[5] Loans that qualify as PPG debt include central government debt, central government-guaranteed debt, debt contracted by sub-sovereign and majority state-owned entities in recipient countries without central government guarantees, and debt contracted by private entities with guarantees from public sector entities other than the central government.

[6] According to a 2020 World Bank and IMF guidance note, "[a] debt instrument is collateralized when the creditor has rights over an asset or revenue stream that would allow it, if the borrower defaults on its payment obligations, to rely on the asset or revenue stream to secure repayment of the debt. In a legal sense, it entails a borrower granting liens over specific existing assets or future receivables to a lender as security against repayment of the loan. More broadly, [...] it also includes arrangements that do not constitute granting of a security interest, but that have an equivalent effect" (World Bank and IMF 2020: 4)."

the production and sale cycle, while the debtor's control over the assets is restricted.[7]

Defining official lending: To identify official sector loans, we followed the OECD's standard definition and focus exclusively on loans from Chinese state-owned entities (OECD 2024)[8], including those from the country's policy banks (China Eximbank and China Development Bank), state-owned commercial banks (Bank of China, ICBC, China Construction Bank), state-owned enterprises (PetroChina, Sinohydro, China Machinery Engineering Corporation), and government agencies (People's Bank of China).[9]

Our dataset introduces three sets of variables on the collateralization practices of Chinese creditors: those that measure (1) sources and types of collateral; (2) cross-collateralization (the same collateral used for multiple loans) and cash collateral pooling; and (3) the use of escrow or restricted bank accounts, including the minimum cash balances that borrowers commit to maintain in the accounts and the actual cash holdings that borrowers maintain over time. Collateral types: To systematize our analysis of different types of collateral, we developed a classification scheme loosely based on the Uniform Commercial Code (UCC) collateral classification scheme in the United States. For each transaction in our dataset, all property in the security package was assigned to one of nine categories, such as bank deposit accounts, accounts receivable, goods, inventory, and equipment. Unlike the UCC classification scheme, ours extends to real estate (for details see Box 1 and Appendix B). We chose the UCC scheme as our starting point because it is the most comprehensive of its kind, and has been in widespread, consistent, continuous use for decades.

The distinction between liquid and illiquid forms of collateral plays a crucial role in our analysis. Relatively liquid forms include cash and assets that can be quickly converted into cash without a significant loss in value. By contrast, goods, real estate, and special purpose company shares that are not traded on public exchanges are relatively illiquid and likely to be hard to sell. If a loan's collateral package included Bank Deposits or Revenues, we categorized it as "liquid." All other types of collateral—Contract Rights, Investment Property, Real Estate, Equipment, Inventory, Physical Goods, and Other Financial Interests—were categorized as "illiquid" (see Box 1 and Appendix B for details). For ease of exposition, we use the term "cash collateral" to capture highly liquid, money-like forms of collateral and quasi-collateral.

We identified the sources of funding in the bank accounts that secure the loans in our dataset, assigning them to one or more of the following categories: (i) revenues from commodity sales,

[7]Creditor control is an important feature of the types of asset-backed lending—debt secured by liquid assets and bank accounts with high minimum balance requirements—that are prevalent in our dataset. In more familiar types of collateralized corporate and consumer loans, retail shops continue to sell the inventory they bought on credit, car buyers drive their cars while they pay down car loans, and homeowners live in their mortgaged homes, unless and until they default on the loans and their creditors follow the legal process to repossess these assets.

[8]The OECD definition of an official bilateral creditor is broader than that used by the Paris Club. The Paris Club definition only includes "governments or their appropriate institutions" and is negotiated for each participating creditor

[9]It is important to note that, while the OECD definition of the "official sector" is commonly used in the academic literature to ensure comparability over space and time, CDB and China's state-owned commercial banks do not consider themselves to be official creditors. As we explain in Section 3.1, our findings are applicable to both concessional and non-concessional loans.

(ii) project revenues, (iii) government revenues unrelated to the purpose of the loan, (iv) SOE revenues unrelated to the purpose of the loan, and (v) other cash deposits. In cases where the underlying sources of security are commodity assets or revenue streams, we documented the specific commodity supporting the collateralization arrangement. We identified eleven types of commodity assets and revenue streams in the coding process: bauxite, cacao, copper, cobalt, gold, gas, iron ore, oil, platinum, sesame, and tobacco.

We also categorized each loan in the dataset according to whether it was supported by "related" collateral, "unrelated" collateral, or both types. We determined whether the collateral in question was acquired, constructed, expanded, or improved with the loan proceeds. The World Bank and the IMF have raised policy concerns with "collateralization involving unrelated assets or revenues" and warned that it was "likely to create problems" (World Bank and IMF 2023: 14). Among other problems, "[a] borrower needs to internalize the fact that the weaker the link between project revenues and the revenues that serve as collateral, the higher the incentive for the lender to over-collateralize and the lower the lender's incentives to monitor the economic rate of return of the financed project" (World Bank and IMF 2020: 10).

Cross-collateralization and cash collateral pools: We determined whether each loan in the dataset was secured by collateral that also secured other loans. Cross-collateralization entails using the same asset or pool of assets as collateral for multiple debts, creating interconnected security interests. A default on any one of the debts could trigger creditor enforcement against the shared collateral, irrespective of the payment status of other obligations secured by the same assets. If a creditor seizes the collateral, it may trigger a cascade of defaults and creditor remedies with respect to other debts inside and outside the arrangement. Moreover, when the same revenue stream secures successive projects over many years, the debtor may cede control over those revenues far into the future. Cash collateral pooling is a separate, but closely related, practice recorded in our dataset. We use the term to refer to the pooling of cash from multiple sources as collateral for one or more loans (see Appendices B and D).

Bank account details and locations: For every escrow or otherwise restricted bank account, we coded the type of account, indicating whether the funds were deposited in a revenue account, a reserve account, or both.[10] Such accounts typically hold project revenues, commodity export receipts, or other earmarked revenues that may be used to make debt payments.[11] Creditors

[10]Escrow accounts and restricted accounts in our dataset are bank accounts governed by an account agreement that specifies the terms of deposit, withdrawal, and account management (see Appendix B for more details). In the vast majority of cases in our dataset, these accounts are explicitly referred to as "escrow accounts" in the underlying transactional documentation. We use the terms "restricted accounts" and "escrow accounts" interchangeably.

[11]Revenue accounts in our dataset are bank accounts where revenues or proceeds generated from specific sources (e.g., project revenues, tax revenues, sales proceeds, operating revenues) are deposited to secure repayment of the debt; they sometimes take other names, including collection accounts, sales collection accounts, and proceeds accounts. Reserve accounts—of which there are many different variations, including debt service reserve accounts (DSRAs), debt payment reserve accounts, and payment accounts—are designated banks accounts that hold cash deposits (reserves) to ensure that there are sufficient funds for timely debt service payments (see Appendix B for more details).

that have preferential access to the accounts gain repayment security and effective seniority over other creditors (IMF 2003a), and additional leverage in the debtor-creditor relationship that comes with control over a source of external liquidity. For each account, we recorded the name and location of the bank where the account was opened, the minimum cash balance(s) that the debtor had to maintain in the account at different points in time, the actual cash balances in the account at different points in time, the source(s) of funds in the account, the presence or absence of a covenant to deposit funds in the account, and the conditions under which withdrawals are permitted by or on behalf of the lender.[12]

3 Almost half of Chinese PPG lending is collateralized—mostly with deposits in bank accounts abroad

This section summarizes the key findings from our analysis of collateralized PPG loan commitments by Chinese state-owned creditors to borrowers in EMDEs.

3.1 The incidence of collateralization

Among all Chinese PPG loans to EMDEs since 2000, we identify 620 collateralized PPG loan commitments (worth $326 billion in nominal US dollars and $418 billion in constant 2021 US dollars).[13] These commitments were extended by 31 Chinese creditors to 158 borrowers in 57 EMDEs between 2000 and 2021.

In Figure 1, we present the full portfolio of PPG loan commitments from Chinese state-owned creditors to EMDEs between 2000 and 2021 (worth $911 billion in constant 2021 US dollars) and decompose it into secured and unsecured lending volumes.[14]

Nearly half, or 46%, of this portfolio (worth $418 billion in constant 2021 US dollars) was collateralized, using the World Bank-IMF definition that we discuss in Section 2. We categorize all of the remaining PPG loan commitments (worth $493 billion in constant 2021 US dollars) as uncollateralized. However, because we only record a transaction as collateralized when we can make an independent judgment to that effect based on the available documentation, we believe 46% to be a lower-bound estimate of secured credit in the Chinese PPG loan portfolio

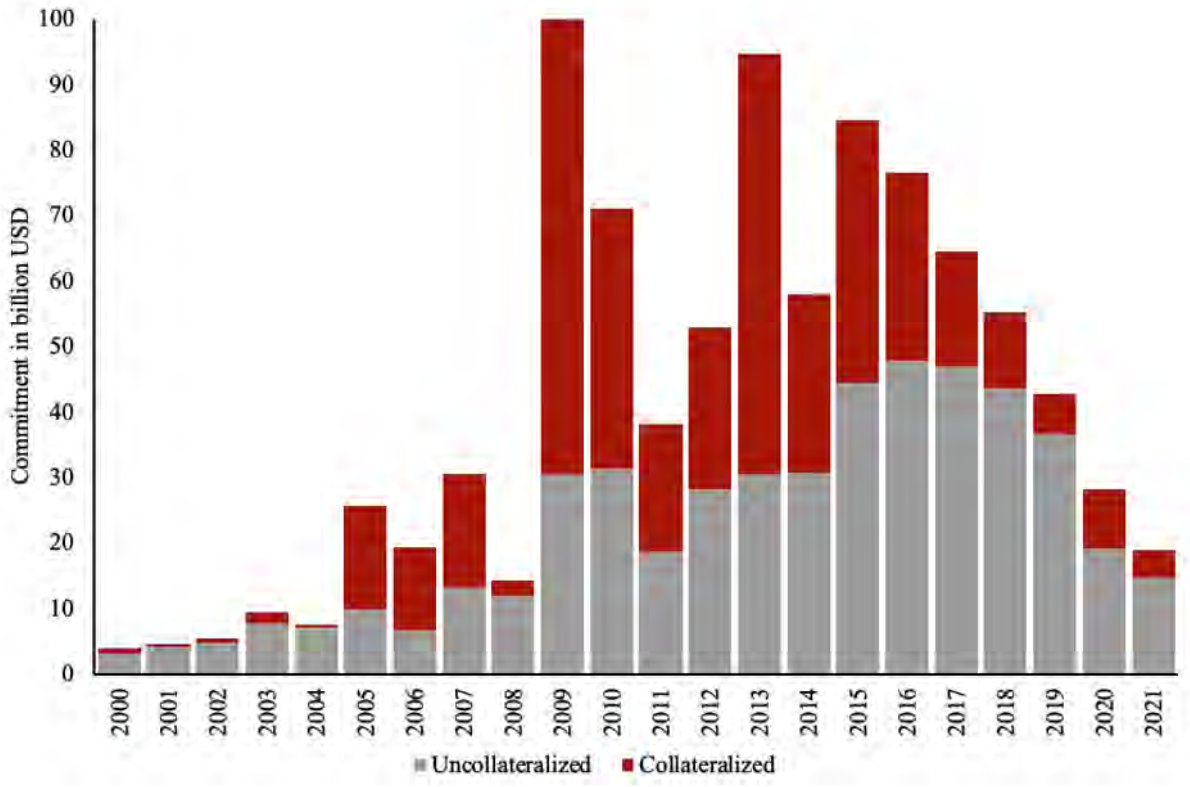
[12]The purpose of the "Covenant to Deposit Revenues" variable is to differentiate between a pledge or assignment of property rights in the revenues and contractual obligations of the borrower or collateral provider to direct cash flows to a designated escrow account (see Appendix B). The covenant may not be a formal grant of security interest and may not be subject to the same reporting and registration requirements but may have the same economic effect of giving the creditor visibility into and substantial control over the cash flows, particularly when the revenues derive from sales to a Chinese SOE instructed to make payments to an account in China.

[13]In our analysis, we only consider approved, active, and completed projects and activities that were financed with collateralized PPG loan commitments (excluding currency swap borrowings) from Chinese state-owned creditors between 2000 and 2021. See Appendix A for more details.

[14]Figure 1 only considers collateralized PPG lending commitments. However, according to the 3.0 version of AidData's GCDF dataset, 27% of China's uncollateralized PPG lending portfolio in EMDEs ($135 billion out of $493 billion in constant 2021 USD) is supported by at least one credit enhancement, such as a third-party repayment guarantee or a credit insurance policy. Two-thirds (61%) of China's PPG lending portfolio in EMDEs ($552 billion in constant 2021 USD) benefits from some form of credit enhancement, including collateral (of the formal and functional varieties), third-party repayment guarantees, or credit insurance policies.

in EMDEs.[15]

Figure 1. Collateralized and uncollateralized commitment amounts for PPG loans



Note: This figure shows total public and publicly-guaranteed lending commitments (in constant 2021 US dollars) by Chinese state-owned entities to borrowers in EMDEs between 2000 and 2021. Red bars indicate lending commitments that are formally or functionally collateralized using the World Bank and IMF definition (World Bank and IMF 2020, 2023), whereas grey bars represent uncollateralized lending commitments. Data are from version 1.0 of the HCC dataset and from version 3.0 of AidData's GCDF dataset. See Appendix B for details.

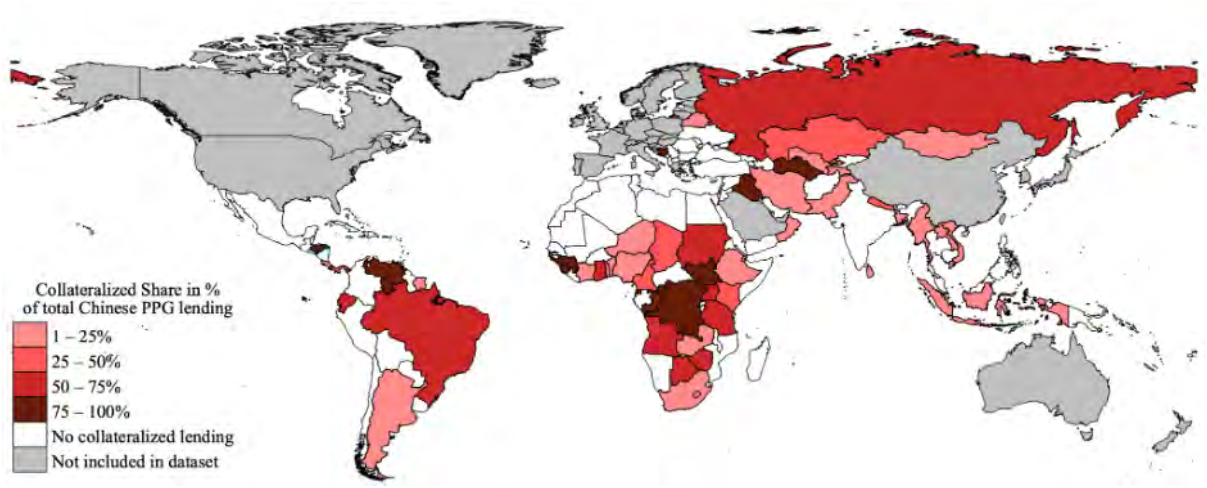
Chinese lenders' heavy reliance on collateral is not limited to specific countries or regions. Our dataset demonstrates that state-owned institutions in China have collateralized PPG claims in at least 57 different EMDEs. Collateralization is therefore a central feature of their global lending practice. At the same time, we find significant variation in the nature and extent of collateralization across lenders and borrowing countries.

Chinese lenders are more likely to use collateral in high-risk environments, such as countries with weak institutions and high sovereign credit risk. A separate, but related, finding is that 66% of Chinese lending to public sector entities that lack explicit government guarantees relies on collateral. By contrast, only 30% of Chinese lending to central governments is collateralized.[16] This empirical pattern is consistent with a 2003 IMF policy paper, which concluded

[15] A case in point is the $1.5 billion USD loan that China Eximbank made to a Ukrainian state-owned enterprise known as PJSC "State Food Grain Corporation of Ukraine" (PJSC DPZKU) in December 2012. We were unable to identify sufficiently specific evidence to categorize this PPG loan (Record ID#67803 in the 3.0 version of AidData's GCDF dataset) as collateralized. However, a financial journalist who has reviewed the December 2012 loan contract claims that the borrowing is in fact collateralized (Denkov 2014).

[16] Appendix Table C1 decomposes the dataset into central government debt, central government-guaranteed debt, and other public sector debt.

Figure 2. Geographical distribution of collateralized PPG lending by Chinese creditors to EMDEs



Note: This figure presents the percentages of China's PPG lending volume to EMDEs that are collateralized. Data are from version 1.0 of the HCC dataset and from version 3.0 of AidData's GCDF dataset. See Appendix B for details.

that "[p]ublic sector collateralized borrowing usually occurs through public enterprises" (IMF 2003b: 7).

We find that China Development Bank (CDB) is particularly likely to use collateral. 68% of CDB's PPG lending volume to EMDEs is collateralized. By contrast, only 23% of China Eximbank's PPG lending volume to EMDEs is collateralized, and 32% of the PPG lending volume from Chinese state-owned commercial banks—such as ICBC and Bank of China—relies on collateral.[17] CDB's lending activities in EMDEs have sharply contracted in recent years, which may help explain the decline in the overall incidence of collateralization over time (in Figure 1). However, we caution readers against inferring that collateralization is a relic of the past. A substantial share (45%) of the 2022-2025 PPG loan contracts in the 2.0 version of the How China Lends dataset are collateralized (Gelpern et al. 2023, 2025).

We also find that, contrary to the conventional wisdom, collateralization is not exclusively or even predominantly confined to the non-concessional lending activities of Chinese creditors (e.g., Brautigam and Gallagher 2014: 348). Appendix Figure C2 Panel B demonstrates that 55% of collateralized PPG loans from Chinese creditors to EMDEs are provided on concessional terms.

We also categorized secured loans according to their collateral providers. Recipient country SOEs are by far the most common providers of collateral for Chinese creditors, even when they are not the borrowers. SOE collateral accounts for 78% of the secured lending commitments in our dataset, which reflects the fact that creditors get their rights to collateral assets from the owners of those assets, and get priority access to revenues at the source of those revenues. Chinese creditors use a variety of legal tools, such as pledges, liens, assignments,

[17] Appendix Table C2 summarizes the creditor composition of the dataset.

and contractual undertakings by state-owned entities that control revenue-generating assets, to ensure access to cash flows and other collateral throughout the lending relationship.

3.2 Types of collateral: Cash deposits in bank accounts dominate

In order to better understand the security arrangements that underpin Chinese creditors' PPG lending practices in EMDEs, this section analyzes the different types of collateral in our dataset. We start with a systematic framework for classifying assets based on attributes expressly identified in the supporting documentation. This framework, which is described in Box 1, identifies the assets that may be used as collateral and the associated mechanisms that creditors use to monitor, control, and seize collateral at different points in the production and sale cycle.

Box 3.1. A collateral classification framework

Each collateralized loan in the dataset gives the creditor priority access to one or more assets to secure repayment. We assigned each asset to one of nine categories based on a modified version of the framework used in the Uniform Commercial Code (UCC) in the United States. For ease of exposition, the labels used for collateral categories in the body of this paper and defined below specifically describe the assets found in the dataset. We list the generally applicable collateral categories in parentheses and provide further detail on the classification framework in Appendix B.

- **Bank Accounts** (Deposit Accounts) in our dataset are either revenue accounts where exporters or service providers agree to deposit their proceeds, or reserve accounts, such as debt service reserve accounts and debt payment reserve accounts that serve as primary or backup sources of loan repayment. When the deposit account is at the creditor's bank, the creditor is typically entitled by law to set off any amounts owed to it by the debtor against funds in the account, in addition to any rights it may acquire by contract.[a]
- **Revenues** (Accounts Receivable) in our dataset include the right of the debtor or a state-owned entity in the borrowing country (in most cases, a commodity exporter) to collect revenues from commodity sales or infrastructure projects. A creditor armed with a security interest in or assignment of revenues can collect directly from third parties, including at the revenue source.[b]
- **Real Estate** (Real Property) includes land and anything permanently attached to land (e.g., buildings, oil reserves, mineral deposits). It includes items such as equipment embedded in a building/structure after installation. We include Real Estate in our collateral classification framework, although it falls outside the scope of the UCC classification framework.
- **Equipment** consists of moveable assets used in business operations, typically over long periods of time, as distinct from goods held for sale. Examples of equipment in our dataset include ships, floating oil rigs, and floating liquefied natural gas facilities.

- **Other Financial Interests** (Negotiable Instruments) include documents that convey rights to specific payments, distinct from rights in a bank account or a stream of payments.
- **Physical Goods** (Goods) are tangible, movable personal property, including crops, timber, and manufactured products not used as inventory or equipment.
- **Inventory** comprises goods held for sale or lease or consumed in enterprise operations. Examples include unsold merchandise and raw materials used in manufacturing.
- **Investment Property**: In all but one case in our dataset, this category captures equity interests in project companies.[c] Although these interests are transferable in principle, in our dataset, they are practically illiquid.
- **Contract Rights** (Assigned Contract Rights) are a residual category in our dataset, comprising rights under offtake, operating, or shareholder rights agreements.[d] It includes the right to sell commodities at specified prices, exercise voting rights, or participate in the operation of project assets. It excludes payment rights, which are captured in other categories.

[a] Set-off rights under background laws and regulations are independent of any security interest granted by contract.

[b] Enforcement may require registration, notice, and in some cases, third party consent (DOC 2016: 34).

[c] The one exception is a savings bond that was pledged to China Eximbank to support a loan for the 600MW Hwange Makomo Power Station Expansion Project in Zimbabwe.

[d] Assigned contract rights are legal rights under a contract—not the physical goods or commodities themselves. Our category is loosely based on "General Intangibles" under the UCC.

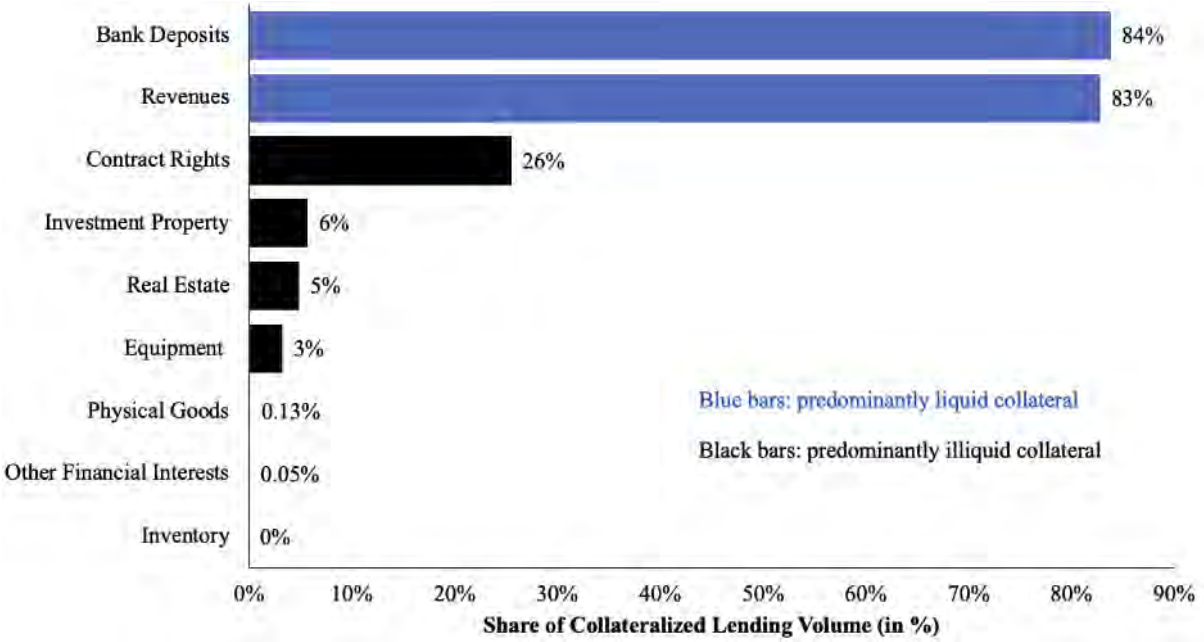
The dominant form of collateral in our dataset is deposits in bank accounts. Bank accounts can play two distinct but related roles in a security package. First, an escrow account can function as a governance device in a project financing, ensuring that funds are available and disbursed for construction, operation, and debt service related to the project in a timely manner over the life of the loan (e.g., Yescombe 2013:375-384). Offshore revenue collection accounts have also been used to mitigate government capacity and fiscal administration problems, as in the case of the World Bank's financing for Chad-Cameroon Pipeline (Gelpern et al. 2023). Accounts structured in this way are more likely to be managed independently, beyond the direct control of debtor or creditor. Second, an account can function as a source of repayment, or as repayment security if the borrower failed to pay as promised (see Appendix D).[18] Formally, the first function helps prevent default; the second can help the creditor recover in default. However, in some cases—including most bank accounts in our dataset—there is little substantive difference between them. The creditor can observe and has practical control over account inflows and outflows; it uses the account to exercise leverage over the borrower and maximize its own recovery. In some cases, including Kenya's Standard Gauge Railway financing (discussed in Section 5.1), the account agreement appears to grant the creditor a formal security interest in the account. In most cases, we can identify de facto control over in-

[18] The United States' oil-backed financing for Mexico in 1994, also described in our 2023 publication, is an example. (Gelpern et al. 2023)

flows and outflows, contract covenants to deposit revenues in the account, minimum balance requirements, and the creditor's set-off rights under Chinese laws and regulations.

Figure 3. Types of collateral in Chinese PPG lending to EMDEs

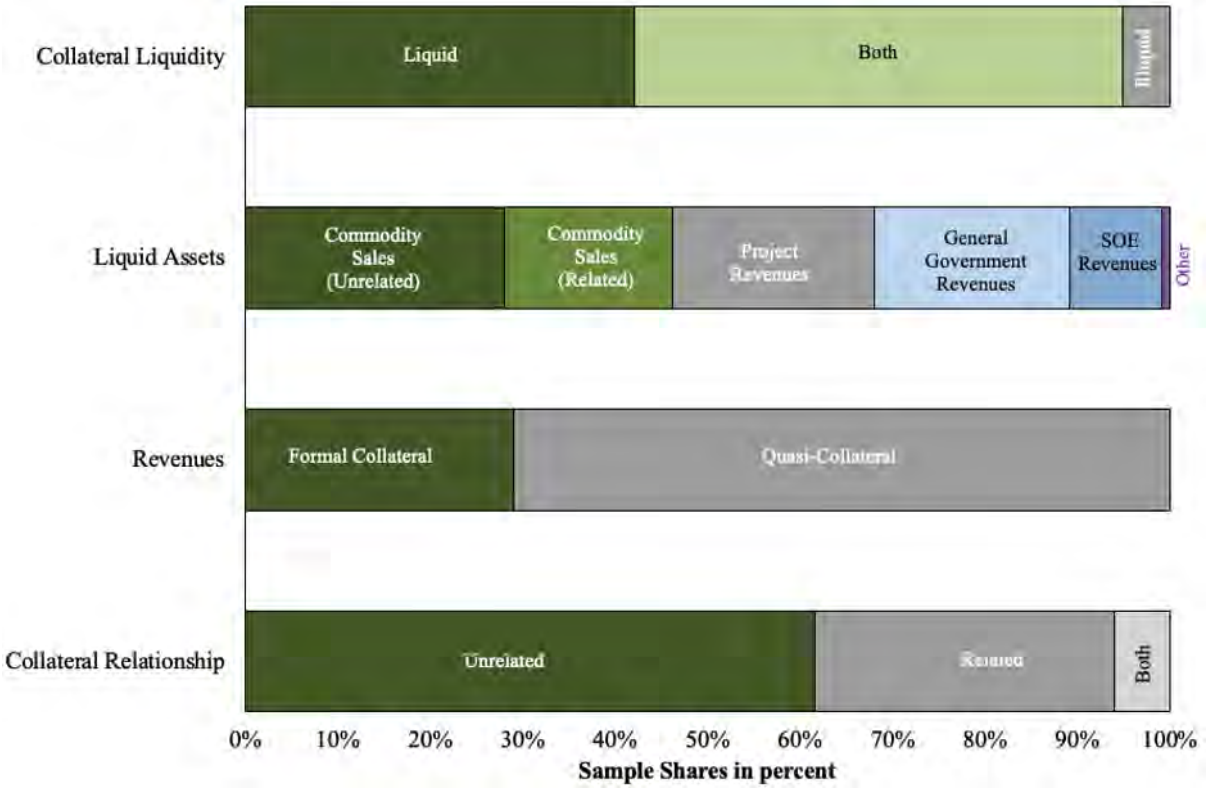
Panel A: Collateral Classification



Note: This figure presents the shares of the collateralized PPG lending volume supported by each type of collateral identified in the dataset. Because multiple types of collateral can support a single loan, the shares do not sum to 100%. With the exception of "Revenues," the categorical labels are aligned with the UCC-Based Collateral Designations that we document in Appendix B and summarize in Box 1. "Revenues" in this figure capture all cases in which a loan commitment is supported by an escrow account and control over a revenue stream through (i) a formal pledge or assignment of property rights in revenues (accounts receivable), (ii) a contract covenant to deposit revenues from a specified source in an escrow account controlled by the creditor, or (iii) both. Blue bars denote predominantly liquid forms of collateral; black bars denote predominantly illiquid ones. All data are from version 1.0 of the HCC dataset. See Appendices A and B for further details.

In Panel A of Figure 3, we classify collateral (as defined in Section 2) based on a simplified version of the UCC's classification framework. Box 1 and Appendix B explain the concepts and methodology underlying our classification of assets. The results show that "Bank Deposits" dominate, making up 84% of the collateralized lending volume and over 80% of all loans in our dataset. These are bank accounts in which the borrowers—or other collateral providers, such as operating SOEs—must deposit cash. "Revenues" represent the rights to receive payments—usually in the near term—resulting from the sale of goods and services, such as hydroelectric power tariffs, toll road revenues, and foreign currency earnings from commodity exports. In our dataset, these rights typically represent cash flows owed to the sovereign debtor or a state-owned commodity exporter in the borrowing country. An assignment or a grant of security interest in accounts receivable empowers the creditor to enforce its claim against third parties, including seizing revenues at their source. "Revenues" are also among the most important liquid assets that EMDEs have pledged to Chinese creditors: they

Panel B: Key Features of Collateralized PPG Lending Portfolio



Note: The first bar shows the shares of the collateralized PPG lending portfolio that are secured with liquid assets, illiquid assets, or both types of assets. The second bar disaggregates the PPG lending portfolio that is collateralized with liquid assets according to the underlying sources of funding (i.e., liquid asset types). The Liquid Assets categories are not mutually exclusive. The third bar disaggregates the PPG lending portfolio that is collateralized against revenues into two cohorts: (i) lending commitments that are supported by an escrow account and assigned or contingent property rights (a security interest in Accounts Receivable) in a revenue stream ("Formal Collateral") and (ii) lending commitments that are supported by an escrow account and a contract covenant to deposit revenues from a specified source in an escrow account controlled by the creditor ("Quasi-Collateral"). Any lending commitment that meets condition (i), regardless of whether it also meets condition (ii) is classified as "Formal Collateral." The fourth bar shows the percentages of the collateralized PPG lending portfolio that are supported by related collateral, unrelated collateral, or both types of collateral. All data are from version 1.0 of the HCC dataset. See Appendices A and B for further details.

represent 83% of the collateralized lending volume in our dataset. [19]

Physical and illiquid assets constitute a substantially smaller share of total collateral. Panel A in Figure 3 shows that real estate supports only 5% of China's overall collateralized PPG loan portfolio in EMDEs, while equipment and goods represent 3% and 0.13%, respectively. Our dataset does not include any debts secured by inventory, such as physical commodities held for sale. There are, however, noteworthy cases in which Chinese state-owned creditors have made use of physical

- A China Eximbank loan for the Unit 7 of the Tuzla Thermal Power Plant ("TZ B7")

[19] "Contract Rights" covers rights to operate and manage revenue-generating assets, collect revenues and insurance payouts, and other contract rights that may be assigned by the collateral provider. "Contract Rights" are coded as an illiquid form of collateral because they are hard to transfer, cumbersome to enforce, and difficult to value.

in Bosnia Herzegovina, which was supported by a mortgage on real estate, the TZ B7 plant;

- Multiple China Eximbank loans for the Bui Hydroelectric Power Plant Project in Ghana, which were supported by a mortgage on the facility's land, building, equipment and machinery;

- A CDB loan to Transnet (South Africa's state-owned railway company) that was supported by a first fixed mortgage and a first fixed and floating charge ranking security over diesel and electric locomotives procured from China South Rail (CSR) Corporation and China North Rail (CNR) Corporation;

- A CDB loan to the National Bank for Foreign Economic Affairs of the Republic of Uzbekistan, which was supported by a mortgage on three Boeing 787-8 aircraft ("Dreamliners") owned by Uzbekistan Airways; and

- A syndicated loan from ICBC and China Eximbank for the Port Elizabeth II Upgrading and Expansion Project in Sierra Leone, which was supported by a collateral package that includes project machinery and equipment. [20]

Investment Property is the only other type of collateral that is used in a non-trivial portion (6%) of China's PPG lending portfolio in EMDEs (see Panel A of Figure 3). [21] In all but one case, the security arrangement entails a pledge of equity in majority state-owned project companies and project companies with sovereign guarantees. The equity shares are illiquid: they are not, for the most part, publicly traded or in demand by other private investors, which means they cannot be easily converted into cash. Examples include:

- A syndicated loan supported by CDB, Bank of China, and China Construction Bank for the Amur Gas Processing Plant Construction Project in Russia, which lacks a government guarantee but was supported by the 99.9% equity stake that Gazprom (a Russian SOE) holds in the special purpose vehicle (Gazprom Pererabotka Blagoveshchensk) responsible for the project;

- A loan from Trans-Asia Gas Pipeline (Hong Kong) Company Limited—a subsidiary of China National Petroleum Corporation (CNPC)—for Line D of the Central Asia-China Gas Pipeline Project, which lacks a government guarantee but was supported by a 50% equity stake that OJSC Tajiktransgaz (a Tajik SOE) holds in a special purpose vehicle called Trans-Tajik Gas Pipeline Company Limited (TTGP);

- A government-guaranteed loan from ICBC and China Eximbank for the Port Elizabeth II Upgrading and Expansion Project in Sierra Leone, which was supported by Sky Rock

[20] More than 80% of Chinese lenders' PPG commitments to EMDE borrowers that are secured with Real Estate, Equipment, or Goods (as designated by the "UCC-Based Collateral Designations" variable in our dataset) are concentrated in three sectors: Industry, Mining & Construction; Energy; and Transport & Storage.

[21] Negotiable instruments support only 0.05% of China's overall collateralized PPG loan portfolio in EMDEs (see Figure 3).

Management Ltd.'s 100% equity stake in the special purpose vehicle—National Port Development (SL) Ltd.—responsible for the project; and

- A partially government-guaranteed loan from Bank of China and China Eximbank for the 1320MW Patuakhali Coal-Fired Thermal Power Plant Construction Project in Bangladesh, which was supported by the 50% equity stakes that Rural Power Company Ltd. (a Bangladesh SOE) and NORINCO International Cooperation Limited (a Chinese SOE) each hold in the special purpose vehicle (RPCL-NORINCO Intl. Power Ltd.) responsible for the project.

Panel B of Figure 3 highlights several additional features of China's collateralized PPG lending portfolio. Nearly 50% of the liquid assets that EMDE borrowers have pledged to Chinese creditors are revenues derived from commodity sales. A separate, but closely related, finding is that nearly two-thirds (62%) of China's collateralized PPG lending volume in EMDEs draws upon assets that are unrelated to the projects and activities financed with the loan proceeds (i.e., assets that were not acquired, constructed or expanded with the financing provided by Chinese creditors). [22] Chinese creditors also rely heavily on effective control ("quasi-collateral") arrangements instead of formal grants of security interest or property rights in collateral.[23] More than 70% of the PPG lending portfolio that is collateralized against revenues relies on quasi-collateral, such as payment routing to give creditors the practical ability to monitor, seize, and realize the value of an asset to pay the debt.

The use of multiple forms of collateral in parallel to secure repayment of nearly three-quarters (73%) of the PPG loans in our dataset is another key insight with far-reaching implications. This form of redundancy, or "Belt and Suspenders," is a common way of dealing with the many different risks implicated in limited-recourse project finance transactions, such as construction, operation, political, counterparty credit, and market risks. In those types of transactions, seemingly redundant security arrangements are designed to mitigate uncertainty. However, the "Belt and Suspenders" structure has not been observed or documented in the academic literature dealing with full-recourse sovereign debt, nor together with collateral unrelated to the stated purpose of the loan. The costs and benefits of such multi-layered structures look different when they are used to control cash flows from established commodity exporters with no connection to the risky financed project. As Figure 4 illustrates, Chinese creditors seek to gain visibility into and control over project assets and cash flows from inception—with multiple layers of offtake agreements, liens, assignments, deposit requirements,

[22] See Appendix Figure C2. In some cases, loans were initially secured with revenue streams unrelated to the financed project, such as cocoa export receipts; however, after the project established a revenue-generating asset, the loan's security package expanded to include project revenues, such as hydroelectric electricity sales. For example, the China Eximbank loans for Ghana's Bui Dam Construction Project were initially collateralized against receivables from Ghana's state-owned marketing board (COCOBOD) sale of cocoa to Genertec International Corporation of Beijing under a twenty-year cocoa sales agreement, which remained in place until the dam became operational and the agreement concluded.

[23] More specifically, the "Revenues" bar in Panel B of Figure 3 captures the shares of China's PPG lending portfolio that are collateralized against different types of revenues: (i) an escrow account and accounts receivable ("Formal Collateral") or (ii) a contract covenant to deposit revenues from a specified source in an escrow account controlled by the creditor ("Quasi-Collateral")

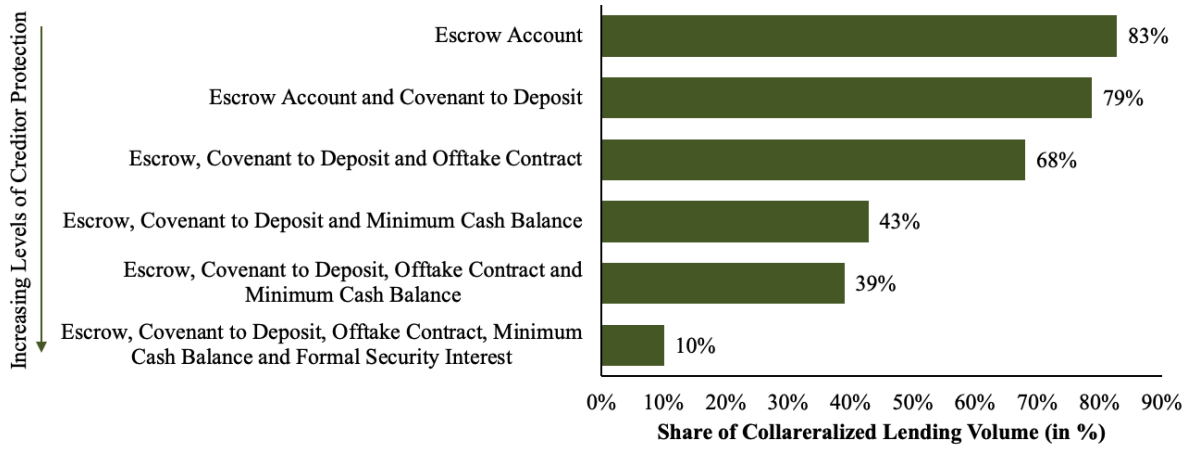
and restricted accounts. Using different instruments of control in parallel is a strategy for ensuring priority access to liquid assets and their cash proceeds at all times.

For many loans in our dataset, this multi-layered approach involves a combination of (i) a creditor-controlled bank account, (ii) an obligation to deposit funds, and (iii) an offtake contract to deliver commodities and credit the sales revenue directly to the deposit account. This combination of mechanisms provides Chinese lenders with comprehensive visibility into and control over the proceeds of the underlying asset. It is designed to ensure that the revenues from its sale would be applied in priority to service outstanding debts and maintain pools of accumulated cash collateral. It is unsurprising that Chinese lenders prefer this structure over illiquid forms of collateral like real estate, physical commodities, or equipment infrastructure. Such assets are harder to access and more challenging to control. They also require active management to maintain and realize value and can easily become political liabilities.

Figure 4 demonstrates that China's collateralized PPG loans are usually supported by multiple sources of collateral. It also calls attention to the ways in which Chinese lenders have adapted project finance transaction techniques to create a multi-layered safety net and maximize the probability of risky EMDE loans being repaid. One layer of protection is the establishment of an escrow account outside the direct control of the debtor. The account is only valuable to the extent it is funded. Additional security comes from identifying a source of funds and directing them into the account: a contract covenant to deposit revenues from a specified source into the account binds the revenue-generating enterprise as well as the debtor. It is not a formal security interest, but it gives the creditor direct recourse to, and a measure of control over, the revenue stream. Almost 80% of China's collateralized PPG lending volume in EMDEs benefits from this type of arrangement.

Three additional layers of protection, used separately or in combination, can bolster this arrangement further: (1) committing the debtor and collateral provider to maintain a minimum cash balance in the escrow account, (2) controlling a revenue stream through a long-term commodity offtake agreement (preferably with a state-owned buyer in China and enforceable against them) that generates revenues for the debtor or its enterprise, and (3) requiring a formal pledge or assignment of property rights in the revenues (accounts receivable). Nearly 70% of China's collateralized PPG lending in EMDEs benefits from the establishment of an escrow account, a contract covenant to deposit revenues from a specified source into the account, and a commodity offtake contract. 43% of China's collateralized PPG lending in EMDEs benefits from the establishment of an escrow account, a contract covenant to deposit revenues from a specified source into the account, and a requirement to maintain a minimum cash balance in the escrow account. 39% benefits from the same arrangement and a commodity offtake agreement. The strongest possible safety net for the creditor involves all five security measures: only 10% of China's collateralized PPG lending volume in EMDEs benefits from this type of arrangement, which likely reflects a preference for effective control through contractual arrangements rather than formal security interests that are enforceable via litigation.

Figure 4. Escrow accounts that provide varying levels of creditor protection



Note: This figure illustrates the share of China's collateralized PPG lending to EMDEs that benefits from different levels of creditor protection. All data are from version 1.0 of the HCC dataset. See Appendices A and B for further details.

3.3 Sources of funding in bank deposit accounts; cross-collateralization and "cash pooling"

Figure 5 zooms in on the sources of funds in the bank accounts that secure the loans in our dataset, and describes the revenues funding the accounts in more detail. Chinese creditors have a strong preference for reliable revenue streams guaranteed by the sovereign debtor or their state-owned commodity exporter under an offtake agreement, usually made with a Chinese buyer and in place at the time of the loan commitment. In particular, 70% of the collateralized PPG lending volume in our dataset relies on revenues derived from commodity sales under offtake agreements, and 95% of the offtakers are Chinese state-owned commodity importers. Section 4.2 shows that these revenues are routed into restricted bank accounts in the PRC.

We distinguish between revenues from commodity sales that are "related" and those that are "unrelated" to the purpose of the loan. We consider commodity revenues to be related when the loan they secure finances a commodity extraction project or supports a state-owned commodity extraction, processing, or sales enterprise. However, 45% of the collateralized lending volume in our dataset is backed by revenues from commodity sales that have no connection to the loan (see Figure 5). These collateral arrangements effectively divert funds that would otherwise accrue to the commodity enterprise or central government revenues, to dedicated accounts controlled by the creditor under an unrelated loan agreement. In most cases, the SOE and the borrowing government are last in the line for distribution of funds from the account. To determine whether the loans and the revenues that secure them are related, it is crucial to identify the agreed sources of funds for the restricted bank accounts. Mapping the commodity provenance of restricted account funds in turn sheds light on the mechanisms by which Chinese creditors structure collateralized and quasi-collateralized lending.

The commodity revenue sources vary by borrowing country, but typically draw on that coun-

try's leading commodity export: oil in Angola, Iraq, Russia, Sudan, South Sudan, Equatorial Guinea, the Republic of the Congo, Brazil, and Venezuela; gas in Indonesia, Myanmar, and Turkmenistan; gold in Kazakhstan; copper and cobalt in the Democratic Republic of the Congo; bauxite in Guinea; platinum and tobacco in Zimbabwe; cocoa in Ghana; and sesame in Ethiopia. Despite the variety, oil proceeds dominate: they account for 79% of the commodity-backed lending volume in our dataset, followed by gas at 4%. [24]

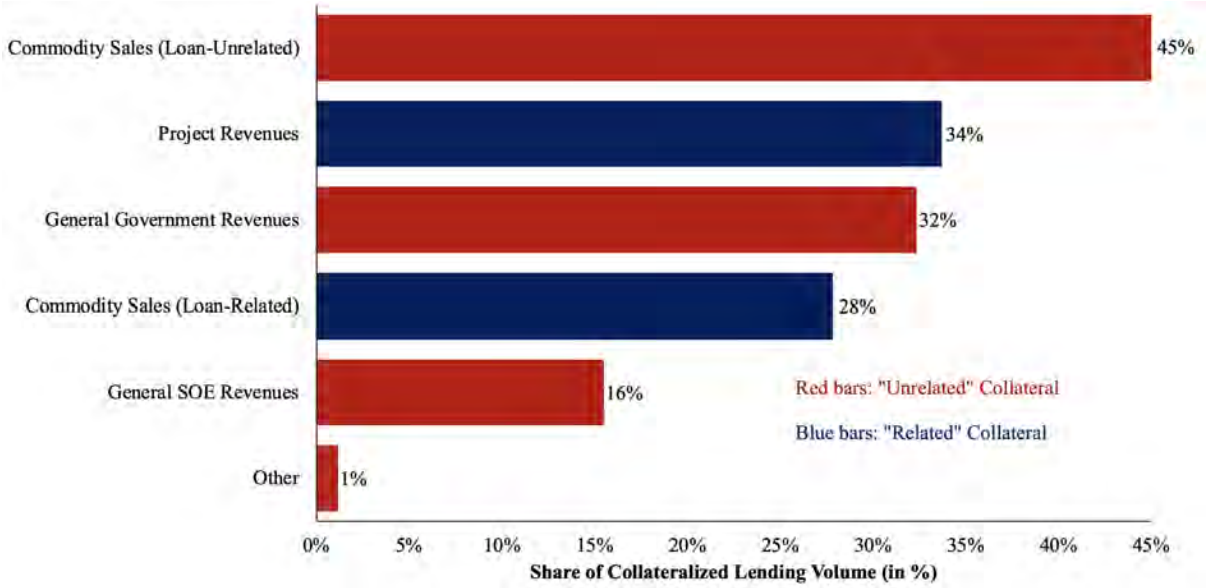
The second most significant source of funds to be deposited in restricted bank accounts is revenue generated directly by the project financed with the loan (see Figure 5). In the case of infrastructure projects—such as those that support the construction or rehabilitation of airports or power plants—this typically involves revenues derived from the infrastructure assets themselves, including airport fees and electricity payments that are deposited into designated revenue accounts. Project-related revenues secure 34% of China's collateralized PPG lending to EMDEs.

Unlike project-generated revenues, general government and SOE revenues used as collateral are independent of the financed projects. In many cases, this takes the form of a minimum cash collateral balance that is maintained by the recipient government or an SOE, without any indication that these funds must originate from project revenues. Finally, in a relatively small number of cases, our dataset indicates that loans were secured with cash deposits in escrow accounts, but there is not enough information to determine whether these deposits originated from borrowers or separate collateral providers. These cases represent 1% of collateralized PPG lending commitments from Chinese state-owned creditors to borrowing institutions in EMDEs. Given that a loan's security package can include multiple sources of collateral, we encountered some cases in which one part of the package (e.g., project revenues) is clearly identified and another part is not (e.g., a minimum cash balance requirement in an escrow account for an unspecified institution).

Cross-collateralization: Another important feature of Chinese lenders' use of cash collateral pools is that they simultaneously act as security for multiple debts. For nearly half of China's collateralized PPG loans in EMDEs, the same asset or pool of assets acts as collateral for more than one loan. Cross-collateralization accounts for 46% of China's collateralized PPG lending volume to EMDEs. Our dataset also identifies 52 unique cash collateral pools securing more than one debt. In each of these cases, the cash collateral pool secures the debts of one EMDE borrower to the same Chinese creditor or group of Chinese creditors. Cross-collateralization can exacerbate debt distress and complicate a debt restructuring if multiple creditors have competing rights to the same assets. However, in nearly all cases of cross-collateralization in our dataset, a common source of collateral supports multiple loans from the same creditor. This practice poses a different challenge: it can cede government control over assets or revenue streams to a single creditor for long periods of time, until all the

[24] These figures are based on USD loan commitment values. 61% of the commodity-backed PPG loans in our dataset are collateralized against the proceeds of oil sales, followed by cacao (4%) and bauxite and sesame (both 3%).

Figure 5. Sources of funding in bank deposit accounts



Note: This figure shows the relative importance of different sources of funding in bank deposit accounts that supported China's PPG collateralized lending to EMDEs between 2000 and 2021. Shares sum to more than 100 percent since a loan commitment can rely on more than one source of funding in bank deposit accounts. "Loan-related" commodity sales under offtake agreements are excluded from the "Project Revenues" category in Figure 5 All data are from version 1.0 of the HCC dataset. See Appendices A and B for more details. Figure 3b and Figure 5 present slightly different shares of the portfolio secured with liquid assets because the former measures the distribution of collateral types within the collateralized PPG lending portfolio, whereas the latter measures the share of liquid asset–backed loans relative to total PPG lending.

underlying debts for all the financed projects or programs are repaid. This can take decades.

In 2004, China Eximbank experimented with this cross-collateralization and cash collateral pooling structure to finance unrelated infrastructure projects in Angola (see Appendix D). It was subsequently refined, replicated, and scaled by a diverse group of Chinese creditors undertaking PPG lending operations in Africa, Latin America, the Middle East, and Central Asia. Our dataset demonstrates that China Eximbank used the so-called "Angola Mode" contractual template in Equatorial Guinea in 2006, the Republic of the Congo in 2006, Ethiopia in 2006, Sudan in 2008, Guinea in 2017, and South Sudan in 2018. It also attempted to do so—unsuccessfully—in Chad in 2011 and in Niger in 2013.[25] CDB put a different version

[25]In August 2011, China Eximbank and the Government of Chad signed a $2 billion master facility agreement (MFA) under which subsidiary loan agreements for public investment projects could be approved. The borrower's principal and interest payment obligations under the MFA were to be collateralized with oil export receipts. However, after the IMF warned that "collateralization of payment obligations subordinated other creditors and contravened the surrender requirements under the BEAC law [related to foreign currency assets]" (IMF 2013a: 11), the Government of Chad cancelled the MFA in December 2013. China Eximbank and the Government of Niger signed a similar oil-backed MFA in September 2013. The agreement was ratified by the legislature in May 2014, but subsequently cancelled. The 1.0 version of the HCC dataset excludes (1) suspended and cancelled loan commitments; (2) projects and activities that Chinese state-owned creditors agreed in principle to finance but never resulted in formal loan commitments; and (3) so-called "umbrella" agreements (such as master framework agreements) that sought to finance multiple projects and activities via subsidiary loans. However, we subjected all collateralized PPG loan records from the 3.0 version of the GCDF dataset that meet conditions (1), (2), or (3)—including those that capture the MFA cancellations in Niger and Chad—to the coding criteria described in Appendix B. These supplementary data are available upon request.

of the contractual template into practice in Venezuela in 2007, Russia in 2009, Turkmenistan in 2009, Brazil in 2009, Ecuador in 2010, and Ghana in 2011. More recently, Chinese SOE creditors have implemented a version of the "Angola Mode" in Iraq.

4 Revenue and reserve account mechanics

Our dataset indicates that deposit accounts are the predominant instrument in China's collateralized PPG lending transactions with EMDEs. It also demonstrates that nearly all of these accounts are formally designated escrow accounts. However, the collateralization arrangements of Chinese state-owned creditors usually involve some combination of escrow accounts and revenues from commodity sales. This section explains how these collateral arrangements function in practice.

4.1 Basic setup

Figure 6 provides a stylized representation of how Chinese creditors typically structure secured lending transactions with borrowing governments, including the use of four-party agreement templates and the practice of collateral pooling. Approximately 26% of the PPG lending volume (and 42% of the PPG loans) in our dataset uses a version of the transaction structure depicted in Figure 6. Appendix D provides an example from Angola, where China Eximbank and the Angolan Ministry of Finance signed a $2 billion Master Loan Facility Agreement and the country's state-owned oil company (Sonangol) entered into an oil sales and purchase agreement with China's largest state-owned oil buyer (UNIPEC).

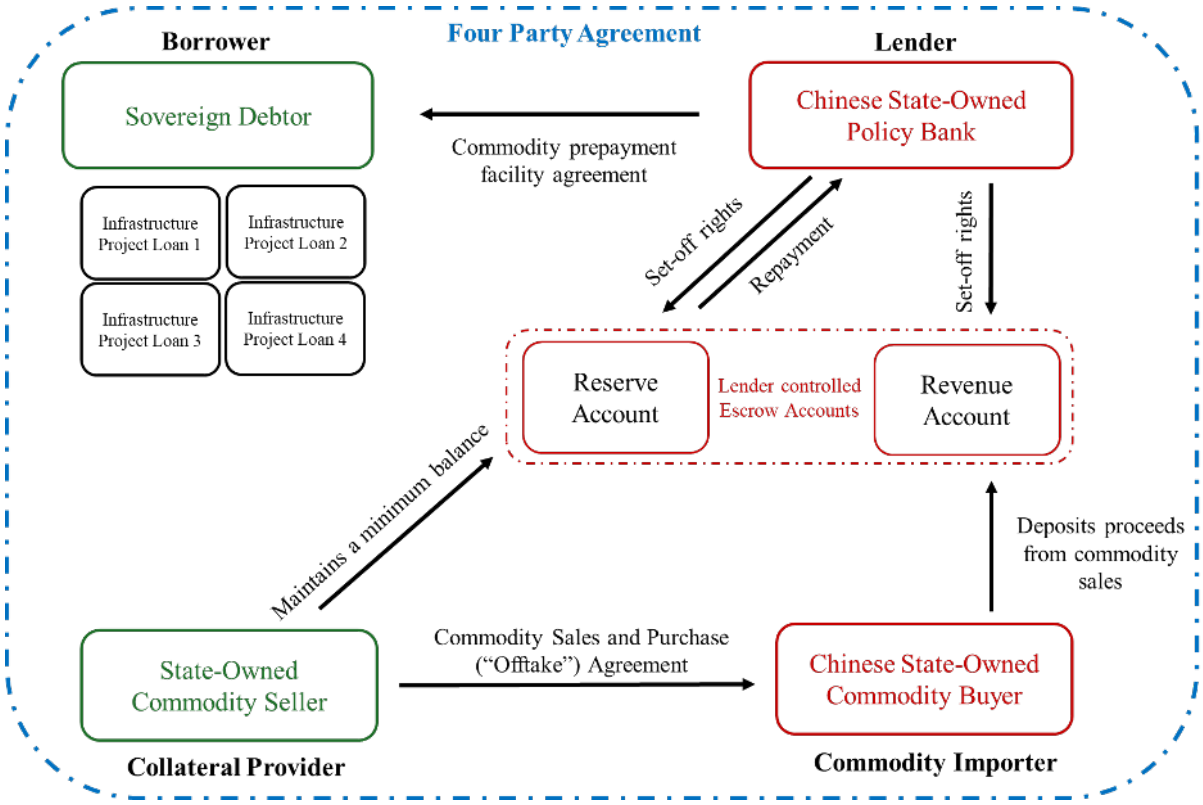
In Figure 6, a Chinese state-owned policy bank and an EMDE government have entered into a loan agreement that is linked to a separate commodity sales and purchase ("offtake") agreement between the borrower's commodity-exporting SOE (the collateral provider) and a Chinese state-owned commodity importer. A four-party agreement between the lender, the borrower, the state-owned commodity exporter, and state-owned commodity importer specifies that 100% of the sales proceeds from the offtake contract will be automatically deposited in a revenue account.[26] The revenue account is linked to a lender-controlled reserve account, which is pre-funded and serves as a buffer or a payment mechanism for the loan.

An account management agreement signed by the creditor, the debtor, the collateral provider, and the account bank typically specifies the minimum cash balances that must be maintained in the two escrow accounts over time.[27] These accounts may be managed by a different

[26] Commodity offtake contracts in our dataset often have a 10-25 year term, which makes it substantially more difficult for borrowing countries to reroute their receivables for other purposes going forward.

[27] A bank account is valuable as repayment security to the extent that it has a positive cash balance and is accessible to the creditor when the debtor stops paying. Therefore, creditors not only try to control the flow of cash in and out of the account to the maximum extent possible, but also take additional measures at the same time to identify the debtor's cash revenue sources, ensure that cash is deposited directly into the account, limit the debtor's access to the account, assert contractual and statutory set-off rights, and require the debtor to maintain enough cash in the account to make scheduled debt payments and serve as a buffer in the event of default. The Chinese creditors in our dataset use multiple, overlapping mechanisms in this way to maximize control over cash flows from identified productive assets in the borrowing EMDEs, and ensure real-time access to bank accounts

Figure 6. How escrow accounts work: A stylized example



Note: This figure provides a stylized overview of how Chinese creditors collateralize loans to debtor governments through escrow accounts and the use of revenue from commodity sales.

financial institution or by the creditor itself (see Section 4.3). The account agreement restricts the borrower's access to the funds and gives the lender significant control over deposits and withdrawals based on agreed conditions. The account bank may have the right under its national laws and regulations to debit the account to pay (set off) any amounts owed to it by the debtor.

In the stylized example in Figure 6, the funds deposited in the revenue and reserve accounts act as a shared source of security for an array of individual loan agreements, each signed separately under a master framework (facility) agreement. This is an example of cross-collateralization. In the event of default on any of the individual loans, the creditor can be paid from the shared cash collateral pool. Therefore, when the largest state-owned commodity exporter in the EMDE pledges 100% of its sales revenues under a twenty-year offtake contract with a Chinese importer as security for multiple loans under the facility agreement, and routes them into an offshore, lender-controlled revenue account, it is effectively ceding control over its revenues from the first loan disbursement until the last of the facility loans is repaid.

When project revenues are pledged as a source of collateral, borrowers are typically obligated

and other liquid collateral while their loans are outstanding.

to deposit 100% of revenues generated by the financed project into the designated revenue account. However, in some instances, the scope of this requirement is broader—extending beyond the specific project to cover 100% of revenues generated by the associated infrastructure asset, such as airports, railways, and power facilities. In other instances, Chinese creditors secure even more expansive control over government revenues—for example, by requiring that SOEs and government ministries deposit a fixed percentage of their total organizational revenues into the designated revenue account (see Appendix E for more details).

Our dataset allows for systematic measurement of the incidence and design of all these features across China's entire collateral PPG lending portfolio in low- and middle-income countries. In the following subsections, we will look at each feature in more detail.

4.2 Prevalence of revenue and reserve accounts

We first provide evidence on the incidence of revenue and reserve account usage. As shown in Figure 3, 84% of China's PPG collateralized lending portfolio to EMDEs uses at least one deposit account to secure the repayment of outstanding debts. Appendix table C1 provides a more granular breakdown based upon several additional variables in our newly assembled dataset. The vast majority of collateralized PPG loan commitments—79% ($329 billion USD)—from Chinese state-owned creditors to borrowers in low- and middle-income countries are linked to revenue accounts, which are used to channel commodity sales, project revenues, and/or SOE revenues into escrow. Reserve accounts, which are usually pre-funded and serve as a buffer for upcoming repayments, support 18% ($74 billion USD) of China's PPG loan commitments to EMDEs (see Appendix table C3).

4.3 Account banks: Location and authority

Another important consideration is the ease with which Chinese state-owned creditors can access the cash deposits in revenue and reserve accounts that support their PPG loans to EMDE borrowers. 306 of the 620 collateralized PPG loan commitment records in our dataset (a) rely on cash collateral in revenue or reserve accounts, and (b) provide account residency information.[28] In this subsample, we find that 79% of PPG loan commitments are collateralized with cash deposits in accounts at banks chartered in China. Only 21% reside in the borrower's chartering jurisdiction and 1% reside in a third chartering jurisdiction (such as the United Kingdom, Luxembourg, or South Africa).

Our dataset also identifies the specific banks where borrowers were required to open these accounts. In 74% (225) of the 306 loan commitment records with available information, China's policy banks—CDB (22%) and China Eximbank (51%)—served as both lenders and account banks. Therefore, CDB and China Eximbank have an extraordinary level of control over the cash deposits of borrowers and collateral providers.

[28] The remaining 314 records either do not rely on cash collateral (4 records) or do not provide account residency information (310 records).

In a typical secured credit transaction, a lender would establish its rights in the collateral asset against third parties through a public filing that gives it a priority claim against that asset. However, when a debtor agrees to open and fund an account at a bank that is also its creditor, it effectively grants the lender control and priority access to the account, including the ability to exercise the bank's statutory set-off rights. Granting the bank set-off rights does not typically require a formal pledge or a public filing (e.g., Gelpern et al. 2023).

Depending on where the account is located, set-off rights can derive from Chinese, borrower-, or third-country laws and regulations. CDB describes set-off rights of a creditor bank under Chinese law as follows in an escrow account agreement with the Government of Ecuador: "[t]he Account Holder acknowledges CDB's statutory rights under Chinese law and regulation to deduct from amounts standing to the credit of the Proceeds Account any amounts owed to CDB under this Agreement or any other agreement between CDB and the Republic of Ecuador [...]."[29] Although statutory set-off rights are formally and legally distinct from a contractual security interest (as stated in the same section of the same agreement), the economic effect may be indistinguishable under the circumstances. This excerpt also calls attention to the fact that set-off rights apply to all debts owed by the account owner to the bank. With two or more debts owed by the same account owner to the same bank, the economic effect is akin to cross-collateralization.

4.4 Minimum account balance requirements and actual cash balances

In a typical collateralized borrowing arrangement in our dataset, Chinese creditors require their EMDE borrowers to maintain minimum cash balances in escrow accounts as a condition precedent to loan disbursement, and separately as a series of undertakings for the duration of the loan. As a result, the creditor is under no obligation to disburse the loan until the borrower meets the initial minimum account balance requirement. When an account balance falls below the prescribed minimum, it may constitute an event of default, even if the debtor continues to service the debt and perform all its other covenants.

We were able to identify required minimum account balances for 51 accounts in 24 EMDEs in our dataset and find that these requirements come in different forms. They can take the form of fixed cash balances that must be maintained in reserve or revenue accounts during the periods of time when loans are active (e.g., a fixed amount during the loan's grace or drawdown/availability period and a different fixed amount during the loan's repayment period). They can also take the form of cash balance requirements that vary according to the timing and size of future debt service payments (e.g., 1.5x the next scheduled semi-annual installment of principal, interest, and fees).

While minimum account balances appear unremarkable at the level of individual accounts, the aggregate cash requirements can be very large—in particular, if a borrower is required

[29] See §14.1 of the Account Management Agreement between China Development Bank and the Republic of Ecuador, August 31, 2010. The agreement is accessible via http://china-contracts.aiddata.org/. Its terms and conditions are systematically coded in the 2.0 version of the HCL dataset (Gelpern et al. 2023, 2025).

to maintain minimum balances in multiple accounts under the same transaction (e.g., in a reserve and a revenue account).[30] The Government of Equatorial Guinea, for example, is required to maintain an amount equivalent to at least 30 percent of its outstanding debt to China Eximbank in a revenue account as well as the equivalent of the next semi-annual principal and interest payment in a separate reserve account (IMF 2010; Diario Rombe 2024).[31] At the debtor country level, we find that borrowers in our dataset are on average required to deposit funds in these accounts worth 19% of their aggregate (annual) external PPG debt service to all external creditors. [32]

The actual cash balances in the accounts typically reach similar levels. Figure 7 presents actual cash holdings as a percentage of total (annual) external PPG debt service for 14 countries with available information on at least some account holdings. In this group of mostly low-income, commodity-exporting countries, actual cash holdings on average amount to 24% percent of total external PPG debt service, or 5% of total government revenue.[33] Since these numbers are based only on those accounts with available information, they provide lower bound estimates for the total amount of cash that is deposited in creditor-controlled accounts.[34]

The fact that EMDEs deposit such sizable shares of their total debt service obligations and annual government revenues in these accounts is striking. Cash holdings in offshore accounts do not contribute to foreign exchange reserves and constrain the borrower's fiscal space and autonomy (World Bank 2025: 30). As a result, large excess balances have become a source of conflict between Chinese creditors and their public sector debtors in EMDEs—in particular, during times of debt distress (e.g., Terkper 2014: 5). They have also been criticized by the IMF, which has called for "repatriation [of these funds in an escrow account domiciled in mainland China] to avoid sizeable opportunity costs and improve liquidity for treasury operations" (IMF 2024) and emphasized that "[i]t is critical that any accumulation of excess balances in the escrow account [...] be repatriated to alleviate ongoing funding stress" (IMF 2025a).[35]

[30] Minimum account balance requirements are common in limited-recourse project finance transactions, but rare in full-recourse sovereign debt transactions. It is not unusual for borrowers in limited-recourse project finance transactions to keep 3-6 months of proceeds in a revenue account (Tinsley 2014: 354). The revenues in such transactions come from the project, and depend primarily on its viability. Nor is it unusual for borrowers in limited-recourse project finance transactions to maintain a cash balance in a reserve account that is equivalent to 3-6 months of principal and interest payments (Tinsley 2014: 76-78).

[31] Each year, the borrower is responsible for depositing revenues from the sale of a fixed number of oil cargoes into an offshore revenue account at China Eximbank (Diario Rombe 2023, 2024).

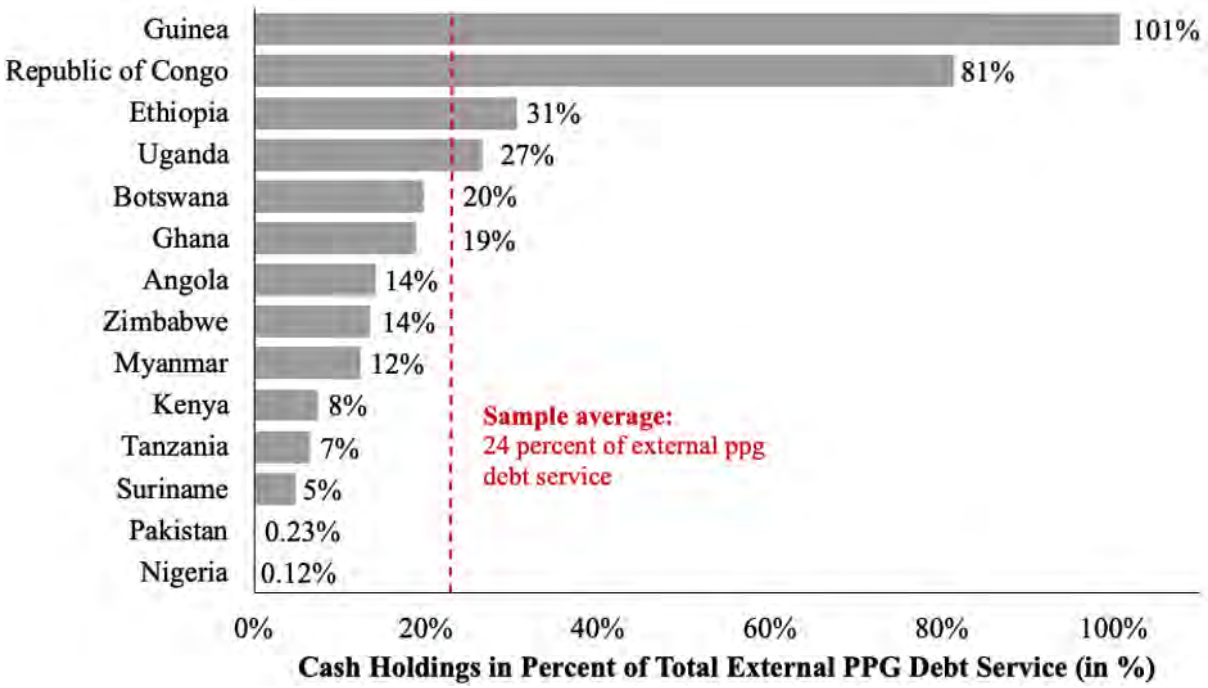
[32] See Appendix Figure 3 for more information on the composition of the sample used to generate this summary statistic.

[33] Appendix F provides a more detailed analysis of how minimum account requirements and actual cash holdings vary at the individual account level. We find cases in which minimum requirements are met or exceeded and cases in which actual account holdings seem to fall short of minimum account requirements. We discuss potential explanations for this pattern.

[34] For example, Pakistan is required to simultaneously hold cash collateral in four different escrow accounts. The number reported in Figure 7 (and the overall sample average) is based on actual holdings in only one of these four accounts. Since information on cash holdings in the other three accounts is missing, overall cash holdings are likely to be significantly larger than our estimates suggest.

[35] See also IMF 2018: 28. A related concern is that commodity export revenues are circumventing the borrowing government's single treasury account through automatic routing into offshore escrow accounts (EITI 2023; IMF 2023b: 16-17).

Figure 7. Cash holdings in escrow accounts in percentage of total external, annual PPG debt service



Note: This figure shows actual cash holdings as a share of total external annual PPG debt service. Data on external PPG debt service are from the World Bank's International Debt Statistics. The figure includes all countries in our dataset for which we have information on cash holdings in at least one account. Since countries typically hold cash in multiple accounts at the same time, these numbers are lower bound estimates for total cash holdings by country.

It is difficult to quantify the effective fiscal cost of keeping cash collateral in these accounts. The cash deposits that EMDE debtors maintain in escrow accounts with Chinese creditors accrue interest in some cases but not in others (e.g., The Wall Street Journal 2010; Office of the Auditor-General of the Republic of Kenya 2024: 495; Periodismo de Investigación 2016: 2). Although the rates that apply to the interest-bearing accounts are rarely disclosed, they are expected to be significantly below the financing costs of borrowing governments (World Bank 2025: 30). Another source of uncertainty—that merits further investigation—is the extent to which borrowers have the flexibility in practice to adjust their cash collateral balances dynamically before and after repayment dates. [36]

[36]Some account agreements call for borrowers to dynamically adjust their account balances to different minimum levels during specific windows of time (e.g., 20 days prior to the next installment of principal, interest, and fees). Nearly all of the time-stamped data that we collected on actual cash balances are drawn from end-of-calendar year or end-of-fiscal-year disclosures by borrowers. Because there is significant variation in both the dates corresponding to borrower disclosures and lender repayment schedules, it is unlikely actual cash balances were measured during the narrow windows of time that are specified in account agreements. Therefore, actual cash balances likely reflect substantial holdings beyond those that are strictly required by minimum account balance requirements.

4.5 Secrecy and oversight of escrow accounts

Chinese creditors and their debtors have taken extraordinary measures to shield the use of escrow accounts—and the cash deposits that they hold—from public scrutiny (e.g., Dreher et al. 2022; Gelpern et al,. 2023). It took a great deal of effort and new sources and methods to gather data on the extent to which EMDEs maintain cash balances in onshore and offshore escrow accounts to meet their contractual requirements to Chinese state-owned creditors. There are several major obstacles to transparency and oversight that merit discussion.

Confidentiality restrictions: Account agreements among creditors, debtors, collateral providers, and account banks typically impose expansive confidentiality obligations on the parties to the agreement. Consider for example the escrow account agreement that supports China Eximbank's loan agreement with the Government of Uganda for the Entebbe International Airport Upgrading and Expansion Project. It not only indicates that "the Parties shall keep the terms and conditions of this Deed confidential [...]," but also that "[t]he obligation of confidentiality shall endure in perpetuity [...]" and "[t]he Parties [to the escrow account agreement] shall not at any time during the terms of this Deed release any statement to the press or make any other public statement of any nature which could reasonably be expected to be published in any media regarding the relationship or the subject matter of this Deed [...]."[37] Although a handful of agreements are in the public domain, it is entirely implausible that they represent the universe of escrow, account management, security, and other cash flow control agreements entered into by EMDE governments with Chinese lenders.

Limited political accountability: Offshore escrow accounts seem to fall outside the reach of political oversight institutions in debtor countries, such as supreme audit institutions (SAIs) and public accounts committees within parliamentary bodies (IMF 2013b: 18; Maslen and Aslan 2022; World Bank and IMF 2023: Vasquez et al 2024). A key impediment to domestic oversight is that escrow account agreements are often structured as "side letters," in which borrowers and/or collateral providers agree to special undertakings in favor of Chinese creditors after legislative review and ratification of the loan agreement has taken place.[38] We identified only one case of a sovereign borrower submitting its escrow account agreement with a Chinese creditor for legislative review and ratification (Assibey-Yeboah and Brefo-Boateng 2018). However, we observed many cases in which legislative oversight institutions

[37] See §17 of the Escrow Account Agreement in Respect of Uganda Upgrading and Expansion of the Entebbe International Airport Phase I Project between the Government of the Republic of Uganda, the Export-Import Bank of China, the Civil Aviation Authority of the Republic of Uganda, and Stanbic Bank Uganda Limited, December 3, 2015. The agreement is accessible via http://china-contracts.aiddata.org/. Its terms and conditions are systematically coded in the 2.0 version of the HCL dataset (Gelpern et al. 2023, 2025).

[38] For example, the Government Concessional Loan (GCL) Agreement for the Entebbe International Airport Upgrading and Expansion Project was signed by the Government of the Republic of Uganda and the Export-Import Bank of China on March 31, 2015. It was subsequently reviewed and ratified by Uganda's Parliament on July 29, 2015. Approximately four months later, on December 3, 2015, the lender and borrower finalized the escrow account agreement without legislative review or ratification. Then, in December 2019, Uganda's Office of the Auditor General admonished the Ministry of Finance for agreeing to escrow account requirements that placed a "financial strain [on] the cash flows of the country" (Office of the Auditor General of the Republic of Uganda 2019: 10). A similar example involving a China Eximbank-financed broadband infrastructure project in Suriname is described in World Bank and IMF (2023: 7-8).

admonished executive branch institutions for inadequate disclosure of escrow account agreements and conditions.[39] The World Bank and the IMF have raised similar concerns about revenue pledges that take place after loan agreements are signed (World Bank and IMF 2023: 7-8).

Revenue streams and cash holdings that bypass the borrowing country: Another important obstacle to oversight and transparency is the fact that the vast majority (80%) of the accounts in question are domiciled outside debtor countries, which makes it substantially less likely that regulators, auditors, and statistical offices in these countries are aware of the existence and use of the accounts. A related issue is that the flows may never touch the debtor country and stay in China instead. This is because cash holdings in these accounts typically accumulate without any direct transfer of funds from the borrowing entity (e.g., the government or public enterprise) to Chinese creditors. Indeed, a common requirement is that Chinese state-owned commodity importers who buy commodities from the debtor country directly deposit part of these payments into escrow accounts that the sovereign borrowers opened in mainland China or an offshore jurisdiction for the benefit of their Chinese creditors (as described in Figure 5). As a result, the designated foreign currency earnings of state-owned EMDE commodity exporters stay in China; the routing and ring-fencing are effectively invisible to government institutions and other stakeholders in the borrowing country, and beyond multilateral surveillance.

5 Collateral practice: Case study evidence from Kenya and Ghana

In our study of 100 debt contracts between Chinese lenders and sovereign borrowers, we reported certain facts about the lenders' approach to securing repayment—most notably, the prevalence of restricted accounts—but could not describe the collateral arrangements in detail without access to the account agreements (Gelpern et al. 2023). The 1.0 version of the HCC dataset includes a limited number of these agreements, which allow us to describe and explain how these mechanisms work.

Because most collateralized PPG arrangements in this dataset entail multiple interconnected agreements, we sought to get as close as possible to a holistic analysis of the legal arrangements using two case studies for which we had more complete sets of contract documents. The case studies, Kenya's Standard Gauge Railway (SGR) project and Ghana's road construction credit facility secured by future revenues from refined bauxite, share some features typical of the HCC dataset, but are also outliers in important respects.

[39] For example, a legislative committee on parastatal bodies in Zambia reported in 2017 that it was "seriously concerned over the failure by the [Zambia National Broadcasting Corporation] to provide the Escrow Account Management Agreement on the [China Eximbank-financed] Zambian National Digital Terrestrial Television Migration Project [...] and the laxity with which [Zambia National Broadcasting Corporation] handles matters raised by auditors" (Republic of Zambia 2017: 160). The committee directed the Controlling Officer of Zambia National Broadcasting Corporation "to ensure that the [Escrow Account Management Agreement] is availed for audit verification, while officers who failed to avail it to the auditors should face disciplinary action" (Republic of Zambia 2017: 160).

Among the typical features, we document the central place of restricted bank accounts with significant minimum balance requirements in the creditors' security package, the pattern of SOEs providing collateral for central government credit, the operation of revenue and repayment accounts, and the distribution sequence ("waterfall") that puts the sovereign borrower and its SOEs at the end of the line.

In many other respects, the examples are atypical. Restricted accounts are located in the borrowing country in both cases, diminishing the creditor's control over government revenue flows. Kenya's SGR project has more features of conventional infrastructure financing than most of the other transactions in our dataset. It stands out because the debt is secured by railroad freight charges paid by the port authority, rather than unrelated commodities proceeds. The contracts experiment with and adapt features from project finance, albeit with full recourse to the central government. They explicitly reference a formal grant of security interest; however, some are so awkwardly formulated as to cast doubt on their enforceability.

The Ghana case study is more typical of the HCC dataset. The government took on the debt to build public infrastructure and promised to secure it with unrelated proceeds from refined bauxite exports. Apart from the bank account location in Ghana, the arrangement is unusual because the bauxite revenues never materialized. Generating the projected export revenues would have required a very large-scale investment and far more time than the loan documents appeared to contemplate. Separately, the arrangement became controversial because the borrowing government would not characterize it as debt in its financial reporting for six years and insisted instead that it was a forward sale of commodities.

Together, the case studies illustrate the multi-layered security packages that are a central feature of our new dataset, but also the scope for negotiated variation and experimentation in transaction design. They also highlight the importance of contract disclosure and caution against making conclusions about complex collateral arrangements based on incomplete documentation. At the same time, they are a reminder that contract text and legal formalities are a very imperfect proxy for the counterparties' behavior in a relationship. A debtor may not perform as promised, and their creditor may choose to forgo their contract remedies in favor of informal or less visible sanctions. Compared to formal security interests and contract enforcement, practical control over established export revenue flows offers creditors an effective monitoring and enforcement tool, maximum flexibility in its deployment, and minimum public exposure. The result is a policy challenge.

5.1 Kenya – Standard Gauge Railway

In May 2014, Kenya's National Treasury—acting on behalf of the central government—entered into two loan agreements with China Eximbank: a $1.9 billion USD buyer's credit loan (BCL) agreement and a $1.6 billion USD preferential buyer's credit (PBC) agreement (together, the "loan agreements") to finance the first phase of a project to upgrade and expand the coun-

try's rail system.[40] Phase 1 of the SGR project entailed building a railway from Mombasa to Nairobi to streamline freight transport from the coast to the capital.[41] The SGR was designed to run in parallel with the country's only other major railway, the outdated narrow-gauge "Uganda Railway," which was built under British rule in 1901 and had been the dominant mode of transit between Mombasa and inland destinations until the opening of a major highway in the 1960s (Knowles 2016). The old railway soon fell into disrepair, and trucks came to account for 95% of the freight traffic on the same route by the time SGR began operations in 2018 (Competition Authority of Kenya 2019: 43).

The two loan agreements between China Eximbank as the lender and Kenya's government as the borrower (hereafter "Kenya") provided that Kenya's National Treasury would on-lend $3.5 billion USD to the state-owned Kenya Railways Corporation (KRC), which oversees the country's rail system, to hire China Road and Bridge Corporation (CRBC), a Chinese SOE, to build the railway, supply all construction materials, and install railway facilities and locomotives, for $3.804 billion USD.[42] KRC in turn would use the loan proceeds to pay for 90% of the cost of two Engineering, Procurement, and Construction (EPC) contracts between KRC and CRBC.[43] KRC would cover the remaining 10% of the cost. Payments under the EPC contracts would be made in installments as CRBC met project completion milestones.[44] In 2014, the two China Eximbank loan commitments for Phase 1 of the SGR Project constituted about 5% of the country's GDP.

Although the financing, construction, and operation commitments of the various parties formed a single integrated economic arrangement, the repayment obligations under the contracts were independent of one another: Kenya would have to repay China Eximbank whether

[40]See Preferential Buyer's Credit (PBC) Loan Agreement for the Kenya Mombasa-Nairobi Standard Gauge Railway Project between the Government of the Republic of Kenya and the Export-Import Bank of China, May 11, 2014. Also see Buyer Credit Loan (BCL) Agreement for the Kenya Mombasa-Nairobi Standard Gauge Railway Project between the Government of the Republic of Kenya and the Export-Import Bank of China, May 11, 2014. These agreements are accessible via http://china-contracts.aiddata.org/. Their terms and conditions are systematically coded in the 2.0 version of the HCL dataset (Gelpern et al. 2023, 2025).

[41]Phase 2 of the SGR project involved an extension of the railway from Nairobi to Naivasha. It was supported by a third China Eximbank loan worth $1,397,927,373.27 USD. The buyer's credit loan agreement for Phase 2, which was signed by the lender and borrower on December 3, 2015, is also accessible via http://china-contracts.aiddata.org/ and included in the 2.0 version of the HCL dataset (Gelpern et al. 2023, 2025).

[42]The first loan was a buyer's credit loan (BCL) worth $2,003,584,028.87 USD and it was provided on the following terms: a 5.25 year grace period, a 15.25 year maturity, and an interest rate of 6-month Libor plus 3.6% margin. The face value of the BCL was subsequently revised to $1,903,404,827.42 USD. The second loan was a preferential buyer's credit (PBC) worth $1,600,000,000 USD and it was provided on the following terms: a 7.25 year grace period, a 20.25 year maturity, and a 2% fixed interest rate.

[43]KRC and CRBC signed two EPC contracts for Phase 1 worth $3,804,192,784.92 USD: (1) a $2,657,401,776.17 USD Construction on the Civil Works of Mombasa-Nairobi Standard Gauge Railway Project EPC Turnkey Commercial Contract on July 11, 2012 and (2) a $1,146,791,008.75 USD Supply and Installation of the Facilities, Locomotives and Rolling Stocks for the Mombasa-Nairobi Standard Gauge Railway Project Contract on October 4, 2012. The borrower was expected to use the proceeds of the BCL and PBC to finance 90% of the total costs of the two EPC contracts. It was also expected to use the BCL proceeds to cover 85% of the total cost ($179,811,671.43 out of $211,543,142.85) of a medium-long term buyer's credit insurance premium from China Export & Credit Insurance Corporation (Sinosure). See §2.2 Purpose of the Loan, Subsection (b) of the BCL Agreement and §2.4 of the PBC Agreement.

[44]See §5.1 of the Supply and Installation of the Facilities, Locomotives and Rolling Stocks for the Mombasa-Nairobi Standard Gauge Railway Project Contract and §6 of the Construction on the Civil Works of Mombasa-Nairobi Standard Gauge Railway Project EPC Turnkey Commercial Contract.

or not KRC repaid the on-lent funds to the Treasury, and whether or not the railroad generated any revenues for KRC.

The loan agreements between Kenya and China Eximbank called for repayment to be "credit enhanced and secured" from four sources: a Railway Development Fund (RDF), a Revenue Account, and a Payment Account (together, "Escrow Accounts") to be opened in the name of KRC, and a Long-Term Service Agreement (LTSA) between KRC and the Kenya Port Authority (KPA) as a rate-paying user of the railway. Under the LTSA, KPA agreed to direct minimum freight volumes to the SGR for transportation according to a schedule. KPA was responsible for collecting freight charges on behalf of KRC and remitting these funds monthly—either into one of the Escrow Accounts or a separate lender-approved account.[45] If the rail traffic did not produce enough revenues to meet the LTSA revenue targets, KPA would owe a penalty in the amount of the shortfall (a "take-or-pay'" provision).[46]

The loans fully disbursed and the railway construction was completed eighteen months ahead of schedule, in May 2017 (Dreher et al. 2022). Kenya began repaying the BCL and PBC in July 2019 and July 2021, respectively[47], But KRC failed to make a payment to Kenya's National Treasury under the on-lending agreement in June 2021.[48] Kenya later revealed that, by the end of the 2023-2024 fiscal year, KRC had accumulated about 167.5 billion KES (about $1.29 billion USD) in arrears under the on-lending agreement for Phase 1 of the SGR project (Republic of Kenya 2024). There is also some evidence that Kenya may have failed to make one or more debt service payments to China Eximbank on the BCL's originally scheduled dates, thereby incurring penalty interest during the 2023-2024 fiscal year (Republic of Kenya 2024)[49]. However, to the best of our knowledge, China Eximbank did not accelerate the debt or pursue any other contract remedies available to it in the event of default.[50]

Kenyan law does not require advance legislative approval or publication of individual foreign

[45]See Pg. 5 of the Agreement Between Kenya Railways Corporation and Kenya Ports Authority in Respect to Delivery and Movement of Freight to the Embakasi Inland Container Depot Using the Standard Gauge Railway Line, September 30, 2014. See `https://www.dropbox.com/scl/fi/1q4uoc0pxvqjbl8atj0wb/Kenya-2014-LTSA-for-SGR-Project.pdf?rlkey=jg1toymqryixtk5nsau9e6uma&e=2&dl=0`.

[46]The freight volume requirements were set according to a Schedule that required 2 to 7.5 million tons of freight annually from 2020 to 2034. See §12.2(d) of the BCL Agreement; §6.11(4) of the PBC Agreement; and Agreement Between Kenya Railways Corporation and Kenya Ports Authority in Respect to Delivery and Movement of Freight to the Embakasi Inland Container Depot Using the Standard Gauge Railway Line, September 30, 2014.

[47]See §7.1-7.2(B)-(C) of the BCL Agreement and Article 4 of the PBC Agreement. As of July 2023, the BCL's principal amount outstanding was $1.303 billion USD and the PBC's principal amount outstanding was $1.415 billion USD (National Treasury of the Government of Kenya 2023). The full history of BCL and PBC disbursements and repayments can be accessed via the External Public Debt Register of Kenya's National Treasury (at `https://www.treasury.go.ke/external-public-debt-register/`)

[48]Office of the Auditor-General of the Republic of Kenya 2022.

[49]In October 2022, Business Daily published an excerpt from what appears to be an official Kenyan Treasury document that suggests Kenya had incurred KES 1.31 billion in penalty or default interest to China Eximbank. Kenya's National Treasury released an official statement denying that it had defaulted on its SGR loan to China Eximbank or otherwise accumulated arrears. The statement did not explicitly dispute the authenticity of the document. Nor did it explain the penalty interest expense shown in it (Mutua 2022; Republic of Kenya 2022, 2024). The BCL agreement for Phase 1 of the SGR project includes a penalty interest clause (see §6.9). However, the PBC agreement does not.

[50]On this point, see Republic of Kenya 2022.

debt contracts. However, in November 2022, the William Ruto administration published the BCL and PBC agreements, fulfilling a campaign promise (Latif Dahir 2022). The SGR financing structure has been described in some detail elsewhere after several of the key transaction documents were released (Brautigam et al. 2022). Here we focus on elements that are either unaddressed or inferred from general project finance practice in existing research and reporting. We draw on the available terms of the Escrow Account Agreement, which governs the operation of the Escrow Accounts maintained by KRC as part of the "security arrangement for Secured Obligations"[51] under the BCL and PBC agreements.[52] Our analysis is based on a version of the Escrow Account Agreement for the Mombasa-Nairobi Standard Gauge Railway Project marked as a "Draft finalized by Exim, NT, and KRC 20140820."[53]

Although both LTSA and the Escrow Account Agreement are defined as "Security Documents" in the loan agreements, only the Escrow Account Agreement could be fairly interpreted as an attempt to grant a security interest to China Eximbank.[54] Contracts for SGR and several other projects in the dataset use the word "security" both as a term of art, referencing a formal security interest in collateral, and also colloquially, describing various forms of credit enhancement.

The two loan agreements require KRC to open a Revenue Account and a Payment Account (together, the Escrow Accounts) in its own name at Kenya Commercial Bank (the Escrow Bank) before the first loan disbursement.[55] The Escrow Account Agreement among Kenya, KRC, the Escrow Bank, and China Eximbank governs both of the Escrow Accounts, and specifies the security arrangement in some detail. We describe the two accounts in turn and then proceed to analyze their function as collateral security.

a. Payment Account

The Payment Account holds funds in US dollars and serves as the principal mechanism for loan repayment.[56] Under the Escrow Account Agreement, KRC committed to maintain a minimum cash balance of $84 million in the Payment Account while both loans were in their

[51] §3.3 of the Escrow Agreement. The agreement is accessible via `http://china-contracts.aiddata.org/`. Its terms and conditions are systematically coded in the 2.0 version of the HCL dataset (Gelpern et al. 2023, 2025).

[52] "Secured Obligations" are defined in the agreement as "all indebtedness and all obligations or liabilities of any kind which may now or at any time in the future be due, owing or incurred by the Borrower [Government of Kenya] to China Eximbank under the Loan Agreements, or by any of the Borrower or KRC under this Agreement, in each case whatever their nature or basis (including whether present or future, actual or contingent, either solely or jointly with any other person or entity) in any currency or currencies and however they are described including any principal, interest and expenses [...]." See §2.2.26 of the Escrow Agreement.

[53] "NT" stands for Kenya's National Treasury.

[54] The Take-or-Pay provision under the Long-Term Service Agreement (LTSA) appears to create an unsecured debt obligation of KPA to KRC in the amount of the value of the cargo shortfall below stipulated minimums. See pg. 7 of the LTSA.

[55] §2.2.6 and §6.11(2)-(3) of the PBC Agreement; §12.2(B)-(C) of the BCL Agreement; and the Escrow Agreement.

[56] §12.2(b) of the BCL agreement, which states that "[a] payment account established and opened by the End User in the Account Bank approved by the Lender prior to the establishment of such account, which shall be subject to the escrow agreement contemplated under the relevant Escrow Account Agreement and be used to maintain the agreed minimum amount of balance as a debt service reserve arrangement in favor of the Lender and which shall also be subject to any follow-up security arrangement in this regard." The Escrow Agreement defines the "Escrow Bank" as "duly established and existing under the laws of the Republic of Kenya."

respective grace periods, and $250 million while either loan was in its repayment period. The minimum US dollar balance went back down to $80 million between the expected repayment date of the BCL in July 2029 and that of the PBC in July 2034.[57] The grace periods for the BCL and PBC were set to five and seven years, respectively, after each loan was fully disbursed, and neither loan was to enter its repayment period until the project's scheduled completion date.[58] The minimum balance requirements apply at all times before project completion, and for 20 days leading up to each payment date after project completion. China Eximbank can override the contractual minimum balance requirements by furnishing Kenya, KRC, and the Escrow Bank a different minimum balance schedule.[59]

The Escrow Account Agreement does not specify a source of funding for the Payment Account; however, the payment mechanics, the minimum balance schedule, and the terms governing the Revenue Account suggest that the parties envisioned funding the accounts from SGR revenues after the railway came online. If the Payment Account balance falls below the required minimum, the Escrow Bank is automatically entitled (though apparently not required) to convert funds in the Revenue Account into US dollars and transfer them to the Payment Account until the balance reaches the minimum threshold. If there is not enough money in the Revenue Account, KRC must procure it "from alternative sources."[60] If Kenya misses a scheduled loan payment, China Eximbank is entitled (but again, not required) to instruct the Escrow Bank to transfer the money to an account of its choice. Once all amounts due China Eximbank at any given time have been paid, and provided the account met its minimum balance requirements, KRC may apply to the Escrow Bank to use the excess balance in the Payment Account to repay its debt to Kenya's National Treasury.

b. Revenue Account

The function of the Revenue Account under the loan agreements and the Escrow Account Agreement is to collect revenues from "offtakers" (fee-paying freight rail users; in practice, KPA under LTSA), presumptively in Kenyan Shillings,[61] and distribute it in the order approved by China Eximbank, starting with payments to China Eximbank before KRC operational expenses.[62] Under the agreement, KRC must instruct offtakers to deposit any fees they would otherwise pay to KRC into the Revenue Account.[63]

There is no minimum balance requirement for the Revenue Account before project completion; however, after project completion, the required minima are expressed as Kenyan Shilling equivalents of the US dollar minima for the Payment Account.[64] Unless China Eximbank

[57] §3.2.1.2 of the Escrow Agreement.
[58] §3.2.1.2(A-B) of the Escrow Agreement.
[59] §3.2.1.3 of the Escrow Agreement. The project was completed 18 months ahead of schedule on May 31, 2017. This implies that the 20-day minimum balance requirement qualifier was operative from May 2017 onward.
[60] §3.2.1.4 of the Escrow Agreement.
[61] Other currencies are an option but would need to open a separate account.
[62] §3.2.1.1 of the Escrow Agreement.
[63] §3.2.2.3 of the Escrow Agreement.
[64] §3.2.2.4 of the Escrow Agreement. Unlike the minimum balance requirement for the payment account, which applies only during the 20 days preceding a scheduled payment, the revenue account's minimum balance require-

changes the minima with a superseding schedule, KRC would be obligated to maintain the local currency equivalent of a $250 million minimum cash balance in the Revenue Account while either loan was in its repayment period and the equivalent of $80 million between July 2029 and July 2034 (after the BCL is repaid and until the PBC is repaid in full).[65] As we noted earlier, funds from the Revenue Account automatically top up the Payment Account when it falls below the applicable minimum.[66] KRC may access the funds in the Revenue Account only when both Escrow Accounts are at or above their minima, and only with prior approval of the disbursement plan by China Eximbank.[67] If the Revenue Account falls below the minimum threshold, SRC must replenish it "from alternative sources."[68]

c. Escrow Accounts as Collateral

Revenue collection accounts and debt service reserve accounts held in escrow are commonly used in limited-recourse project finance transactions, particularly where project design requires large lump-sum payments. The escrow account device supports incremental build-up of cash to make such payments (e.g., Brautigam et al. 2022: 14). The Escrow Account Agreement for Phase 1 of the SGR project combines the traditional escrow account function with what appears to be the grant of a security interest over the Escrow Accounts and the cash flows directed into the accounts pursuant to the transaction documents. The intent is unambiguous. In addition to repeated references to "security granted or created by this Agreement," "Encumbrance,"[69] and "security created hereby," and a mechanism for China Eximbank to get paid directly from the accounts,[70] the Escrow Account Agreement spells out the consequences of an Event of Default. The agreement provides that, "[i]f an Event of Default occurs and is continuing," China Eximbank may instruct the Escrow Bank to block all withdrawals by the Kenyan parties from the two accounts, and also that:

> The security created under Clause 3.3.1.2 above shall become immediately enforceable and China Eximbank may, without notice to or consent by KRC and/or the Borrower, give notice to the Escrow Bank requiring the balance standing to the credit of the Escrow Accounts (or either of them, as so notified) to be paid to China Eximbank in or towards satisfaction of the Secured Obligations at such time or as it may direct.[71]

In sum, while both loans are in their repayment periods, they are in theory supported by a cash collateral pool of up to $500 million USD. The KRC's Payment Account has a minimum balance requirement and entitles the creditor to dip into the account to get paid if Kenya's

ment applies at all times after the project completion date.

[65] §3.2.2.1, §3.2.1.4, §3.2.1.2 of the Escrow Agreement.

[66] §3.2.1.4 of the Escrow Agreement.

[67] §3.2.1.4 of the Escrow Agreement.

[68] §3.2.2.5 of the Escrow Agreement.

[69] "'Encumbrance' includes any-mortgage, pledge; lien, charge, assignment, hypothecation, security interest, title retention, preferential right or trust arrangement or agreement, for the purpose of providing security or other security interest of any kind [...]." See §2.2.8 of the Escrow Agreement.

[70] §3.2.1.5 of the Escrow Agreement.

[71] See §3.4.1.2 of the Escrow Agreement.

National Treasury is five days late with a payment. The Revenue Account has the same minimum balance requirement, albeit in local currency and after project completion; it turns into a backup repayment source when the Payment Account dips below $250 million USD. China Eximbank can unilaterally freeze and drain either or both accounts in the event of default.[72]

Despite this apparently robust security arrangement, the design and drafting of the Escrow Account Agreement leave two major gaps in the creditor's safety net. First, the Escrow Bank is a Kenyan institution partly owned and wholly regulated by the borrowing government.[73] This is unusual by international project finance standards and an outlier in our dataset. Moreover, while we have no reason to assume that a Kenyan bank would flout its contracts, the contract drafting is unclear at best in key parts. For instance, the term meant to operate as a grant of security interest in KRC's revenues from SGR and the restricted bank accounts, referenced in the passage quoted earlier on the consequences of default, reads as follows:

> 3.3.1.2. KRC shall, as continuing security for the payment, discharge and performance of the Secured Obligations, charges and/or by way of security assignment to China Eximbank all its present and future rights, title and interest in and to the Escrow Accounts, the Receivables and all amounts standing to the credit of the Escrow Accounts from time to time. [Emphasis added]

The job of this clause is to grant China Eximbank a security interest, yet it merely promises to do so in the future ("shall"). Meanwhile, the two verbs that would affect the grant ("charge" and "assign") appear to be garbled. To be sure, a reasonable judge in a common law system like Kenya's could well give effect to the clear intent of the drafters expressed throughout the document, but the risk to the creditor is non-trivial.

d. Esrow Account Performance

In its annual financial statements, KRC discloses the cash balances in various escrow accounts, including the Payment and Revenue Accounts that support the BCL and PBC for Phase 1 of the SGR Project. Table 1 shows the evolution of KRC's Payment and Revenue Account cash balances at the end of each fiscal year (June 31st). Until July 2019, both loans were in their grace periods and therefore only the Payment Account was required to maintain a cash balance above $84 million USD. This requirement appears to have been met. After July 2019, when the BCL's grace period expired, both the Payment Account—subject to the 20-day payment qualifier—and the Revenue Account were each required to maintain cash balances equivalent to $250 million USD. It appears that KRC largely failed to maintain these required balances.

[72] See §3.4.1.1 and §3.4.1.2 of the Escrow Agreement.

[73] KCB is publicly-traded but minority-owned by the Government of Kenya. It was a wholly state-owned bank in 1970, but the government's equity stake in KCB was gradually diluted over time. The Cabinet Secretary of the NT, who was responsible for signing the loan agreements with China Eximbank for Phase 1 of the SGR project, still holds a permanent seat on KCB's Board of Directors (KCB n.d.).

Table 1. Year-end escrow account cash balances in USD

Year	USD Payment Account	USD Revenue Account	KES Revenue Account	Revenue Account(s) Total	Total Accounts	Min. Account Balance Requirement
2014	-	-	11	11	11	0
2015	-	-	11	11	11	33,600,000
2016	59,217,713	-	27	27	59,217,740	58,800,000
2017	85,394,282	-	702,983	702,983	86,097,265	84,000,000
2018	88,238,141	4,197,863	13,987,268	18,185,132	106,423,273	84,000,000
2019	88,968,824	52,276,830	15,357,161	67,633,990	156,602,814	84,000,000
2020	***86,434,882***	**173,404,587**	**28,117,964**	***201,522,552***	***287,957,434***	500,000,000
2021	***34,367***	***278,670,443***	***4,347,623***	***283,018,066***	***283,052,433***	500,000,000
2022	***37,357***	**191,268,678**	**1,991,874**	***193,260,552***	***193,297,909***	500,000,000

Note: This figure presents the annual cash balances in two different escrow accounts. The entries in bold represent balances below their applicable minimum. The balances are taken from KRC's audited financial statements ending on June 30 of each year. The BCL was scheduled for 20 semi-annual repayments between July 21, 2019, and July 21, 2029. The PBC was scheduled for 26 semi-annual repayments between July 21, 2021, and July 21, 2034. Therefore, the table reflects balances on the day before the 20-day payment account minimum balance requirement binds.

Between 2020 and 2022, the Revenue Account balances remained much higher and closer to their required minima than the Payment Account balances. One possible explanation for this pattern is that KRC used Payment Account balances to make full or partial payments to Kenya in order to service its on-lent debt obligations. Recall that the Escrow Account Agreement entitles the Escrow Bank to convert and transfer funds from the Revenue Account to the Payment Account without further instruction from China Eximbank should the Payment Account fall below its required minimum balance. However, persistent disparities in the account balances raise questions. KRC's USG and KES Revenue Accounts have maintained relatively large cash balances despite the Payment Account's consistently below-minimum balance and the multi-year accumulation of arrears to Kenya for failing to repay on-lent funds.[74] Additionally, failures to meet the Escrow Account balance minima by KRC would normally qualify as an event of default under the central government's debt contracts with China Eximbank. Both the BCL and PBC agreements refer to the Escrow Accounts and to KRC's duties under the Events of Default Section of the Escrow Account Agreement.[75]

[74]KRC's audited financial statements reveal that it has, since at least 2021, struggled to make timely payments to Kenya's National Treasury for on-lent funds, leading to accumulation of penalty interest and arrears to Kenya's National Treasury. KRC's audited financial statements for FY 2021/2022 acknowledge that "[i]ncluded in the balance [of payables and accrued charges] is penalties/interest on lent loan of Kshs.1,956,705,512 that has accrued due to nonpayment of the Exim Bank loan. In the circumstances, the corporation continues being exposed to increasing interest on loan which may affect the cashflow status of the corporation in future" (Office of the Auditor-General of the Republic of Kenya 2023: 8). A 2023-2024 public debt management report published by Kenya's National Treasury in September 2024 indicates that "[t]he on-lent loan arrears which include principal and accrued interest not paid in FY 2023/2024 amounted to KSh 266.5 billion. Out of this, KSh 167.5 billion relates to Kenya Railways Corporation (SGR) Project which is yet to be serviced accounting for 62 percent of the total arrears" (Republic of Kenya 2024: 57).

[75]Under the BCL agreement, an Event of Default may occur if any party fails to comply with its obligations under the "Loan Documents" in excess of 30 days of receiving written notice from the lender to remedy the breach. Loan Documents include "any other document or agreement which may have been or may hereafter be executed in connection with this Agreement." An Event of Default under "Security Documents," including the Escrow Account Agreement, is also defined as an Event of Default under the BCL agreement. See Pg. 6 and

The evidence of divergence between contract text and the parties' conduct is unsurprising.[76] It reinforces a cautionary note that we previously raised on the distinction between what contracts say and what they do (Gelpern et al. 2023). The new evidence from Phase 1 of Kenya's SGR project calls for additional research on how Chinese creditors and their counterparts perform and enforce contracts—as distinct from writing them. In this particular case, it is possible that transaction design and infelicitous drafting reduced the creditor's bargaining power and induced behavior more favorable to the sovereign debtor—or, alternatively, that China Eximbank and its Kenyan counterparties approached these contracts as an invitation to bargain in the (faint) shadow of potential enforcement (Flandreau et al. 2024).

e. Key Takeaways

In sum, the SGR case highlights three lessons that also hold for the 1.0 version of the HCC dataset. First, it documents the practice of collateralized sovereign lending as a means to overcome the canonical enforcement challenge and inter-creditor competition. Chinese lenders seek to maximize the priority of their claims and the liquidity of the assets supporting their claims. They do so with multiple layers of credit enhancement, including collateralization, which give them various degrees of control over the borrower's revenues. Second, for policymakers, it highlights the prevalence of collateralization, and the alternative mechanisms that can be used to achieve the same effect. Third, the borrowing arrangement for Phase 1 of the SGR Project is an argument against broad-brush conclusions about the virtues and vices of Chinese lending. The transaction is neither best practice for project finance nor a neo-colonial takeover of sovereign infrastructure. It is a sequence of experiments to secure repayment in a high-risk environment—with mixed results. Access to full-text contracts is necessary to convey the substance of this dynamic security mechanism and its operation under stress, yet insufficient to predict the parties' behavior with precision. Behavioral outcomes may be a function of power politics, practical control over revenues, contract rights, and any number of other factors.

5.2 Ghana – Building roads, missing bauxite, springing debt

a. Fiscal Context & Backdrop

On December 19, 2022, the Government of Ghana suspended payments on most of its commercial, capital markets, and bilateral official debt. Only a few weeks prior to default, it had reached a staff-level agreement with the IMF on a $3 billion USD three-year extended credit facility (IMF 2022). By January 2023, Ghana formally applied to restructure its bilateral debts as part of the Common Framework for Debt Treatments Beyond the DSSI ("Common Frame-

§14.1(b) of the BCL Agreement. §7.1(3) of the PBC agreement is more direct: if the Republic of Kenya as borrower were to breach its covenants under the Escrow Account Agreement, it may be considered an Event of Default. §6.11 of the PBC agreement enumerates the Republic of Kenya's obligation to maintain credit enhancements, including the maintenance of revenue and payment accounts subject to the Escrow Account Agreement.

[76] There is a vast literature and decades of debate on the topic in contract theory (e.g., Macaulay 1963; Macneil 1974).

work").[77] One year later, Ghana and its official creditors achieved agreement-in-principle on the broad parameters of a sovereign debt restructuring. Then, in January 2025, the debt restructuring was codified in a Memorandum of Understanding (MOU) with 25 official creditors.

Ghana is a heavily indebted country with large unmet infrastructure needs.[78] According to a 30-year national infrastructure plan published by the National Development Planning Commission, the annual cost of Ghana's infrastructure needs is $37.9 billion USD (NDPC 2019). In anticipation of high levels of government borrowing to meet these needs, the legislature passed the Fiscal Responsibility Act (FRA) on December 28, 2018, including two strict fiscal rules: (1) the annual budget deficit may not exceed 5 percent of GDP on a cash basis, and (2) the government's primary balance must remain positive (Ministry of Finance of Ghana 2019). The intent of the law was to constrain debt accumulation: "[b]y capturing all state institutions in the fiscal rule, they will now have fewer opportunities to borrow beyond loans approved in the budget. [...] The limits set should prevent rapid increases in spending, especially during election years. In the past, election year spending has led to economic instability and debt crises" (Adam and Chinery 2019).[79] At the time of the FRA's passage, Ghana's public debt-to-GDP ratio stood at 58% and it was on a rapidly rising trajectory.[80]

The advent of the FRA may have made the off-balance sheet transaction design more attractive as a way to finance public infrastructure. In a February 2020 eurobond prospectus, Ghana acknowledged that it was resorting to "alternative financing methods to address the gap in infrastructure funding" and it listed "the US$2 billion deferred loan agreement with Sinohydro Corporation for the construction of certain infrastructure projects" among the examples (Republic of Ghana 2020). Between 2013 and 2019, Ghana's government and state-owned entities entered into collateralized loan contracts worth more than $3.5 billion USD with official sector creditors from China.[81]

b. Sinohydro Lending Structure

On May 16, 2018, shortly before the FRA, Ghana signed a master project support agreement (MPSA) with a Chinese SOE called Sinohydro Corporation Limited (hereafter "Sinohydro") for an amount up to $2 billion USD for the construction of priority infrastructure projects.[82] Under the terms of the MPSA, Ghana would direct its Ministry of Roads and Highways

[77] Do Rosario and Akorlie 2023; Ministry of Finance of Ghana 2024; Reuters 2025.

[78] On one measure of the overall quality of infrastructure produced by the World Economic Forum, the country ranks 118th out of 140 countries (Schwab 2019).

[79] According to Ghana's February 2020 bond prospectus, the purpose of the FRA was "to ensure fiscal discipline, prevent fiscal slippages and improve fiscal and debt sustainability" (Republic of Ghana 2020: 14).

[80] By 2020, Ghana's public debt-to-GDP ratio had increased by 19 percentage points—to 79 percent of GDP (Republic of Ghana 2020: 12; IMF 2021b). Research suggests that countries with rising public debt-to-GDP ratios in excess of 60 percent experience economic growth slowdowns (Chudik et al. 2017).

[81] The 1.0 version of the HCC dataset provides evidence of collateralized loan contracts worth $3.5 billion in nominal USD and $4.2 billion in constant 2021 USD.

[82] The MPSA was approved by Ghana's Parliament on July 28, 2018. Sinohydro is a state-owned engineering and construction company, specializing in hydropower projects and other civil works infrastructure projects. It is incorporated under the laws of China and is a subsidiary of Power Construction Corporation of China, an SOE.

(MORH) to sign individual engineering, procurement, and construction (EPC) contracts for construction projects ranging from hospitals and clinics, to roads and bridges, and affordable housing.[83] Ghana's Ministry of Finance (MOF) would assume responsibility for the total price of each EPC contract with Sinohydro.[84] Sinohydro agreed to defer 85% of the total price of EPC payment obligations through individual but identical deferred payment agreements (DPAs).[85] To secure funds for immediate construction and procurement costs, Sinohydro was expected in turn to borrow the deferred payment amounts from the Industrial and Commercial Bank of China (ICBC). ICBC was later replaced by a different Chinese state-owned commercial bank: China Construction Bank (CCB).[86] Though Ghana and Sinohydro were expected to jointly negotiate with CCB, Sinohydro remained lead arranger and negotiator in the process and was the sole party responsible for entering into the finance agreement with CCB.[87] As part of the integrated transaction, Sinohydro was to then enter into an Accounts Receivable Finance Agreement (ARFA) with CCB and assign its right to payments by MORH under the DPAs.[88] After assigning any rights to payment, interests, benefits, or claims it had arising from the EPC and DPAs, Sinohydro could then require MORH to make payments directly to the ultimate financier of the transaction, CCB.[89] Through this structure, MORH entered into EPC contracts with Sinohydro, which deferred 85% of the contract price to be paid over 15 years, and assigned its rights to CCB, making it the effective financier with legal rights to repayment.

Figure 8 illustrates the full set of contractual agreements that govern the transaction. The agreements are designed to mobilize infrastructure financing while preserving lender-country control over multiple sources of repayment. Ghanaian entities are represented in green; Chinese entities are represented in red; dotted lines delineate the scope of contractual obligations

[83]See §1.6 of the Master Project Support Agreement between the Government of Ghana and Sinohydro Corporation Limited, May 16, 2018. The agreement is accessible via http://china-contracts.aiddata.org/. Its terms and conditions are systematically coded in the 2.0 version of the HCL dataset (Gelpern et al. 2023, 2025). At the time of signing of the MPSA, 10 projects had been identified as "Priority Projects," almost all of them road works projects.

[84]§2.2 of the MPSA requires Ghana to furnish a letter of support, committing to DPA repayment obligations. §2.3 states that Ghana is responsible for debt repayment if bauxite revenues are insufficient.

[85]§2.3 of the MPSA All borrowings that took place under the MPSA via DPAs carry identical borrowing terms: a maturity of 15 years, a grace period of 3 years, an interest rate of 6-month LIBOR plus a 2.80% margin, a 2% default (penalty) interest rate, a 0.70% management fee, a 0.50% commitment fee, and a lump sum Sinosure insurance premium of 7%.

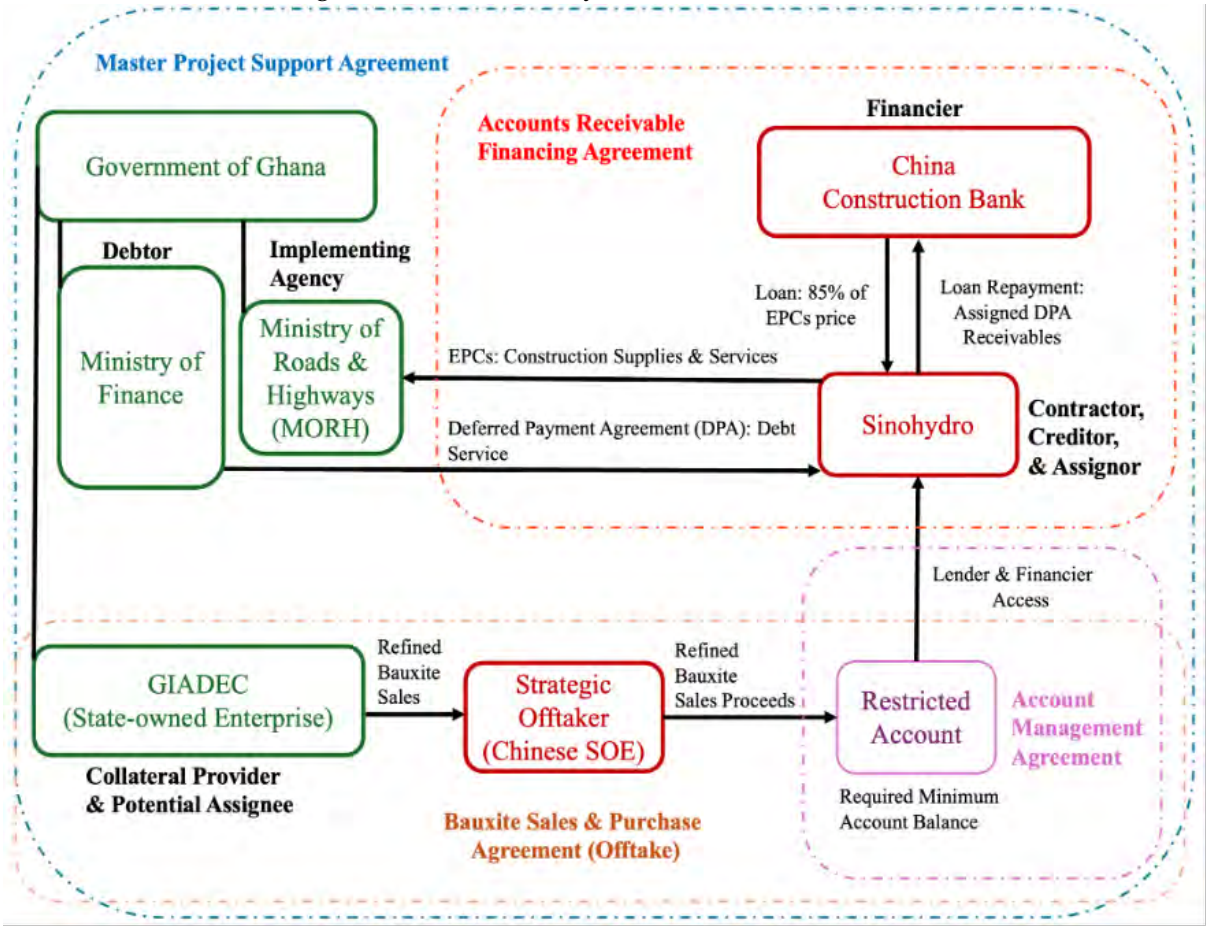
[86]On September 9, 2019, China Construction Bank and Sinohydro Corporation Limited signed an accounts receivable finance agreement for four lots of Phase 1 (Lot 3, Lots 7, Lot 8, and Lot 10). Then, on July 23, 2020, China Construction Bank and Sinohydro Corporation Limited signed an accounts receivable finance agreement for six lots of Phase 1 (Lot 1, Lots 2, Lot 4, Lot 5, Lot 6, and Lot 9).

[87]§2.1 of the MPSA.

[88]See Page 2, Section G of the MPSA and §6(a) on the Assignment of Receivables in each DPA.

[89]Each DPA includes the following provision (in §6): "The Parties agree that Sinohydro shall have the right to sell and transfer the whole or part of the claims for Deferred Payments against MOF based on the IPCs approved or deemed to be approved by MORH under the EPC Contract and as deferred through this Agreement (including all-its rights, interests, benefits and/or claims in, under or to (i) all or part of payments by MOF under EPC contract and this Agreement; and (ii) any and all the claims which Sinohydro is entitled to the Deferred Payment) to the Financiers [...] Following receipt of any Notice of Assignment MOF shall revert to Sinohydro with copy to MORH and the Financier(s) as the assignee within ten (10) Business Days with its Acknowledgment of Notice of Assignment in the form set forth in Annex IV hereto, whereby it agrees to make payments directly to the Financiers, if so requested by Sinohydro by the Notice of Assignment."

Figure 8. Ghana-Sinohydro transaction structure



between parties; and arrows trace the direction of payments and services under those contracts. A key feature of the transaction structure is that if the "Bauxite Sales & Purchase Agreement (Offtake)" fails to materialize, Ghana, through the MOF, remains bound to repay Sinohydro under the MPSA and DPAs. This design feature underscores the flexibility of the borrowing arrangement: repayment is not legally contingent on the success of the commodity offtake mechanism. However, the absence of expected bauxite revenues would place unexpected fiscal pressure on Ghana's public finances if they were to become the sole source of repayment.

c. Source of Funds & Collateral Arrangements

Ghana also agreed to provide a pooled collateral structure that would support all infrastructure project DPAs governed by the MPSA.[90] Under the contracts, Ghana would service its DPA payment obligations using receipts collected from the transfer of "refined bauxite," bauxite ore refined to at least to the level of alumina, to a strategic offtaker pursuant to an offtake agreement.[91] The government agreed to establish an offshore bank account held in

[90] See §2.3(C) of the MPSA.

[91] See §2.3(C) of the MPSA. The production of aluminium requires processing raw bauxite ore into an intermediate substance called "alumina" using the Bayer Chemical Process. The Bayer Chemical Process involves crushing

escrow that would "serve as the exclusive account for receiving revenue generated by the Republic of Ghana from selling Refined Bauxite."[92] In other words, the contractual language suggests that all of the country's potential revenue from selling refined bauxite was required to be held in escrow for the benefit of Sinohydro and its assignees (CCB).[93] The escrow account itself was subject to minimum balance requirements equal to the "aggregate amount of the upcoming two repayments to become due" for each DPA.[94] In the event that receipts from selling refined bauxite were insufficient to repay any part of the total amount of DPA obligations, Ghana was required to utilize other sources of payment, including general tax revenues.[95]

However, the source of funds for the envisaged cash collateral arrangement failed to materialize. To facilitate the generation of refined bauxite sales revenue, Ghana's Parliament enacted the Ghana Integrated Development Corporation Act (2018), which created the Ghana Integrated Aluminum Development Corporation (GIADEC), an SOE responsible for the development and management of Ghana's bauxite reserves.[96] At the time of GIADEC's creation, Ghana did not have an operational bauxite refining plant necessary to produce the refined bauxite (alumina or aluminum) contemplated by the MPSA and DPAs as a source of funds for repayment (Republic of Ghana 2020, 2024). Nor does it have one today. Therefore, while Ghana exported about $37.2 million USD in unprocessed bauxite in 2022, it exported virtually no refined bauxite.[97] As of April 2025, GIADEC was pursuing four construction projects, three of which involved developing bauxite refineries, but none had commenced (GIADEC 2025). It is not clear if the escrow account contemplated by the DPAs was ever arranged. Ghana has not disclosed any deposits or withdrawals from the account. Nor has it disclosed the existence of such an account. Similarly, while the MPSA calls for the receipts to be gener-

bauxite ore, mixing it with water and caustic soda, and heating the resulting slurry from which aluminium oxide (alumina) can be distilled. The resulting alumina can then be converted to aluminium by electrolysis. It requires a dedicated refinery.

[92] See §2.3(C) of the MPSA. The production of aluminium requires processing raw bauxite ore into an intermediate substance called "alumina" using the Bayer Chemical Process. The Bayer Chemical Process involves crushing bauxite ore, mixing it with water and caustic soda, and heating the resulting slurry from which aluminium oxide (alumina) can be distilled. The resulting alumina can then be converted to aluminium by electrolysis. It requires a dedicated refinery. See §6.2 of the Model DPA attached to the MPSA [Emphasis added]. Also see §8.1 of each DPA.

[93] The DPAs further supported Sinohydro's claim to refined bauxite revenues by subjecting them to negative pledge clauses. "14.4 Negative Pledge (a) MOF on behalf of itself and the GOG undertake not to: (i) create any Security or permit to have *any of its assets privatized to the extent related to the Escrow Account Agreement*. ii. sell, transfer or otherwise dispose of *any of its receivables on recourse terms to the extent related to the Escrow Account Agreement*; iii. enter into or permit to subsist any title retention arrangement on its assets related to the Escrow Account Agreement; iv. enter into or permit to subsist any arrangement under which money or the benefit of a bank or other account may be applied, set-off or made subject to a combination of accounts; or(b) Paragraphs (a) and (a) above do not apply to any Security created under the Escrow Account Agreement, or other arrangement or transaction which has been agreed by Sinohydro in writing." See §14.4(a)-(b) of each DPA [Emphasis added].

[94] See §6.2 of the Model DPA attached to the MPSA.

[95] See §2.3(C) of the MPSA. According to Denis Gyeyir or the Natural Resource Governance Institute, "[t]he agreement is such that if we are unable to supply enough alumina [to create aluminum from bauxite] to repay the loan, they are going to rely on other revenues and this includes tax revenue" (Nyabor 2023).

[96] After the MPSA was signed in May 2018, the country's parliament enacted the Ghana Integrated Aluminium Development Corporation Act in August 2018 (Republic of Ghana 2018).

[97] The unprocessed bauxite (alumina ore) figure is drawn from the Observatory of Economic Complexity (OEC). CEIC data indicate that Ghana's aluminum exports were valued at $137,758 USD in 2022.

ated through bauxite sales to a "strategic offtaker," there is no evidence that any such offtake agreement was consummated.[98]

d. Implications

The overall structure of these loan and collateral arrangements has consequential implications for (1) debt transparency and (2) transaction viability and risks.

(1) Debt Transparency

In light of the terms that govern other master facility (framework) agreements in Version 1.0 of the HCC dataset, the Ghana-Sinohydro transaction structure stands out. In a typical master facility agreement, a Chinese state-owned creditor signs a loan agreement directly with a borrowing government, which then agrees to on-lend the funds to an SOE borrower responsible for managing one or more EPC contractors to execute the infrastructure project.[99] On-lent funds go to SOE borrowers to finance EPC contracts. The loans are often repaid utilizing a combination of related and unrelated sources of funds and collateral arrangements. Ghana's borrowing arrangement with Sinohydro relies on a different type of on-lending structure, in which Chinese EPC contractors enter into DPAs with the MORH and assign their rights as lenders to CCB in exchange for funds to complete the projects. This structure allows CCB to finance government infrastructure projects without contracting directly with Ghana or its ministries. The same structure makes it easier for the sovereign borrower to keep project debts out of its public debt reporting and avoid seeking negative pledge covenant waivers from its official and private creditors.

In July 2018, Ghana's Finance Minister told the legislature that the MPSA with Sinohydro "would not add to the debt stock" (Ofori-Atta 2018). Several months later, the Ghanaian Presidency touted it as "innovative outside the box thinking" (Presidency of the Republic of Ghana 2018).[100] Ghana then refused to acknowledge its MPSA liabilities to Sinohydro as sources of public debt exposure in its annual public debt report to parliament, its Article IV consultations with the IMF, its disclosures to the World Bank's Debtor Reporting System (DRS), and its Eurobond prospectus.[101]

[98] In most of Ghana's other resource-backed (collateralized) borrowing arrangements with Chinese state-owned creditors, the designated strategic offtakers are Chinese SOEs that purchase commodity exports from Ghanaian SOEs. Therefore, it is likely that the strategic offtaker would have been a Chinese SOE if a bauxite sales and purchase agreement had been consummated. These types of arrangements allow Chinese SOEs to secure commodity resources that support the party-state's industrial policy goals (Zhou et al. 2023; Zhu et al. 2025; Wei and Liu 2025).

[99] However, both structures are similar in that, in either case, the Chinese state-owned creditor dictates which Chinese contractors will be assigned to the project.

[100] Invoking Article 181 of the 1992 Constitution and Sections 55(1) and 56(1) of the Public Financial Management Act, 2016 (Act 921), the ranking member of the finance committee in Ghana's parliament strenuously objected, insisting that the finance minister's "so-called barter agreement is a LOAN and must be treated as such. Hence, he will be engaging in an illegality if he attempts to do otherwise" (GH Headlines 2018). Article 181 of the 1992 Constitution states that "[n]o loan shall be raised by the Government on behalf of itself or any other public institution or authority otherwise than by or under the authority of an Act of Parliament."

[101] Ofori-Atta 2018; IDA and IMF 2019; Republic of Ghana 2020; IMF 2021b.

- MOFEP submits an Annual Public Debt Report to Parliament to comply with the requirements of Section 72 of the Public Financial Management Act, 2016 (Act 921). None of the borrowings under the MPSA with Sinohydro were disclosed in 2018, 2019, 2020, or 2021 editions of the Annual Public Debt Report.[102]

- As a condition of borrowing from the World Bank, Ghana is also required to disclose all of its repayment obligations to external creditors to the World Bank through its DRS.[103] Between 2018 and 2023, MOFEP did not disclose any of its repayment obligations to Sinohydro through the DRS.[104]

- Ghana is also responsible for disclosing its sources of public debt exposure under its Article IV agreement with the IMF. As of 2021, borrowings under the MPSA with Sinohydro remained a source of disagreement between Ghana and the IMF. A July 2021 staff report supporting the IMF's Article IV Consultation with Ghana included the following statement: "the [Ghanaian] government's headline measure [of public debt] excludes liabilities that pertain to the central government, including [...] extrabudgetary funds such as Sinohydro, and which are included in [the IMF's] definition of public debt" (IMF 2021b: 21).

- Ghana's securities disclosure obliquely referenced the disagreement with the IMF, but did not explicitly list the Sinohydro arrangement as a source of public debt exposure (Republic of Ghana 2020).

After suspending payments to most of its external creditors in December 2022, Ghana reversed course and revealed in a December 2024 eurobond prospectus that the "$2 billion Sinohydro deferred loan agreement, initially structured around refined bauxite proceeds, has been reclassified as a loan due to the non-materialization of a bauxite processing plant, further complicating the country's debt restructuring efforts" (Republic of Ghana 2024). The timing of its disclosure is consistent with empirical evidence that "hidden debt accumulates in boom years and tends to be revealed in bad times, often during IMF programs and sovereign defaults" (Horn et al. 2024).

The reclassification highlights how the kinds of lending structures we observe among Chinese creditors and borrowers in EMDEs can blur the distinctions between full-recourse sovereign debt and limited recourse project finance transactions. Traditional project financing is thought of as off-balance sheet or non-recourse lending to the extent that a lender's means of repayment are limited to the revenues generated by the project being financed (Kearse et al. 2022). Without access to full-text contracts, the Ghana-Sinohydro arrangement may look like

[102] Borrowings under the MPSA with Sinohydro were disclosed in the 2022 and 2023 editions of the Annual Public Debt Report, which were published and presented to Parliament in March 2023 and March 2024, respectively.

[103] Since 1951, the World Bank's Debtor Reporting System (DRS) has served as the primary mechanism through which governments disclose their repayment obligations to external creditors.

[104] In 2023, Ghana's debt to China was upwardly revised in the IDS, likely reflecting the ex-post addition of its previously unreported debts to Sinohydro. For a systematic discussion of debt data revisions, see Horn et al. (2024).

limited-recourse project finance insulated from the sovereign balance sheet. However, while the MPSA and DPAs contemplated bauxite revenues as the primary source of repayment, they also included provisions under which Ghana's finance ministry assumed "all obligations of a financial nature" under MORH's construction program, and acknowledged that these were "direct, unconditional, irrevocable and independent payment obligations" of the MOF. The difference between the optics of the transaction structure and its contractual relationships created the space for Ghana to attempt to recharacterize the nature of the liability and keep it off-balance sheet for years. Only in 2024, when it was on the precipice of sovereign default and after bauxite refineries failed to materialize did Ghana begin to disclose that the borrowings could attach to its balance sheets. Such undisclosed liabilities hide the dilution or subordination of unsecured creditors. Such hidden debts complicate sovereign debt restructuring efforts and potentially distort sovereign borrowing costs (Lupo-Pasini 2021; Rivetti 2021; Horn et al. 2024).

(2) Transaction Viability and Risks: Refined Bauxite Repayment Mechanism

The Sinohydro transaction offers a stark illustration of misaligned incentives when infrastructure lenders rely on unrelated revenue streams as collateral. The convoluted design highlights the risks for debtors and creditors of the transaction structures so prevalent in our dataset.

Sinohydro's financing was predicated on the availability of future revenues from commodity sales to service deferred payment obligations under construction contracts. Project finance lenders typically evaluate the cash flow generating prospects of the project they are financing, because their repayment would depend on its viability. The lender has every incentive to evaluate the project's ability to generate adequate cash flows and tailor payment schedules to reflect construction and operation imperatives. In the Ghana-Sinohydro case, the repayment mechanism relied on Ghana's ability to construct refineries unrelated to the funded infrastructure projects. This arrangement added a layer of complexity to the transaction that increased the risk of non-payment.

At the time of signing the DPAs, Ghana did not have any of the operating bauxite refineries contemplated by the financing framework. While the government quickly took steps to commission projects constructing bauxite refineries, the timeline and additional financing needed to complete the projects to support DPA obligations was ambitious.[105] The DPAs signed in 2018 allowed for a thirty-month construction period and a subsequent six-month grace period during which no loan payments were due.[106] Ghana had three years to raise financing and construct bauxite refineries capable of producing revenues to service the DPAs. GIADEC,

[105]While Ghana and GIADEC did not release refinery project timelines, similar bauxite refinery construction projects in other countries have typically taken between 3-4 years. The UAE's Al Taweelah Alumina Refinery was completed in four years at a cost of $3.3 billion USD (Camara 2025), Saudi Arabia's Ras Al-Khair Alumina Refinery was completed in four years at a cost of nearly $1.5 billion USD (Ma'aden 2011, 2012), and Guinea's SPIC Alumina Refinery built in conjunction with China's State Power Investment Corp (SPIC) is projected to take just under 3 years, though project cost estimates have not been published (Bechtel n.d.).

[106]§5.1 of each DPA identifies a 3-year period without debt service payments (2.5 years during the construction period and a 0.5-year grace period).

which was responsible for executing the refinery projects, planned to expand existing bauxite mines and construct three separate refineries (GIADEC 2025). However, the construction cost estimates of each refinery vary from $400 million to $1 billion, with per-refinery expected cash flows varying from generating a loss of $266 million to a $631 million USD profit (Bopkin and Wong 2020: 10; Swagath 2021; GIADEC 2025). The ultimate outcomes depended heavily on alumina prices, commodity input prices, and refinery electricity costs. Six years later, no construction of bauxite refineries has started and billions of dollars in investment are yet to be secured (Acheampong 2024; GIADEC 2025).

These projects highlight the material risks associated with relying on prospective revenue flows unrelated to the use of loan proceeds. Debtor and creditor incentives to monitor road and bauxite development were fundamentally misaligned. To pay for $2 billion of new road infrastructure, Ghana had effectively committed itself to spend billions of dollars on a set of unrelated bauxite refinery construction projects. In the Sinohydro-Ghana case, Chinese lenders and EPC contractors do not seem to have been involved in the construction of bauxite refineries. Ghana's debt-servicing capacity for the road construction project became extremely sensitive to bauxite refinery project delays, which had no connection to the road project apart from the financing. Unlike traditional pre-export finance and project finance structures, where the financing is designed to support the eventual repayment mechanism, the DPAs did not tailor their construction and grace periods to the construction of bauxite refineries necessary for repayment.[107] The vast gap between DPA payment schedules and bauxite refinery construction timelines, in which Chinese lenders of contractors were not involved, raised the risk of non-payment—and for the government and its creditors, the risk of an exploding balance sheet liability. Rescheduling the DPAs to accommodate bauxite refinery delays would be complicated given the number of parties with wildly divergent incentives.[108]

Finally, the contractual arrangement and Chinese lender's priority claim to future refined bauxite sales weighed on Ghana's ability to attract external finance to build its bauxite refineries (see Appendix G). Under the MPSA and accompanying DPAs, all refined bauxite sales revenues by the government of Ghana and GIADEC are pre-committed to escrow accounts. Prospective investors would face the prospect of immediate subordination, or at best, dilution.

e. Key Takeaways

Although Ghana's MPSA with Sinohydro has several unique features, it also bears some similarities to other collateralized, public infrastructure financing arrangements (Dreher et al. 2022; Gelpern et al. 2023). First, the MPSA purports to shift responsibility for repayment from the central government to a special purpose vehicle that is expected to control a set of ring-fenced government revenues. However, by the terms of the debt contracts, the central

[107] Rather, there is no evidence that the DPAs tailored their timeline to bauxite refinery construction.

[108] Negotiations of this type would at a minimum involve (1) Chinese lenders, (2) GIADEC, (3) bauxite refinery contractors, and (4) bauxite refinery financiers. This also would involve a certain amount of information sharing outside of contractual obligations to provide such information.

government is directly liable for the project-finance debts. By pre-committing to use a specific revenue stream for the servicing and collateralization of debts to a single creditor, the central government gives up control of a potentially large revenue stream and appears to avoid debt disclosure and accountability requirements until it has to realize the large contingent liability. Here transaction structure plays a crucial role in creating full-recourse debt without reporting it under domestic or external requirements. The poor result is an argument against over-reliance on formal transaction attributes at the expense of analyzing the economic substance of sovereign lending and borrowing. Second, the MPSA is designed to rely on a source of debt service and collateral (refined bauxite sales receipts) that is unrelated to the public infrastructure projects being financed. Misaligned debtor, creditor, agency, and SOE incentives backfired on both the refining and the road projects, as well as the government and its creditors. The structure moreover risks discouraging additional productive investment in both sectors.

This episode raises fundamental governance questions for Ghana and Sinohydro alike. Ghana has robust public debt management legislation on the books, and a parliament that takes an active role in approving external borrowings. The projects at issue had long been controversial. And Ghana's lack of bauxite refining capacity at the time of the loan was no secret for any creditor that undertook a modicum of due diligence. The unraveling of the convoluted structure may have been inevitable, a transaction design flaw that seems obvious in retrospect; this leaves unaddressed the problems of poor oversight, poor credit assessment, and the role of collateralization in contributing to this outcome.

6 Conclusions and policy implications

This paper addresses the prevalence of collateralization in contemporary sovereign debt markets, with a focus on China as an international creditor. Chinese PPG lending in EMDEs in the early 21st century has parallels to the "hypothecation mania" of the mid-19th century, when the majority of sovereign bonds listed on the London Stock Exchange included clauses that pledged revenue streams such as customs taxes or export commodities as collateral (Flandreau et al. 2024). Successful contract enforcement and collateral repossession hardly ever happened in 19th century practice owing to more robust sovereign immunity, judicial skepticism, and few legal or practical remedies for the creditors (Schumacher et al. 2021).

As in the past, modern-day creditors seek to maximize their likelihood of repayment using all available legal, economic, financial, and political tools at their disposal, experimenting for years to achieve their goal. Today's Chinese creditors in EMDEs achieve extensive levels of control over their borrowers' cross-border revenue flows, with tools like restricted bank accounts, which afford ready access to liquid assets while the debt is outstanding, and multiple forms of collateral and quasi-collateral. Secured credit transaction designs minimize the role of the courts and elevate creditor self-help. Chinese creditors frequently structure PPG loans to include layers of collateral and self-help options. In any given transaction, these

layers may include escrow accounts and pledges of export revenues or state-owned assets, offtake agreements with Chinese importers, and covenants to deposit offtake revenues into creditor-controlled accounts subject to creditor set-off rights. Such mechanisms can function as a source of recovery, information, influence, or all of the above.

The secured lending practices that we document have far-reaching implications for sovereign borrowing and restructuring. On the one hand, they give borrowers in EMDEs more options to attract much needed development finance. On the other hand, they run a high risk of over-borrowing, effectively subordinating other lenders, and complicating debt crisis resolution. Inside the borrowing countries, they can limit the fiscal autonomy of sovereigns, effectively subordinate government service recipients, and undermine public accountability.

Below we consider three major implications of our findings.

(1) Subordination spillovers and threats to intercreditor equity. Collateral is a form of credit enhancement. It works by giving some creditors priority access to specified assets that can serve as a source of repayment and bolster the creditor's bargaining power. Such priority access for one creditor mechanically excludes it for another. When revenues from a country's principal export commodity secure its debts to one creditor, other creditors and government expenditures are effectively subordinated, all else equal. Other creditors may agree to subordinate their claims if collateralized financing helped generate more revenues, improving everyone's repayment prospects. However, our dataset of collateralized PPG lending to EMDEs by Chinese creditors documents a heavy reliance on collateral unrelated to the stated purpose of the debt: loans secured by commodity revenues are not designed to generate more of these revenues. Multilateral, bilateral, and commercial lenders can manage subordination risk with so-called "negative pledge" clauses in their contracts, which usually require the debtor to forswear secured borrowing or, alternatively, to secure other lenders proportionately ("ratably"). Monitoring negative pledge compliance is especially challenging when—as in our dataset—assets and liabilities are undisclosed or mischaracterized based on formal attributes over economic substance. On the other hand, negative pledge enforcement in this context is not credible. Nor is it obviously desirable, as it would require creditors to lodge their "ratable" claims against EMDE assets and grab more and more collateral. MDBs should redouble their negative pledge compliance monitoring efforts as a public good, to avoid this crisis scenario. In the meantime, muddled and unstable debt stacks, poor documentation, and limited disclosure would continue to sow distrust, and may create incentives for all creditors to keep seeking collateral, charge higher interest rates or avoid lending altogether.

(2) Debt and revenue opacity: Chinese lenders' apparent preference for quasi-collateral means that their security interests are rarely recorded in public registries or collateral filing systems. Instead, they rely on a mix of contract and de facto control over cash flows and assets. Certain transaction forms, such as forward commodity sales, commonly mask secured borrowing. In the sample of contracts that we reviewed, some of the documents that govern collateral arrangements were poorly drafted, missing essential operative language. Imperfect compliance with minimum account balance requirements also suggests divergence between

the contract and the course of lender and borrower performance. Avoiding collateral registration and filing schemes, which are publicly accessible, the private collateral arrangements we document can remain hidden from other prospective external creditors and domestic stakeholders, while spotty enforcement and bilateral renegotiation can obscure early signs of debt distress. These factors, combined with confidentiality clauses preventing disclosure, raise asymmetric information problems among creditors.

(3) Consequences for debt crisis resolution and restructuring: Cross-collateralization and opaque lending structures significantly complicate sovereign debt restructuring. These mechanisms obscure which government entities or SOE ultimately control revenue streams and who is ultimately liable. When defaults occur, it becomes nearly impossible to determine creditor priorities or enforceable claims. Ghana's borrowing arrangement with Sinohydro is illustrative: a large, previously undisclosed liability emerged on its treasury's balance sheet when the country was already facing severe debt distress. These practices heighten systemic uncertainty and weaken the transparency needed for fair and orderly resolution. Indeed, participants in the Global Sovereign Debt Roundtable (GSDR) recently noted that "undisclosed collateralized debt poses particular challenges" for sovereign debt management and debt restructuring (GSDR 2025: 10). While highlighting special challenges associated with commercial debt, they agreed that secured and unsecured debt must be restructured on comparable terms (GSDR 2024: 8).[109]

Looking ahead, we see a need for more research on secured sovereign lending and its implications. While the focus of our study is on the collateralization practices of Chinese lenders, these practices appear to be on the rise worldwide. They could further escalate as creditors learn of subordination risk, motivating them to protect their own claims by taking more collateral—setting off a potentially destructive collateral arms race (Håvard et al. 2014; Mihalyi et al. 2022; IMF 2023a; World Bank and IMF 2023)

[109]Cash collateral poses a particular challenge in sovereign debt restructuring, because it effectively neutralizes an important IMF tool used to incentivize good-faith debt restructuring negotiations. The IMF's policy allows it to "lend into arrears," funding an IMF program while countries are not paying their creditors, subject to additional safeguards. Debtors cannot run arrears with creditors that have access to cash collateral. The creditor has no incentive to negotiate so long as they can pay themselves out of restricted accounts or rerouted revenues.

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Appendix A. Construction of the How China Collateralizes (HCC) Dataset (Version 1.0)

China's official sector creditors do not publish detailed or comprehensive data about the collateralization arrangements that underpin their PPG loan agreements with EMDE borrowers. In order to overcome this obstacle, we identified all collateralized PPG loan commitments in the 3.0 version of AidData's Global Chinese Development Finance (GCDF) Dataset (Dreher et al. 2022; Custer et al. 2023).[110]

We did so by implementing a set of pruning procedures. The 3.0 version of the GCDF dataset captures grant and loan commitments from official sector PRC donors and creditors worth $1.34 trillion (in constant 2021 USD) across 165 low- and middle-income countries over a 22-year period (Dreher et al. 2022; Custer et al. 2023).[111] In total, it captures loan commitments worth $1.28 trillion (in constant 2021 USD) to 134 low- and middle-income countries between 2000 and 2021. A smaller subset of these countries (126) received loan commitments that qualify as public and publicly-guaranteed (PPG) debt and an even smaller subset of countries (63) received collateralized PPG loan commitments.

In order to identify these collateralized PPG loan commitments, we first removed all records that capture financial or in-kind transfers other than loan commitments with the "Flow Type Simplified" variable. Second, we used the "Level of Public Liability" variable to remove all non-PPG loan records, retaining all loan records assigned to the "Central government debt," "Central government-guaranteed debt," and "Other public sector debt" categories and removing all loan records assigned to the "Potential public sector debt," "Private debt," and "Unallocable" categories. Third, we used AidData's "Collateralized/Securitized" variable to identify the subset of PPG loan records that are underpinned by a source of collateral or quasi-collateral.[112] The 3.0 version of AidData's GCDF dataset relies on a World Bank-IMF definition of collateralization that encompasses (a) arrangements in which the borrower grants a lien (security interest) to a creditor over a specific asset or revenue stream, and (b) functionally equivalent arrangements in which the borrower does not grant a lien to a creditor (World Bank and IMF 2020, 2023).

We subsequently reviewed the description of the collateralization arrangement for each PPG

[110]Over the last decade, AidData—a research lab at William & Mary—has worked in collaboration with an international network of scholars from multiple disciplines to continuously update and refine the TUFF methodology, while subjecting it to multiple rounds of peer review (Muchapondwa et al. 2016; Strange et al. 2017; Dreher et al. 2018, 2019; 2021, 2022; Horn et al. 2023a; Gelpern et al. 2023; Custer et al. 2023; Goodman et al. 2024; Bluhm et al. 2025).

[111]The 3.0 version of AidData's GCDF dataset captures 20,985 projects and activities across 165 EMDEs supported by grant and loan commitments worth $1.34 trillion (in constant 2021 USD) from official sector institutions in China. A key feature of the dataset is its comprehensive scope. It covers all regions, all sectors, and all sources and types of financial and in-kind transfers from government and state-owned institutions in China. It also covers 22 financial commitment years (2000-2021).

[112]In a number of cases, we identified PPG loans that were incorrectly classified as collateralized and we removed them from our dataset. We also identified a number of PPG loans that were incorrectly classified as not being collateralized, which we added to our dataset. Similarly, we identified some loans that were incorrectly classified as PPG loans, which we removed from the dataset.

loan record (in the dataset's "Collateral" field) as well as 12,785 underlying sources that were used to construct these records (in the dataset's "Source URLs" field). We also reviewed a supplemental set of sources that were discovered through the implementation of the TUFF methodology in preparation for the late-2025 release of the 4.0 version of the GCDF dataset.[113] These sources include (a) the annual reports, financial statements, stock exchange filings, and bond prospectuses of borrowing institutions; (b) IMF Article IV reports and World Bank-IMF debt sustainability analyses (DSAs); (c) loan agreements, escrow account agreements, mortgage agreements, share pledge agreements, account charge agreements, assignment of receivables agreements, deeds of security, and deeds of covenant; (d) official correspondence between lenders and borrowers; and (e) media reports.[114]

In order to construct *How China Collateralizes (HCC) Dataset (Version 1.0)* and facilitate the variable coding efforts described in Appendix B, we prepared an expanded and modified version of the "Collateral" field from the 3.0 version of the GCDF dataset that describes the nature of the collateralization arrangement for each loan.[115] The "Collateral Description" variable in the 1.0 version of the HCC dataset is based on the "Collateral" field from the 3.0 version of AidData's GCDF dataset and supplemental sources that were discovered through the implementation of the TUFF methodology in preparation for the release of the 4.0 version of the GCDF dataset. If a loan was cross-collateralized, we also prepared a description of the cross-collateralization arrangement (in the "Cross-Collateralization Description" variable of the 1.0 version of the HCC dataset).

We then used these fields and sources to code variables that: (1) classify the sources and types of pledged collateral; (2) measure cross-collateralization and the use of large cash collateral pools for multiple loans; and (3) capture the use of escrow accounts, including the minimum cash balances that borrowers commit to maintain in the accounts and the actual cash holdings that borrowers maintain over time. These variables are described in Appendix B. The 1.0 version of the HCC dataset also includes a set of core variables from the 3.0 version of AidData's GCDF dataset, including the loan commitment amount, commitment year, lender, borrower, recipient country, record identification number, parent identification number, inter-

[113] AidData's TUFF methodology seeks to generate detailed and comprehensive data about the provision of grants and loans from the full set of official sector institutions in China to EMDEs (Custer et al. 2023). It does so by synthesizing and standardizing information from a wide variety of official sources, including (1) transactional documentation published in government registers and gazettes; (2) records extracted from the aid and debt information management systems of finance and planning ministries in host countries; (3) the annual reports, financial statements, stock exchange filings, and bond prospectuses of companies and banks; (4) IMF Article IV reports and IMF/World Bank debt sustainability assessments (DSAs); (5) data and documentation from Chinese ministries, embassies, and economic and commercial counselor offices; and (6) reports published by parliamentary oversight institutions in host countries. Unofficial sources (field research, NGO reports, media reports) are then used to fill information gaps. The 3.0 version of AidData's GCDF dataset is underpinned by nearly 148,000 sources that were discovered through the implementation of the TUFF methodology.

[114] All of the contracts and agreements that govern official sector loans from Chinese state-owned creditors to PPG and non-PPG borrowers can be accessed in the 2.0 version of the How China Lends (HCL) Dataset (Gelpern et al. 2023, 2025). The "contract_final," "contract_complete," and "contract_incomplete_des" variables can be used to identify contracts and agreements that are undated, unsigned, or missing pages.

[115] The 1.0 version of the HCC dataset can be accessed via `http://www.aiddata.org/data/how-china-collateralizes-dataset-version-1-0`

est rate, maturity, grace period, names and types of entities that pledged one or more sources of collateral, the names and types of security (collateral) agents that were appointed to enforce rights against the collateral in the event that the borrower defaulted on its debt repayment obligations.

The full 1.0 version of the HCC dataset captures 688 PPG loan commitments (worth $505 billion in nominal USD and $615 billion in constant 2021 USD) for approved, active, and completed projects and activities from 33 Chinese state-owned creditors to 177 borrowers in 63 low- and middle income countries between 2000 and 2021.[116] It excludes (1) suspended and cancelled loan commitments; (2) projects and activities that Chinese state-owned creditors agreed in principle to finance but never resulted in formal loan commitments; and (3) so-called "umbrella" agreements (such as master framework agreements) that sought to finance multiple projects and activities via subsidiary loans.[117] When currency swap borrowings are excluded, the 1.0 version of the HCC dataset captures 620 PPG loan commitments (worth $326 billion in nominal USD and $418 billion in constant 2021 USD) for approved, active, and completed projects and activities from 32 Chinese state-owned creditors to 162 borrowers in 57 low- and middle income countries between 2000 and 2021.[118]

[116]Consistent with the structure of the 3.0 version of AidData's GCDF dataset, each loan commitment in the dataset corresponds to (a) a single bilateral loan commitment, (b), a single creditor's contribution to a club or syndicated loan commitment, (c) a single tranche under a bilateral loan commitment, or (d) a single creditor's contribution to a tranche under a club or syndicated loan commitment. This dataset structure allows for more precise estimation of loan commitment amounts with varying currencies of denomination and borrowing terms.

[117]There are 47 collateralized PPG loan records in the 3.0 version of the GCDF dataset that meet conditions (1), (2), and/or (3). These records can be isolated by identifying all collateralized PPG loan records where the "Recommended for Aggregates" variable is set to "No." We have subjected all of these records to the coding criteria described in Appendix B and can make these supplementary data available upon request.

[118]In a bilateral currency swap arrangement, the currency of the borrower is held as collateral. Therefore, bilateral currency swap borrowings are included in our dataset. However, we exclude them from our analysis because they have unique features (e.g., short contract maturities, serial rollovers) that set them apart from the rest of China's PPG lending portfolio and might otherwise obscure key collateralization practices and patterns (Horn et al. 2023a, 2023b).

Appendix B. Variable names, definitions, and coding criteria

The *How China Collateralizes Dataset (Version 1.0)* includes the following variables:

- **Collateral Description**: This variable provides a qualitative description of the specific assets or revenue streams (future receivables) that the creditor could use to secure the repayment of a loan if the borrower defaulted on its repayment obligations.

- **Collateral Relationship**: This variable measures whether the security package that supported the loan included related collateral, unrelated collateral, or both. Related collateral refers to assets—or the future revenues from assets—that were acquired, constructed, expanded, or improved with the proceeds of the loan and function as sources of collateral. Unrelated collateral refers to assets—or the future revenues from assets—that were not acquired, constructed, expanded, or improved with the proceeds of the loan and function as sources of collateral. Unrelated collateral = 1, Related collateral = 2, Unrelated and related collateral = 3, NA = Unknown.

- **Cross-Collateralization**: This variable measures whether the loan was secured with collateral that also secured other loans. Cross-collateralization arrangements involve the same asset or pool of assets being pledged as collateral for multiple loans, creating interconnected security interests. A default on one obligation subject to a cross-collateralization arrangement could activate the lender's right to assert claims on the shared collateral, irrespective of the payment status of other obligations secured by the same assets. 1 = Yes, 0 = No, NA = Unknown.

- **Cross-Collateralization Description**: This variable provides a qualitative description of the cross-collateralization arrangement.

- **UCC-Based Collateral Designations**: This variable classifies the type(s) of collateral offered according to a scheme that is based on the Uniform Commercial Code (UCC) and aligned with international legal frameworks for collateral.[119] A loan can be secured with up to nine different types of collateral: (1) Investment Property, (2) Assigned Contract Rights, (3) Accounts Receivable, (4) Deposit Accounts, (5) Equipment, (6) Real Estate,

[119]UCC §9-102. Article 9 of the UCC is a 20th century innovation that replaced a complex multitude of security devices under state law in the United States with a single "unitary" device: the security interest (White & Summers 2010: 1149). UCC articles are drafted and periodically revised by an expert commission, then adopted more-or-less wholesale by each U.S. state. Article 9 of the UCC governs secured credit, and applies to transactions in all but real estate. It is the dominant U.S. legal framework for granting security interests in personal property, and for making this property interest enforceable against the debtor, against other creditors, and against any other potential claimants. Terms like "lien, "charge," "pledge," and "mortgage"may mean generic security interest or refer to a specific kind of property encumbrance. Under the UCC, collateral classification goes a long way to determine how creditors obtain and enforce their rights in the property. The United Kingdom and other common law systems use a broadly similar approach to secured credit, but avoid elaborate collateral classification schemes. Importantly for our purposes, English law draws a distinction between fixed and floating charges. A creditor with a fixed charge effectively controls the collateral (for instance, a blocked bank account); a creditor with a floating charge typically does not, although it may seize or block the debtor from accessing the collateral in the event of default. The English floating charge also extends to property, such as receivables, that the debtor may acquire after it files for bankruptcy protection. In the United States, the secured creditor does not benefit from such "after-acquired property" (LoPucki et al. 2013).

(7) Inventory, (8) Negotiable Instruments, and/or (9) Goods. NA records cases where collateralization of a loan is known, such as through the involvement of a collateral (security) agent, but further details about the specific collateral type are unavailable. Deposit Accounts are bank accounts[120]. In our dataset, these are either revenue accounts, where exporters or service providers agree to deposit their proceeds, or reserve accounts, such as debt service reserve accounts and debt payment reserve accounts that serve as primary or backup sources of loan repayment. Revenue and reserve accounts in the dataset are typically governed by escrow account agreements, which spell out the deposit, withdrawal, and reporting rules that bind the borrower, the lender, and the escrow account bank. In our dataset, the lender is also the escrow bank in many cases. In addition to its contractual rights, the creditor may have statutory rights to set off debts owed to it by the borrower against the borrower's deposit account at the escrow bank.[121] Accounts Receivable are current and future rights to receive payment for goods sold or services rendered.[122] In our dataset, these typically include the right of the debtor (or a state-owned commodity entity in the debtor country) to collect revenues from commodity sales and infrastructure projects. It is not unusual for a creditor to have a priority claim on revenue streams and the deposit accounts through which such revenues are routed, ensuring control over the sources and destinations of the cash flows.[123] Equipment refers to moveable assets used in business operations, typically over long periods of time, as distinct from goods held for sale.[124] Examples of equipment include ships, floating oil rigs, and floating liquefied natural gas facilities. Inventory refers to Goods held for sale or lease, or consumed in enterprise operations.[125] Examples include unsold merchandise and raw materials used in manufacturing. Negotiable Instruments are records of promises or orders to pay a fixed amount of money.[126] Examples include

[120] "Deposit Account" means a demand, time, savings, passbook, or similar account maintained with a bank. The term does not include investment property or accounts evidenced by an instrument.

[121] See Gelpern et al. (2023, 2025).

[122] "Accounts Receivable," except as used in "account for," means a right to payment of a monetary obligation, whether or not earned by performance, (i) for property that has been or is to be sold, leased, licensed, assigned, or otherwise disposed of, (ii) for services rendered or to be rendered, (iii) for a policy of insurance issued or to be issued, (iv) for a secondary obligation incurred or to be incurred, (v) for energy provided or to be provided, (vi) for the use or hire of a vessel under a charter or other contract, (vii) arising out of the use of a credit or charge card or information contained on or for use with the card. The term does not include (i) rights to payment evidenced by chattel paper or an instrument, (ii) commercial tort claims, (iii) deposit accounts, (iv) investment property, (v) letter-of-credit rights or letters of credit, or (vi) rights to payment for money or funds advanced or sold, other than rights arising out of the use of a credit or charge card or information contained on or for use with the card.

[123] "Real Estate" includes land and improvements to land, or legal and equitable rights associated with either. Land encompasses water and air space superjacent to the land and natural products and deposits that are unsevered from the land. (IRC §1.856-10) Improvements to land include any fixed or immovable structure and its fixtures.

[124] "Equipment" means all moveable goods other than inventory, farm products, or consumer goods, typically referring to moveable assets with a long useful life used in business or manufacturing operations. This includes ships, vessels, and floating oil rigs.

[125] "Inventory" means goods, other than farm products, which: (B) are held by a person for sale or lease or to be furnished under a contract of service; (C) are furnished by a person under a contract of service; or (D) consist of raw materials, work in process, or materials used or consumed in a business.

[126] "Instrument" means a negotiable instrument or any other writing that evidences a right to the payment of a monetary obligation, is not itself a security agreement or lease, and is of a type that in ordinary course of business is transferred by delivery with any necessary indorsement or assignment. The term does not include (i) investment property, (ii) letters of credit, or (iii) writings that evidence a right to payment arising out of the use

promissory notes and checks. We use the term to refer to documents that convey rights to specific payment, as distinct from rights to a bank account (Deposit Accounts) or to a stream of payments (Accounts Receivable). Goods are tangible, movable personal property, including crops, timber, and manufactured products not used as inventory or equipment.[127] Investment Property generally refers to tradable securities.[128] In our dataset, this category mostly comprises equity interests in project companies. Assigned Contract Rights in our dataset is a residual category of intangible personal property, such as rights under offtake, operating, or shareholder rights agreements. This category includes the right to sell commodities at specified prices, exercise voting rights, or participate in the operation of project assets. It excludes payment rights, which are captured under Accounts Receivable.

- **Collateral Liquidity**: This variable measures whether the loan was supported by liquid or illiquid sources of collateral based on the UCC designations. Liquid sources of collateral include Deposit Accounts and Accounts Receivable, assets that can be quickly converted into cash without the risk of a significant loss in value.[129] Illiquid sources of collateral include Assigned Contract Rights, Investment Property, Real Estate, Equipment, Goods and Negotiable Instruments, which typically cannot be quickly converted into cash without a significant effort or loss in value. However, we recognize that categories like Negotiable Instruments and Investment Property are not inherently illiquid. Our decision to classify them as such reflects our judgment about the specific assets pledged in this dataset, rather than judgments about the liquidity of the asset classes in general. 1 = Liquid Source(s) of Collateral, 2 = Illiquid Source(s) of Collateral, 3 = Both Liquid and Illiquid Sources of Collateral, 4 = Unknown.

- **Source of Funds**: This variable captures the sources of funding supporting a loan's security arrangement—more specifically, the sources of collateral assigned to the Deposit Accounts category and Accounts Receivable category—in combination with mechanisms of creditor control, such as revenue pledges or covenants to deposit. While sources of repayment (e.g., project revenues or commodity sales) do not necessarily constitute collateral, they may support collateralization mechanisms when they are legally or contractually tied to such mechanisms.[130] This variable identifies up to six types of funding that can be contractually pledged or channeled through deposit structures: Project Revenues, General Government Revenues (Excluding Project Revenues), SOE Revenues (Ex-

of a credit or charge card or information contained on or for use with the card.

[127] "Goods" means all things that are movable when a security interest attaches. The term includes (i) fixtures, (ii) standing timber to be cut and removed under a conveyance or contract for sale, (iii) the unborn young of animals, (iv) crops grown, growing, or to be grown, even if the crops are produced on trees, vines, or bushes, and (v) manufactured homes.

[128] "Investment Property" means a security, whether certificated or uncertificated, security entitlement, securities account, commodity contract, or commodity account.

[129] Accounts Receivable are generally considered to be "current assets" on a balance sheet that can be converted into cash or used within a year.

[130] Therefore, the categorization scheme identifies the sources of funding supporting a loan's security arrangement, without implying that these sources alone represent collateral in the absence of enforcement mechanisms.

cluding Project Revenues), Commodity Sales, Central Bank Reserves, and Cash Deposits (Unspecified Sources). Project Revenues refer to all revenue streams generated directly by the project being financed with the proceeds of the loan. General Government Revenues (Excluding Project Revenues) refer to revenues from the recipient government or a specific government agency in the recipient country that are unrelated to the project being financed with the proceeds of the loan. SOE Revenues (Excluding Project Revenues) refer to revenues from a state-owned enterprise in the recipient county that are unrelated to the project being financed with the proceeds of the loan. Commodity Sales refer to revenue streams derived from commodity sales to domestic or international buyers. Central Bank Reserves, which refer to cash deposits from central banks in recipient countries, only apply to the bilateral currency swap borrowings in the 1.0 version of the HCC dataset. Cash Deposits (Unspecified Sources) refer to foreign currency or local currency from unknown sources that was deposited into bank accounts. These categories are not mutually exclusive, as a loan can be supported by multiple sources of funding. Additionally, commodity Sales can be derived from Project Revenues, General Government Revenues (Excluding Project Revenues), or SOE Revenues (Excluding Project Revenues).

- **Escrow Account**: This variable records whether the security package that supported the loan included current and/or future deposits in an escrow (restricted) account. Escrow accounts and restricted accounts are bank accounts governed by an account management agreement that specifies the terms of deposit, withdrawal, and account management. An escrow account can be a revenue account and/or a reserve account. A value of 1 is assigned if the escrow account is formally designated. A value of 0 indicates the absence of such an arrangement. NA signifies that the presence or absence of a formally designated escrow account arrangement is unknown.

- **Escrow Account Description**: This variable describes the characteristics of the escrow account(s) that underpinned the loan's collateralization arrangement. NA designates (a) loans without escrow accounts, and (b) loans with escrow accounts that have unknown characteristics.

- **Revenue Account**: This variable measures whether the security package that supported the loan included current and/or future cash deposits in a revenue account. Revenue accounts are defined as accounts where revenues or proceeds generated from specific sources (e.g., project revenues, tax revenues, sales proceeds, operating revenues) are deposited to secure repayment of the debt. 1 = Yes, 0 = No, NA = Unknown.

- **Reserve Account**: This variable measures whether the security package that supported the loan included current and/or future cash deposits in a debt payment reserve account, debt service reserve account (DSRA), or an account that is functionally equivalent to a debt payment reserve account or DSRA. A debt payment reserve account is an account where funds accumulate to pay for the next installment of principal, interest, and fees. Funds are typically withdrawn from a debt payment reserve account at the

end of each payment period. DSRAs are accounts that hold cash deposits to ensure that there are sufficient funds for debt service payments in the event that a borrower faces temporary cash flow issues and cannot meet its repayment obligations on time. If a borrower cannot make debt service payments from its normal cash flow (or debt payment reserve account, if one exists), funds are withdrawn from the DSRA to do so. 1 = Yes, 0 = No, NA = Unknown.

- **Minimum Account Balance Description**: This variable describes the minimum account balance that the lender required the borrower to maintain in an escrow account. NA designates cases in which minimum account balance requirements are unknown.

- **Type of Account Balance**: This variable indicates which types of escrow accounts underpinned the loan's collateralization arrangement and are known to have minimum account balance (MAB) requirements. 1 = The MAB requirement applies only to a reserve account. 2 = The MAB requirement applies only to a revenue account. 3 = MAB requirements apply to a reserve account and a revenue account, meaning that the MAB value is calculated as the sum of two separate MAB requirements for two separate accounts. 4 = No information is available about the type(s) of escrow accounts to which the MAB requirement(s) apply.

- **Revenue Account Balance**: This variable measures the cash balance(s) of the revenue account at different points in time. NA designates (a) loans that were supported by revenue accounts with unknown cash balances, and (b) loans that were not supported by revenue accounts.

- **Reserve Account Balance**: This variable measures the cash balance(s) of the reserve account at different points in time. NA designates (a) loans that were supported by reserve accounts with unknown cash balances, and (b) loans that were not supported by revenue accounts.

- **Account Bank**: This variable records the name of the financial institution where any revenue accounts, reserve accounts, or other deposit/escrow accounts were to be opened to support the repayment of the loan. In most cases, such accounts were established by the borrower or collateral provider for the benefit of the lender. NA designates cases in which the financial institution where the accounts were opened is unknown.

- **Jurisdiction of Account Bank**: This variable records the chartering jurisdiction of the financial institution where a deposit account (revenue, reserve, escrow or any other type) supporting debt repayment was to be opened. For cross-border institutions, we distinguish between foreign-owned subsidiaries and branches: subsidiaries are chartered as separate legal entities in the host country; branches are extensions of the home institution. NA designates cases in which the chartering jurisdiction is unknown.

- **Governing Law**: This variable records the legal framework and jurisdiction that governed the terms and enforcement of the loan and/or the collateralization arrangement.

The governing law specifies the legal system under which disputes are resolved, rights are interpreted, and obligations are enforced in relation to the loan agreement. This may include national, regional, or international legal standards, and the jurisdiction could refer to a specific country, state, or legal entity.

- **Common Cash Collateral Pool**: This variable identifies loans that share a common cash collateral pool in an escrow account. Loans that share a common cash collateral pool in an escrow account are assigned the same unique integer value. In some cases, multiple loans rely on a common pool of cash collateral that represents a fixed amount over time. However, in other cases, multiple loans rely on a common pool of cash collateral that varies over time based on a formula. Individual creditor contributions to a syndicated loan, which rely on a common source of cash collateral, are assigned a unique integer value. Likewise, if multiple tranches of a single loan rely on a common source of cash collateral, they are assigned a unique integer value.

- **Covenant to Deposit Revenues**: This variable indicates the presence of a covenant to direct revenue or cash payments to formally designated escrow accounts. The purpose of this variable is to distinguish between contractual obligations on the borrower or collateral provider to direct cash flows from a project or source of repayment from "Accounts Receivable" taken as collateral directly per the 'UCC-Based Collateral Designations' variable. 1 = Yes, 0 = No, NA = Unknown.

- **Commodity**: This variable provides a classification of the specific commodity supporting the collateral package in cases when the underlying source of collateral was a commodity asset or commodity revenue stream. A loan can be secured with up to eleven types of commodity assets or revenue streams: bauxite, cacao, copper, cobalt, gold, gas, iron ore, oil, platinum, sesame, or tobacco. NA designates loans that were not secured with commodity assets or revenue streams.

- **Offtake Agreement**: This variable captures the existence of a commodity offtake agreement between a commodity enterprise in the debtor country and a foreign or domestic commodity buyer. 1 = Yes, 0 = No, NA = Unknown.

- **Commodity Sales to China**: This variable identifies the origin of the revenues from commodity sales used as collateral. It distinguishes between the revenue generated from sales to Chinese buyers/importers and non-Chinese buyers/importers (including domestic and international buyers/importers). NA designates loans collateralized with commodity sales revenues where the commodity buyer/importer is not specified.

- **Withdrawal Conditions**: This variable records the conditions under which the bank that controlled the escrow account(s) could withdraw funds from the escrow account(s) on behalf of the lender. NA designates cases in which such withdrawal conditions are unknown.

- **Other Covenants**: This variable identifies any additional contractual provisions—such

as negative pledge clauses—that obligate the borrower or creditor to undertake, or refrain from undertaking, specific actions during the term of the collateralized borrowing arrangement. NA designates cases in which additional contractual provisions are unknown.

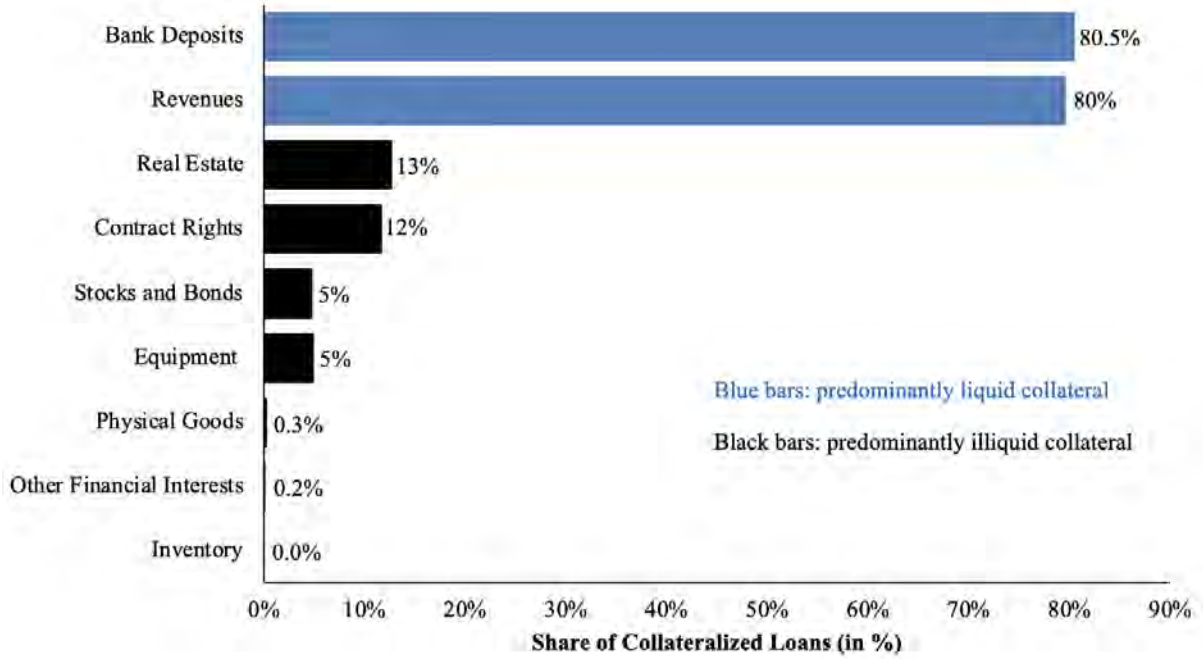
- **Contract**: This variable captures whether any of the underlying contractual documentation (e.g., loan agreement, escrow account agreement, mortgage agreement, guarantee agreement, account charge agreement, share pledge agreement, assignment of receivables agreement) for the loan is accessible. 1 = Yes. 0 = No.

For ease of use, the How China Collateralizes Dataset (Version 1.0) also includes a core set of variables from the 3.0 version of the GCDF dataset. These variables include, but are not limited to, loan commitment amount, commitment year, lender, borrower, recipient country, record identification number, parent identification number, interest rate, maturity, grace period, collateral provider, and security/collateral agent.[131] More detailed information can be found in the read-me section of the dataset, which is accessible via `http://www.aiddata.org/data/how-china-collateralizes-dataset-version-1-0`.

[131] Our research team made some minor modifications to these variables based on new information that was discovered during the data collection process.

Appendix C. Supplemental figures and tables

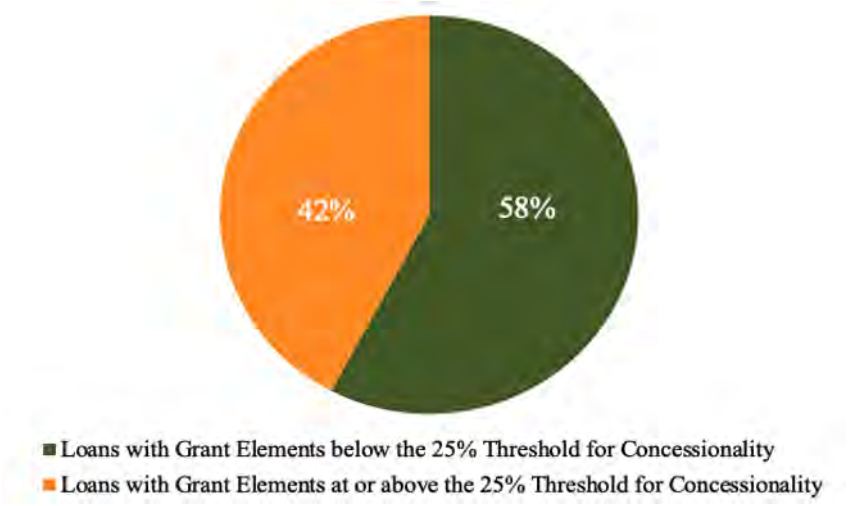
Figure C1. Collateral Classification based on UCC Designations



Note: This figure presents the share of collateralized PPG loans supported by each type of collateral identified in the dataset. Because multiple types of collateral can support a single loan, the shares do not sum to 100%. With the exception of "Revenues," the categorical labels are aligned with the UCC-Based Collateral Designations that we document in Appendix B and summarize in Box 1. "Revenues" in this figure capture all cases in which a loan commitment is supported by an escrow account and control over a revenue stream through (i) a formal pledge or assignment of property rights in revenues (accounts receivable), (ii) a contract covenant to deposit revenues from a specified source in an escrow account controlled by the creditor, or (iii) both. Blue bars denote predominantly liquid forms of collateral; black bars denote predominantly illiquid ones. All data are from version 1.0 of the HCC dataset. See Appendices A and B for further details.

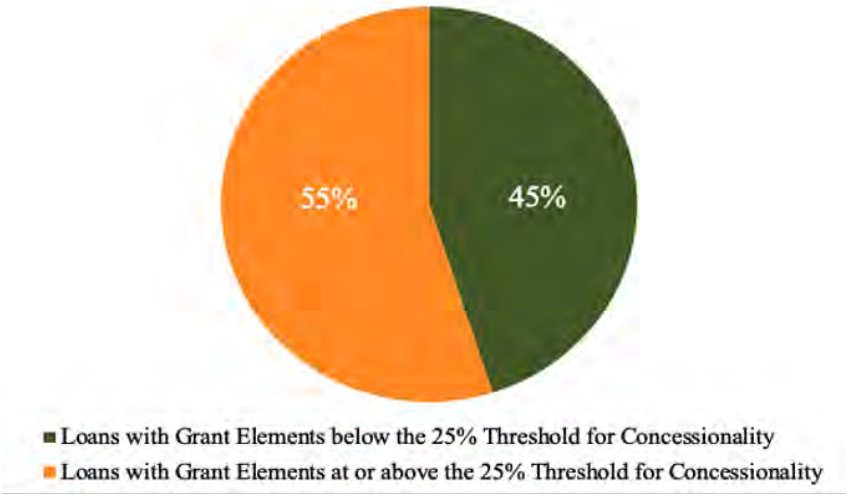
Figure C2: China's Collateralized PPG Loan Portfolio According to OECD Cash-Flow Level of Concessionality

Panel A: Collateralized PPG Lending Volume According to OECD Cash-Flow Level of Concessionality



Note: This figure disaggregates the collateralized PPG lending portfolio by level of concessionality. Concessional and non-concessional designations are based on whether loans fall below or meet/exceed the 25% grant element threshold (using the OECD cash-flow methodology). The collateralized PPG lending data are from version 1.0 of the HCC dataset. The Grant Element (OECD Cash-Flow) variable is drawn from the 3.0 version of AidData's Global Chinese Development Finance (GCDF) Dataset (Dreher et al. 2022; Custer et al. 2023).

Panel B: Collateralized PPG Loans According to OECD Cash-Flow Level of Concessionality

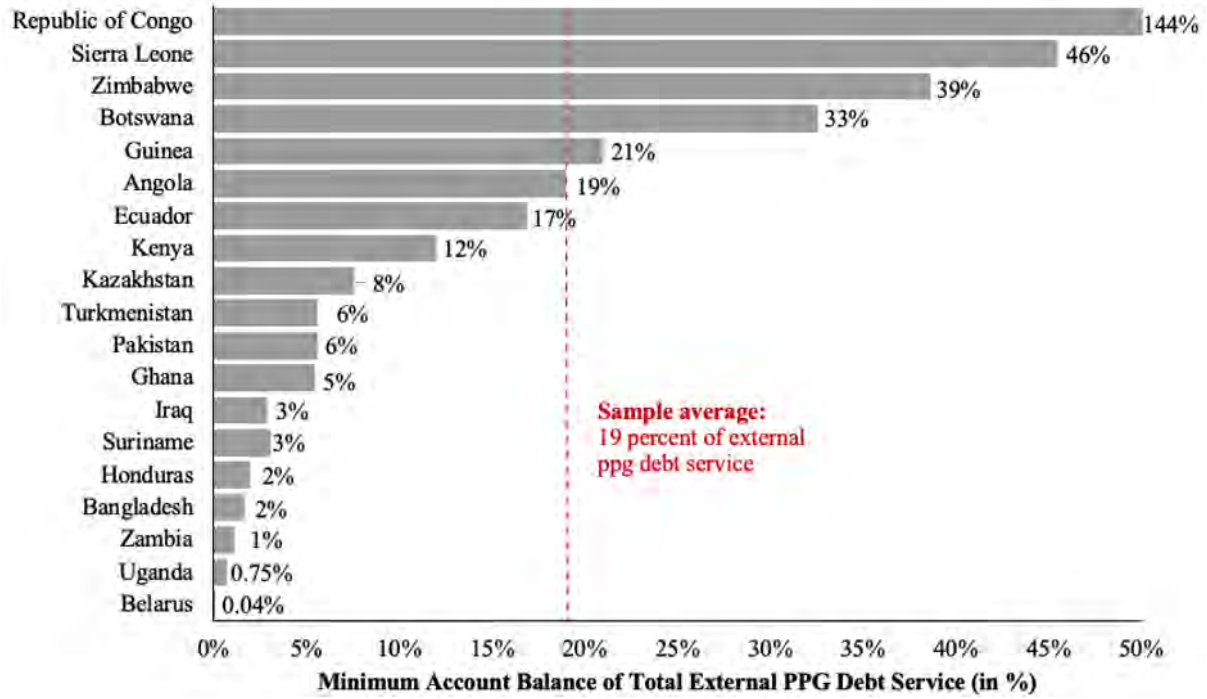


Note: This figure disaggregates the number of collateralized PPG loans by level of concessionality. Concessional and non-concessional designations are based on whether loans fall below or meet/exceed the 25% grant element threshold (using the OECD cash-flow methodology). The collateralized PPG lending data are from version 1.0 of the HCC dataset. The Grant Element (OECD Cash-Flow) variable is drawn from the 3.0 version of AidData's Global Chinese Development Finance (GCDF) Dataset (Dreher et al. 2022; Custer et al. 2023).

The 3.0 version of AidData's GCDF dataset uses the OECD-DAC concessionality calculator to determine the "grant element" of each official sector loan commitment from China that supported a project or activity in the developing world. This measure, which varies from

0 percent to 100 percent, captures the extent to which a given loan is priced at or below market rates. A higher grant element indicates that a loan is being provided on more concessional (generous) terms. The OECD-DAC has historically designated loans with a grant element of 25% or higher as "concessional loans" and those with a grant element below 25% as "non-concessional loans." Therefore, Panel A and Panel B of Figure 2 decompose China's collateralized PPG loans (and lending volumes) into concessional and non-concessional subsamples using the same 25% threshold.

Figure C3. Minimum Account Balance Requirement scaled by total external PPG debt service



Note: This figure presents Minimum Account Balance (MAB) requirements as a share of total external PPG debt service for all countries in our dataset where we have information about MAB requirements. The size of the bar for the Republic of Congo is not proportional. The annual data on total external PPG debt service are from the World Bank International Debt Statistics. We include all countries in our dataset for which we have information on minimum account balance requirements in at least one account. Since countries typically hold cash in multiple accounts at the same time, these numbers are lower bound estimates for total cash holdings by country.

Table C1: Composition of Borrower and Creditor Types (in Constant 2021 USD)

	Commitment Amount in USD million	Share of Collateralized Lending Amount (in %)
Borrower Type		
Recipient State-owned Bank	82.98	57.05%
Recipient Government Agency	111.91	28.54%
Recipient State-owned Company	175.55	63.14%
Recipient Private Sector	1.42	46.32%
Recipient Joint Venture/Special Purpose Vehicle	12.05	34.75%
Other Joint Venture/Special Purpose Vehicle	36.25	78.40%
Chinese State-owned Company	4.42	18.61%
Chinese Private Sector	0.10	21.82%
Chinese Joint Venture/Special Purpose Vehicle	2.09	68.77%
Creditor Type		
State-owned Policy Bank	318.59	46.75%
State-owned Commercial Bank	43.39	32.36%
State-owned Company	58.83	74.65%
Government Agency	0.68	2.06%
Level of Public Liability		
Central Government Debt	112.77	28.32%
Central Government Guarantee	27.83	29.81%
Other Public Sector Debt	277.22	66.11%

Note: This table disaggregates the volume of collateralized PPG lending by borrower type, creditor type, and level of public liability. It also presents shares of collateralized PPG lending as a proportion of total PPG lending within each category. The categories are not mutually exclusive. Data are from version 1.0 of the HCC dataset and from version 3.0 of AidData's GCDF dataset.

Table C2: Composition of Creditors (in Constant 2021 USD)

Creditor	Collateralized Commitment Amount in USD billions	Share of Collateralized Lending per Creditor
State-owned Policy Bank	**318.59**	**47%**
Export-Import Bank of China (China Eximbank)	76.70	23%
China Development Bank (CDB)	241.94	68%
State-owned commercial banks	**43.39**	**32%**
Industrial and Commercial Bank of China (ICBC)	20.67	29%
Bank of China (BOC)	18.30	33%
China Bank of Communications (BoCom or BoComm)	0.34	7%
China Bohai Bank	0.06	27%
Bank of Jiangsu	0.07	100%
Agricultural Bank of China (ABC)	0.41	16%
State-owned companies	**58.83**	**75%**
Aluminum Corporation of China (Chinalco)	0.43	100%
Anton Oilfield Services Group	0.40	100%
China Harbour Engineering Co., Ltd. (CHEC)	0.38	99%
China Machinery Engineering Corporation (CMEC)	1.26	38%
China Merchants Port (CMPort) Holdings Company Limited	0.17	100%
China National Aero-Technology Import & Export Corporation (CATIC)	0.07	9%
China National Overseas Engineering Corporation (COVEC)	0.12	100%
China National Petroleum Corporation (CNPC)	39.60	100%
China National Technical Import and Export Corporation (CNTIC)	0.05	100%
China North Industries Group Corporation Limited (NORINCO Group)	2.16	79%
China State Construction Engineering Corporation (CSCEC)	0.31	100%
CNMC International Capitals Company Limited (CNMC)	0.00	0%
China Construction Bank Corporation (CCB)	4.17	38%
PetroChina Company Limited	4.99	100%
Harbin Electric Company Limited	0.19	100%
Sinohydro Corporation Ltd.	0.70	100%
Sinotec	1.62	100%
Power Construction Corporation of China (POWERCHINA)	1.62	100%
Unipec Asia Co, Ltd	3.45	100%
CNPC Finance (HK) Limited	2.33	59%
Government Agency	**0.68**	**2%**
People's Bank of China (PBC)	0.00	0%
Unspecified Chinese Government Institution	0.68	9%
State-owned Fund	**1.20**	**77%**
Silk Road Fund	0.53	60%
Blue Amber Investment Limited	0.67	100%

Note: This table decomposes the volume of collateralized PPG lending by all Chinese creditors. It also reports the share of collateralized PPG lending as a proportion of total PPG lending from each Chinese creditor. The categories are not mutually exclusive. Data are from version 1.0 of the HCC dataset.

Table C3. Breakdown of China's Collateralized PPG Loan Portfolio Secured with Revenue and Reserve Accounts

	Loan Commitment Amount in %	Loan Commitment Amount (Constant USD in billions)
Loans with Revenue Account	78.75%	329.1
Loans with Reserve Account	17.76%	74.2

Note: This table presents the usage of revenue and reserve accounts as a percentage of total collateralized PPG lending commitments from Chinese state-owned creditors to EMDEs between 2000 and 2021. Shares do not sum to 100 percent since a loan commitment can rely on more than one type of collateral. Data are from version 1.0 of the HCC dataset. See Appendix B for details.

Appendix D. The origin and evolution of the "Angola Mode" of collateralized borrowing—and the "plus ça change, plus c'est la même chose" principle

In March 2004, China Eximbank and Angola's Ministry of Finance signed a $2 billion USD Master Loan Facility Agreement (MLFA), the first of four such agreements that the parties entered into between 2004 and 2009. All four agreements (worth $7.5 billion USD) were structured as oil prepayment facilities, "whereby debt servicing and repayment of a loan is made from a designated offshore account into which Angola's receivables from a particular oil sales contract are deposited" (Republic of Angola 2018: 129). The Angolan government (hereafter "Angola") has described oil prepayment facilities as collateralized debt in its securities offering documents, which also disclose similar arrangements with CDB and commercial lenders, among others (Republic of Angola 2018, 2024).

Under the terms of the 2004 MLFA, Angola and China Eximbank entered into individual buyer's credit loan agreements (ILAs) to finance public infrastructure (road, water, electricity, school, and hospital construction) projects with Chinese EPC contractors (World Bank 2007). All ILAs under the MLFA carried the same borrowing terms and were supported by a shared source of collateral: cash proceeds from future oil sales under a multi-year offtake agreement between Sonangol, Angola's state-owned oil company, and China's largest state-owned oil buyer, UNIPEC (Republic of Angola 2018). [132] The agreement included minimum purchase requirements that varied as a function of the oil price. Oil prepayment facilities required oil revenues to be deposited on a quarterly basis in an escrow account at China Eximbank. The account was subject to a minimum cash balance requirement in the amount of two quarterly debt service (principal and interest) payments. If UNIPEC's quarterly payments into the escrow account exceeded the minimum cash balance requirement, the surplus funds were to be transferred to Angola's central bank, Banco Nacional de Angola (BNA). If UNIPEC's quarterly payments into the escrow account did not meet the minimum cash balance requirement, then BNA had to deposit sufficient funds into the escrow account to reach the required threshold (Corkin 2013).

China Eximbank subsequently replicated and adapted the MLFA and oil prepayment facility structure in Ethiopia, Chad, Niger, the Republic of the Congo, Sudan, South Sudan, Equatorial Guinea, and Guinea. This resource-backed infrastructure lending structure has been colloquially dubbed the "Angola Mode."

China Development Bank (CDB) created its own version of the MLFA (oil prepayment facility) structure, which it used in Ecuador, Venezuela, Brazil, Russia, Kazakhstan, Turkmenistan, Ghana, and Angola. All subsidiary ILAs under a $15 billion USD oil prepayment facility agreement that CDB and Angola's Ministry of Finance entered into in December 2015 were backed by (1) an assignment of rights by Sonangol under an offtake contract (i.e., an oil sale and purchase contract with a Chinese oil buyer), and (2) a charge over a bank account into

[132] All ILAs under the MLFA carried the following borrowing terms: a 21.5-maturity, a 1.5-year grace period, an interest rate of 3-month LIBOR plus a 1.5% margin, a 0.3% management fee, and a 0.3% commitment fee.

which the buyer would deposit proceeds due to Sonangol under the offtake contract; and (3) a minimum cash balance of approximately $1.5 billion USD in a DSRA. Under the CDB facility, $5 billion USD was slated for new infrastructure projects undertaken by the government, with the remaining $10 billion USD to be on-lent to Sonangol as part of an effort to recapitalize it and reduce its outstanding debts to CDB (Republic of Angola 2018, 2024).

By December 2020, Angola's Ministry of Finance struggled to meet its repayment obligations under the prepayment facility agreement. CDB agreed to reprofile several subsidiary loans taken out under the December 2015 facility. The reprofiling agreement allowed Angola to receive a three-year deferral of principal payments falling due between 2020 and 2023, the repayment of which would then stretch over a period of seven years. Under the terms of the reprofiling agreement, the Government of Angola also agreed to use the outstanding cash balance in the DSRA to make interest payments to the CDB between 2020 to 2022, which it expected would bring the DSRA balance to nearly zero by mid-2022 (IMF 2021c). It also agreed to replenish the cash balance of the DSRA to approximately $1.5 billion USD by 2023. The Government of Angola ultimately met the escrow account replenishment condition (Parks et al. 2023). However, in 2023, the resumption of principal payments to CDB under the oil prepayment facility "exacerbated a sharp economic downturn in Angola's economy and hit its currency, the kwanza" (Cotterill 2024). By 2024, the Angolan authorities were openly discussing their frustrations with the requirement to have a large amount of foreign exchange tied up in an escrow account that could only be used to service debts to a single creditor. Angola's President told the New York Times in December 2024 that he would not sign another oil-backed loan with China if given the chance (Eligon and Silva 2024). His announcement followed an earlier proclamation by Angola's Ministry of Finance that it was "discontinuing the contracting of oil-backed financing" (Ministry of Finance of Angola 2022).

Nevertheless, Angola has continued to pursue collateralized borrowing arrangements to access market liquidity without appearing to add to its stock of external public indebtedness and sending debt-distress signals to markets. On December 16, 2024 and January 15, 2025, Angola and J.P Morgan Securities (JPM) entered into two one-year Total Return Swap (TRS) transactions (Republic of Angola 2025: 250). A TRS entails an exchange of cash payments for the "total return" on an underlying reference asset (mimicking the economics of owning the asset).[133] Under the TRS agreements, JPM paid $600 million USD and $400 million USD to Angola, and received in exchange $1.93 billion of Angola's newly issued medium-term notes. Angola transferred title in the notes to JPM, which would receive the total return on the notes for the term of the swap. If Angola repays the $1 billion USD at the end of the swap term, JPM would return the notes to Angola for cancellation. If it fails to repay, it could find itself owing nearly $3 billion USD.

The TRS structure mimics an overcollateralized loan but has legal and accounting benefits that allow Angola to classify the notes as a contingent liability, thereby keeping the collateral

[133]Finnerty (2000) provides a primer on TRS arrangements.

debt issuance off its balance sheet.[134] Only the $1 billion USD in JPM advances is classified as debt. In a typical swap transaction, the party committing to remit total returns on the asset would normally retain ownership of that asset. Here, however, Angola transferred title to its securities to JPM. If the value of the notes falls during the term of the swap, JPM may require Angola to provide additional collateral (Republic of Angola 2025).[135]

While the transaction provides Angola with immediate liquidity, it carries serious risks. First, the swap provides Angola with an expensive source of short-term liquidity to repay maturing debts. Given that the loan and accompanying TRS notes are medium term with 5-year maturities, Angola has effectively refinanced existing debt and increased the maturity structure of its public liabilities, but these short-term funds are costly. The transaction amounts to incurring $3 billion USD in obligations to receive a $1 billion USD loan, which is likely more expensive than simply issuing high-yield debut but has the benefit of keeping most of the liability off-balance sheet. Second, if the market value of the Eurobonds falls below a certain threshold, JPM has the right to call on Angola to provide additional collateral. If Angola issues more bonds to meet this requirement, it worsens its debt load without receiving new financing. Third, the arrangement is temporary. The swap agreement was scheduled to expire in 1-year, at which time Angola can repurchase the TRS notes and extinguish the liability, renew the swap agreement and continue making payments on the notes, or choose not to repurchase the notes and recognize them as direct liabilities on its balance sheet. In all three scenarios, Angola must navigate even higher debt loads. In the last scenario, the main benefit gained by circumventing high-yield bond issuances on the market—keeping the liabilities off balance sheet—are eroded, which could trigger a revaluation of Angola's existing debt stock and thereby increase its borrowing costs.

[134] The TRS disclosure says specifically that Angola will treat the JPM loan as a direct liability but not the bonds issued as collateral, which it treats as a contingent liability (Republic of Angola 2025: 20).

[135] According to IMF (2025b: 5), "the Total Return Swap (TRS) operation with J.P. Morgan, amounting to 2 percent of GDP, presents another contingent fiscal liability in the near-term. If sovereign spreads were to deteriorate and the price of the Eurobond, pledged as collateral under the TRS, were to fall significantly, this would require the authorities to add collateral in response to the margin call from J.P. Morgan."

Appendix E. "Expansive" revenue pledges

When project revenues are formally or functionally pledged as sources of collateral to Chinese creditors, it is customary for PPG borrowers to deposit 100% of the revenues generated by the financed project into a designated bank account. However, in some cases, Chinese creditors require that government institutions or SOEs in borrower countries make more "expansive" revenue pledges. Consider for example the terms that govern the loan agreement between China Eximbank and the Government of Uganda for the Entebbe International Airport Upgrading and Expansion Project specify that "[a]ll the revenues (proceeds) of Entebbe International Airport (including but not limited to revenues generated from the Project) shall be applied in priority to payment of any and all amounts due and payable under this Agreement."[136] This condition is notable because the Entebbe International Airport was in operation prior to the loan commitment, which means that China Eximbank effectively made a first priority claim on a public sector revenue stream that would have existed in the absence of the project.[137] It is also notable because it raised questions and concerns about the fiscal autonomy of the borrower. In November 2021, the Uganda Civil Aviation Authority (UCAA)—the project's end-user and the recipient of the on-lent funds from China Eximbank—told a parliamentary oversight body that keeping all of the airport's revenues in a lender-controlled escrow account was "not palatable for an international airport of a sovereign state whose operations are dynamic and sometimes unpredictable" (Daily Monitor 2021). Uganda's Office of the Auditor General also flagged that the loan's escrow account requirements were placing "financial strain [on] the cash flows of the country" and it called upon Uganda's Ministry of Finance to "in the future avoid loans with such unfavourable terms or negotiate to have such terms softened" (Office of the Auditor General of the Republic of Uganda 2019: 10).[138]

In other cases, Chinese creditors require that their PPG borrowers in EMDEs deposit a fixed percentage of their total organizational revenues into a designated escrow account. Consider for example the terms that govern the preferential buyer's credit agreement between China Eximbank and the Republic of the Congo for Phase 3 of the National Telecommunication Coverage Project specify that "The Borrower and the Owner [The Republic of Congo's Ministry of Territory Planning and General Delegation of Grands Travaux of Congo] have obligation to ensure the sufficient amount in the Escrow Account(s) for the loan repayment during the maturity period of the loan, and ensure the income of the Project and the income of the Owner shall be used preferentially to repay to the lender all the principal amount drawn and outstanding under the Concessional Loan."[139] Similarly, under the terms of a $98.4 million USD

[136]See §6.12 of the Government Concessional Loan (GCL) Agreement between the Government of the Republic of Uganda and the Export-Import Bank of China, March 31, 2015.

[137]The (GCL) agreement is accessible via `http://china-contracts.aiddata.org/`. Its terms and conditions are systematically coded in the 2.0 version of the HCL dataset (Gelpern et al. 2023, 2025).

[138]In March 2019, the Government of Uganda dispatched an 11-member delegation (consisting of UCAA officials, Ministry of Finance, Planning and Economic Development officials, the Deputy Solicitor General, and Uganda's Ambassador to China) to Beijing to seek concessions from China Eximbank related to the contractual condition that UCAA deposit all of the revenues of the Entebbe International Airport into an escrow account (Parks et al. 2022).

[139]See §6.13 of the Preferential Buyer's Credit (PBC) Agreement between the Government of the Republic of

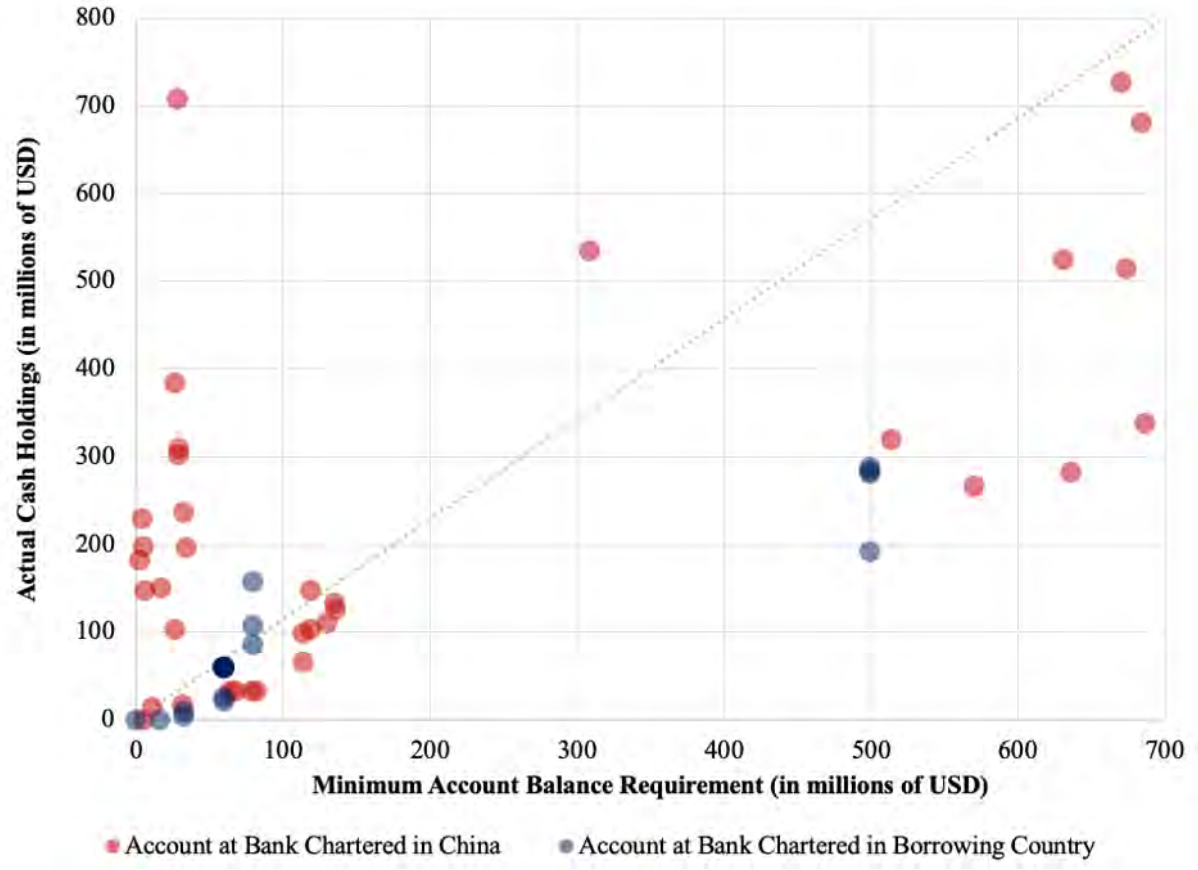
loan agreement between China Eximbank and the Government of Suriname for a National Broadband Network Project, Telesur—the state-owned telecommunications company of Suriname—is required to deposit at least 50% of its organizational funding (including but not limited to broadband user revenues generated by the National Broadband Network Project) in an escrow account (Parks et al. 2023).

Congo and the Export-Import Bank of China, May 20, 2017. The PBC agreement is accessible via `http://china-contracts.aiddata.org/`.

Appendix F. Actual cash holdings in escrow accounts vs. minimum account balance requirements

In Figure F1, we plot cash balances in individual escrow accounts against the minimum cash balance requirements for the same accounts.[140] Each dot in the scatter plot represents an account-year observation. Dots above the 45-degree line represent cases in which borrowers made cash deposits that exceeded the minimum account balance requirements, while dots below the 45-degree line represent cases in which actual cash holdings fell short of the minimum account balance requirements. Figure F1 seems to suggest that a large share of accounts violate minimum account balance requirements. There are, however, several caveats to this interpretation.

Figure F1. Cash holdings and minimum account requirements by residency of account bank



Note: This figure shows the relationship between the Minimum Account Balance (MAB) requirement (horizontal axis) and the actual cash balances held in revenue and reserve accounts (vertical axis). Each dot represents the totl account (revenue plus reserve) balance and the corresponding MAB at a given point in time. The graph includes 61 observations, which only capture those accounts and years for which both the MAB requirement and the actual balance are available. Marker colors further distinguish between accounts controlled by Chinese banks (in red) and domestic banks (in blue). All data are from the 1.0 version of the HCC dataset.

First, Figure F1 is based on annual rather than calendar day-level measurements of minimum account balance requirements and actual cash balances, which is potentially consequential

[140] Figure 4 captures all of the accounts in our dataset for which we observe cash balances and minimum cash balance requirements in the same year.

since we know that some account agreements require borrowers to dynamically adjust their account balances to different minimum levels during specific windows of time (e.g., 20 days prior to the next installment of principal, interest, and fees). It is possible for a borrower to comply with its minimum account balance requirement even if its cash holdings in the corresponding account fall below the relevant threshold value at the specific point in time when an end-of-fiscal-year (or end-of-calendar-year) measurement is taken. As such, we cannot rule out the possibility that more temporally precise data would reveal higher levels of borrower compliance than that which is reported in Figure F1. However, given that nearly all of our data on actual cash holdings are drawn from end-of-calendar-year or end-of-fiscal-year disclosures by borrowers, it is unlikely that we have measured actual cash holdings during the narrow windows of time that are specified in account agreements. It is more likely that we have measured actual cash holdings outside of these windows, which suggests that Figure F1 is a lower-bound estimate of the true level of borrower compliance.

Even in those cases where we accurately measure cash holdings and minimum account requirements within the same time window, the pattern observed in Figure F1 presents an observational equivalence problem: account balances can fall below their required levels because of account withdrawals by creditors, account withdrawals by debtors, or debtors failing to deposit sufficient funds. We cannot categorically rule out any of these explanations, but some are more plausible than others.

Escrow account agreements with Chinese creditors typically establish a "cash flow waterfall," which specifies how project and/or non-project revenues will flow through a set of escrow accounts (under the control of the escrow account bank or lender) in a cascading order of priority. These agreements also identify the conditions under which (a) withdrawals can be made from the accounts and (b) transfers can be made between the accounts. As a general rule, lenders are granted first priority access to project and/or non-project revenues (i.e., lenders are at the top of the waterfall and sovereign borrowers and their SOEs are at the bottom of the waterfall). Therefore, if the dots below the 45-degree line in Figure F1 represent cases in which account balances fell below their required levels because of cash withdrawals, it is more likely that these withdrawals were made by creditors than by borrowers. In Section 5, we provide evidence that suggests China Eximbank—with the help of a local escrow agent—swept cash out of escrow accounts domiciled in the borrower country (Kenya). Parks et al. (2023) provides additional evidence that Chinese creditors have conducted cash sweeps in a variety of countries, including Angola, Suriname, and Tanzania.

Yet it is also possible that the dots below the 45-degree line in Figure F1 represent cases in which the borrowers failed to deposit the required minimum amounts at different points in time. In Section 5, we probe the plausibility of this explanation by conducting an in-depth case study of the China Eximbank-financed Standard Gauge Railway Project in Kenya. This case is particularly illuminating because the escrow account agreement that supports the borrowing arrangement specifies a time-varying set of minimum account balance requirements and we have temporally precise data on the actual account balances (i.e., calendar-day level

observations). Although our findings are not dispositive, they suggest that cash seizures by creditors are the most likely of the three explanations for why account balances sometimes fall below their required levels.

Appendix G. When collateralized borrowing impinges upon national industrial policy

Ghana has estimated raw bauxite reserves of over 900 million metric tons and it produces about 10-20 million tons a year (Bloomberg News 2021; Peedikayil 2023). However, to boost the value-add of its supply chain, Ghana passed a law empowering GIADEC to ban raw bauxite exports. The Ghana Integrated Aluminium Development Corporation Act of 2018 is consistent with a vision of creating an "Integrated Aluminum Industry" that makes it a regional leader in aluminum manufacturing and exports. According to GIADEC, "[a] fully integrated aluminum industry could make Ghana a true industrial powerhouse in Africa. Instead of just extracting and shipping raw bauxite, Ghana could become a hub for aluminum manufacturing, exports, and innovation. By processing bauxite into alumina and then aluminum locally, we can create new industries, reduce dependence on imports, and unlock billions in economic growth."

Central to this vision is creating bauxite refineries that transform raw bauxite ore to "refined bauxite"—such as alumina, the precursor to aluminum. However, given that all future bauxite sales revenues are pledged to Chinese escrow accounts, Ghana's ability to attract external financing for the development of refineries is limited, effectively discouraging investment in Ghana's bauxite industry.

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