We empirically characterize how China is internationalizing its bond market by staggering the entry of different types of foreign investors into its domestic market and propose a dynamic reputation model to explain this strategy. Our framework rationalizes China’s strategy as trying to build credibility as a safe issuer while reducing the cost of capital flight. We use our framework to shed light on China’s response to episodes of capital outflows.

**Keywords:** Bond Market Liberalization, International Currency, Exorbitant Privilege, Safe Assets, Reputation, Capital Controls, Chinese Financial Markets, Renminbi.

**JEL Codes:** E01, E44, F21, F23, F32, F34, G11, G15, G32.
With the third largest domestic bond market in the world behind the United States and the European Union, China has the potential to become a major destination of global bond investment. This opens the possibility of the Renminbi (RMB) rising to become a major international currency in bond markets. However, unlike the U.S. and Eurozone bond markets, the Chinese bond market has been largely closed to foreign investors, severely limiting the use of the Chinese Renminbi as an international currency for investment. Over the last decade, that has begun to change and China has progressively opened its domestic bond market to foreign investment. While the internationalization process of China’s bond market is in its early stages, the size of the market and the ongoing opening up process makes the evolution of China’s bond market an important dynamic at the core of the international financial system. This paper empirically characterizes the internationalization process and the changing nature of foreign investment and provides a model to shed light on the gradual strategy that the Chinese government is pursuing in the internationalization of its bond market.

We begin our analysis by providing a comprehensive characterization of foreign investment in China’s domestic bond market (see also Amstad and He (2020) and Amstad, Sun and Xiong (2020)). We show that after being largely segmented from global capital markets, foreigners have now started investing in China’s domestic bond market. The initial increase in foreign investment was driven by central banks while the more recent increase has been driven by private investors.

We demonstrate that this pattern of early investment by stable investors like central banks followed by flightier private investment was driven by deliberate policy choices of the Chinese government aimed at selecting the investor base. By introducing a series of foreign investment schemes with varying quotas, lock-up periods, and registration requirements, China was able to stagger the entry of different investor types into its domestic market. China began by allowing in more stable, long-term investors, such as central banks, sovereign wealth funds, and non-profits. After creating this stable investor base, China gradually loosened its array of restrictions to increasingly allow in flightier foreign investors such as passive and active mutual funds, exchange traded funds (ETFs), and some hedge funds.

We examine whether foreign investment funds that own RMB bonds are specialists in investing in emerging market or developed market bonds to try to infer how they are viewing the Chinese bond market. We estimate the correlation among investment funds between the share of the foreign portfolio invested in RMB bonds and the remaining share invested in a reference set of safe developed countries government bonds. We show that at present Chinese Renminbi denominated bonds fall in between developed and emerging market bonds in foreign investor portfolios.

The patterns we document raise many questions about how a economy can or should internationalize its bond market. In particular, we consider the rationale for gradualism and why a liberalizing country would want to select its investor base. We introduce a model to make sense of the above facts and provide a way to think about these issues. The model has three core ingredients: governments that are potentially opportunistic and may want to block foreigners from withdrawing their capital in crises, heterogeneous foreign investors with varying degrees of flightiness, and slow
building of reputation of issuing governments in the eyes of foreign investors.

We interpret the policy choices of China as trading off building reputation as a country capable of providing a reliable store of value and risking a disruptive foreign capital flight. Letting in foreign investors helps build reputation for the issuer in global capital markets, but letting in too many foreign investors, particularly flighty ones, can be counterproductive by exacerbating crises as the investors pull out in times of stress. Crises are costly both directly because they lead to costly liquidations, and indirectly because attempts to limit capital flight via ex-post capital controls on outflows lead to a loss of reputation. In our model, the reputation of a government in the eyes of foreign investors is the perceived probability that the government will not impose ex-post capital controls. This captures investors’ fears of repatriation risk: the possibility that they will not be able to “get their money out of the country.” The aim of the government is not to lower overall repayment to foreigners, as in a sovereign default, but instead to temporarily lock-in foreign capital to prevent costly unwinding of positions.

To capture the gradual opening up of markets to different types of investors, we introduce two classes of investors in the model. One class, stable investors, is less flighty in a crisis in the sense of being more willing to roll over existing debt. We view this class as capturing the behavior of central banks and sovereign wealth funds, as well as some private investors that have particularly long horizons and stable funding (e.g., endowments and other non-profit institutions). The other class, flighty investors, captures the majority of private investors like mutual funds, ETFs, and hedge funds. In a crisis, these investors are flighty in the sense of a more inelastic demand to withdraw funds and not roll over the existing debt. We model this differential flightiness as how many pledgeable assets the borrower needs to have for debt to be rolled over (i.e., how low the debt to asset ratio of the borrower has to be).

We develop a dynamic reputation model in which a country, like China, chooses which classes of foreign investors to allow into its domestic bond market and how much to borrow from each type it lets in. In a crisis, foreign investors want to withdraw capital and are reluctant to roll over existing debt, forcing some assets to be liquidated to repay debt. Liquidating assets is costly, and the government is tempted to introduce ex-post capital controls to limit the flight by foreigners. However, the expectation that these controls might be imposed is precisely the reputational problem the country faces: the more foreigners expect the country to impose the controls ex-post, the worse the terms of credit are ex-ante. This mechanism helps to shed light on how a country begins the process towards becoming an international currency (see also Bahaj and Reis (2020)).

Consistent with our empirical findings, the government only gradually opens the domestic bond market to foreigners. At low levels of reputation, the government chooses to borrow entirely from stable investors. At this stage of the internationalization process, the flighty private investors are too costly to allow into the domestic market. If the government does not institute ex-post capital controls on existing stable investors, then reputation increases over time and the interest rate schedule subsequently offered by foreigners becomes more attractive, increasing the government’s
desire to borrow more from foreigners. As reputation endogenously builds, the value of letting more foreigners in becomes sufficiently high that the government allows flighty private investors into the domestic market. Importantly, the action of letting in private flighty investors itself increases the government’s reputation, since it is a disproportionately expensive action to take for a government intending to impose ex-post controls.

Establishing reputation as a safe asset provider, like the U.S., is a slow and arduous process (Eichengreen et al. (2017)). Throughout modern history, many would-be contenders, like Japan or the Eurozone, have failed to displace the dominance of the U.S. in providing safe assets. Sargent (2012) stressed the importance and difficulty in building a reputation for the newly created United States in the 1780s and the newly created Euro Area in the 2000s. Whether or not China will become an international safe asset provider is also uncertain. Even if China comes up short of rivaling the U.S. in this dimension, the trade-offs it faces as it liberalizes its domestic bond market are relevant to a range of emerging and developing countries as they consider allowing different classes of investors to trade in their domestic bond market.

In the final section of the paper, we analyze the capital flight of 2015-16 through the lens of the model. We extend the model to include a high and low state to capture normal times and crisis times. With investors only tempted to flee in crisis times, reputation can only be gained or lost in the fire of a crisis. In normal times, when foreigners do not flee from the country’s debt, the government is not tempted to restrict foreigners’ ability to repatriate their funds. This lack of temptation also means that no reputation is built. Since crises are infrequent, so are opportunities to build reputation. In this respect, the behavior of a government during crises is a salient moment for investors to update their beliefs about the type of government they are facing. This updating is particularly strong for a country like China at the beginning of the internationalization process because investors are unsure whether China will resist the temptation to impose controls on capital outflows in the face of a capital flight.

In 2015-16, China experienced such a capital flight and foreign investors indeed worried that China would impose restrictions on the repatriation of their investments. While China restricted the ability of its own citizens and domestic firms to take money out of the country, foreign investors were allowed to sell and repatriate their funds. As the capital flight slowed, China actually took action to further liberalize, including the reforms that led flightier types of investors to enter. In subsequent years, foreign investors not only returned to the domestic bond market but even increased their holdings. Our model generates this V-shaped pattern of capital flows in a crisis if the government does not impose controls. Investors first withdraw their funds (the capital flight) but subsequently are willing to reinvest their funds and even increase their position having learned that the government resisted the temptation to impose ex-post controls.

Related Literature. The internationalization of China’s bond market is an important global macroeconomic development that has attracted much policy attention but surprisingly little formal
analysis, either empirically or theoretically. Our focus is related to the literature on China’s bond and currency market reforms like Song and Xiong (2018), Cerutti and Obstfeld (2018), and papers included in the handbook by Amstad, Sun and Xiong (2020).¹ Xiong (2018) and Brunnermeier, Sockin and Xiong (2022) focus on China’s gradualistic approach to managing the financial system and issues with local government financial leverage. Song et al. (2011) document a number of stylized facts about the nature of China’s economic growth strategy and provide a theoretical framework consistent with the observed patterns.

There is a recent theoretical literature on the international monetary system, mostly focusing on established international currencies like the U.S. Dollar and Euro (Farhi and Maggiori (2018), He et al. (2019), Chahrour and Valchev (2021), Gopinath and Stein (2021), Drenik, Kirpalani and Perez (2021), Choi, Kirpalani and Perez (2022)). An important exception is Bahaj and Reis (2020) who focus on the early process of jump-starting the Renminbi as an international currency. They focus on the unit of account and payments role of a currency and examine the role of the introduction of People’s Bank of China (PBoC) swap lines in leading the Chinese Renminbi to be adopted in the global payments system.

Our model of dynamic reputation is related to foundational work by Kreps and Wilson (1982), Milgrom and Roberts (1982), and Barro and Gordon (1983). Diamond (1989, 1991) mixes dynamic reputation and adverse selection to study the dynamics of reputation acquisition in financial markets and the choice between bond and loan financing. Our modeling of reputation builds on the strand of literature that considers changes in type over time (Mailath and Samuelson (2001), Cripps et al. (2004), Phelan (2006), and Mailath et al. (2006)).² Our paper is related to the literature examining how reputational incentives can help sustain debt repayment by governments as in Amador and Phelan (2021) and Fourakis (2021).

Finally, our focus on the temptation that governments face in imposing ex-post capital controls and the presence of stable and flighty investors is related to the literature studying fire sales, liquidity, and heterogeneous investor bases (Caballero and Simsek (2020), Clayton and Schaab (2022), Coppola (2021)).

1 Background on China’s Bond Market

We begin by providing a brief overview of China’s bond market. For more comprehensive introductions to the market, see Amstad and He (2020) in Amstad, Sun and Xiong (2020), or Schipke and Zhang (2019). Today, China’s market is the third largest in the world, behind only the United States and the Euro Area. Appendix Figure A.II shows the remarkable growth in China’s bond market over the last 15 years, reaching about $20 trillion at the end of 2021. In the last ten years, the size of China’s bond market surpassed that of the U.K. and Japan. The other large markets in

¹See also Prasad (2017), Mo and Subrahmanyam (2020), and Lai (2021).
²See also Tadelis (1999) and Lu (2013).
Figure A.II are the closest to the textbook case of free capital movement, thus making China an interesting outlier due to the combination of market size and segmentation from the rest of world capital markets.

China’s Central Government had long been the largest issuer in domestic bond markets, with China Government Bonds (CGBs) used as the de facto proxy risk-free rate in local bond markets. The second most important category had long been Policy Bank Bonds (PBBs), the bonds of the large Chinese state-affiliated policy banks (Agricultural Development Bank of China, China Development Bank, and the Export-Import Bank of China). The bonds of these banks are generally assumed to be implicitly guaranteed by the Central Government. Recently, both of these categories were surpassed in terms of amount outstanding by local government bonds (Xiong (2018)). The rest of the market, which is much smaller than the above three governmental or quasi-governmental set of issuers, is composed of bonds issued by firms, either State-Owned Enterprises (SOEs) in the form of enterprise bonds, corporate bonds by private firms, or bonds issued by commercial banks.

Through much of its development, China’s bond market was essentially closed to foreign investors. That began to change in the early 2000s. Rather than open its domestic bond market to all foreign investors at once, China instead pursued a gradual liberalization policy. China’s policy of opening up began by allowing in foreign investors with strict limits on the size of investment via quotas and by regulating the type of investors that could enter through special programs with demanding application processes and often lengthy lock-up periods. Over the last 20 years, China reduced each of these barriers gradually, allowing larger investment scale, a greater variety of foreign investors, and increasingly allowing foreign investors to quickly take their money out of the country.

The liberalization process took a major initial step in 2002 with the introduction of the Qualified Foreign Institutional Investor (QFII) program.\(^3\) Under this system, following a fairly onerous registration and application process, investors could gain access to domestic stock and exchange-traded bond markets. However, most of the foreign investment via QFII was in the Chinese stock market as the exchange-traded bond market is a small share of the overall bond market.\(^4\) In these early stages, the quotas were small and only a narrow range of investors actually gained access to the market. Importantly, QFII investment was originally subject to a one-year lock-up period. In 2009, this was lowered to three months for “pension funds, insurance funds, mutual funds, charitable funds, endowment funds, government and monetary authorities and open-ended funds” (ASIFMA (2021)).

In the 2010s, China significantly broadened direct access to the domestic bond market, allowing foreign participation in the China Interbank Bond Market (CIBM). The primary participants were central banks and other official investors, like sovereign wealth funds, and they could directly access the interbank market. In 2013, QFII and RQFII participants were allowed access to the interbank market.\(^5\) The Renminbi Qualified Foreign Institutional Investor (RQFII) was introduced in 2011, allowing investors to use RMB to enter the market rather than foreign currency. The programs were merged in 2020.

\(^3\)Amstad and He (2020) note that 90% of foreign investment through these programs went to the stock market, with the small remaining share going to bonds.
market (Guo (2019)). In 2015, the PBoC allowed full access without a quota to the interbank bond market for long-term investors such as central banks and sovereign wealth funds (Amstad and He (2020)). These reforms helped meet the requirements for the Renminbi's inclusion in the SDR (Special Drawing Rights) basket in 2016. Quota restrictions were removed for all investors with the launch of CIBM Direct in February 2016 (Guo (2019)), but this form of access still required direct access to China's bond markets with its accompanying regulatory and registration hurdles (Schipke et al. (2019)).

These hurdles were significantly lowered in 2017 with the introduction of Bond Connect. Unlike earlier programs, Bond Connect is based offshore in Hong Kong and can be accessed via standard trading platforms like Bloomberg without the registration requirements of QFII or CIBM Direct. The ease of access into the Chinese market via Bond Connect was seen as an important reform to facilitate China's inclusion in global bond indices such as the Bloomberg Global Aggregate Index and the JP Morgan Government Bond Index - Emerging Markets (GBI-EM). In order to be included in these indices, bonds must be freely tradable, there cannot be substantial capital controls, and in some cases hedging instruments need to be available. In its 2018 press release announcing the inclusion of RMB bonds, Bloomberg wrote: “In order to be considered for inclusion in the Global Aggregate Index, a local currency debt market must be classified as investment grade and its currency must be freely tradable, convertible, hedgeable, and free of capital controls. Ongoing enhancements from the PBoC have resulted in RMB-denominated securities meeting these absolute index rules.” While these criteria could arguably have already been met for official sector investors investing through CIBM Direct prior to Bond Connect, it was only recently that private investors were deemed to reach that level of access. Indeed, whether the Chinese bond market is freely investable for most foreign investors today is still a matter of contention. FTSE only added Chinese bonds to its World Government Bond Index (WGBI) in October 2021 and following this decision, for instance, Japan’s Government Pension Investment Fund (the largest tracker of the WGBI) subsequently decided to track a version of the WGBI index excluding China, arguing that market access was still too

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5 The Chinese government was explicit that these relaxation of restrictions were only for long-term investors. PBC No. 220, July 14, 2015, the “Notice of the People’s Bank of China (PBC) on Issues Concerning Investment of Foreign Central Banks, International Financial Institutions and Sovereign Wealth Funds with RMB Funds in the Inter-bank Market” writes “With a view to enhancing efficiency of foreign central banks or monetary authorities, international financial institutions, and sovereign wealth funds (hereinafter referred to as relevant overseas institutional investors) investing in the Chinese inter-bank market... Relevant overseas institutional investors shall act as long-term investors, and conduct trading based on reasonable needs for preserving or increasing the value of their assets. The PBC will, in accordance with the reciprocity principle and macro-prudential requirements, regulate trading behavior of relevant overseas institutional investors.”

6 In preparation for the launch of Bond Connect, PBC’s Announcement [2016] No.3 extended the category of foreign institutional participants eligible to access the interbank bond market from the Foreign Central Bank-Type Institutions (including foreign central banks or monetary authorities, international financial organizations and sovereign wealth funds), QFIIs and RQFIIs to all qualified foreign institutional investors, including “other medium and long-term institutional investors” and changed the tone from “investors shall act as long-term investors” to “PBC encourages an overseas institutional investor to make medium and long term investments”.

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incomplete for them to invest (Sano and Galbraith (2019)).

While each step of these reforms has its own intricacies, one can understand China’s bond market liberalization as beginning by allowing in a subset of long-term investors with restrictions on investment amounts and withdrawals, loosening these restrictions for subsets of investors over time, before moving toward free access to a range of global investors. This gradualism is consistent with the philosophy of “crossing the river by touching the stones,” moving by incremental policy reforms to develop the economy while maintaining economic stability. As we document below, these reforms have overall been accompanied by inflows of foreign investment in Chinese bond markets, starting with official foreign investors and, more recently, growing amounts of private investment.

2 Renminbi Bonds in International Portfolios

In this section, we document the rise of Renminbi-denominated bonds in international investment portfolios. From the beginning of 2014, foreign investment in onshore RMB bonds rose from under $150 billion to nearly $660 billion at the start of 2022. The largest increase came in 2020, when foreign holdings increased by nearly $200 billion. By late 2023, the number had fallen to $515 billion as China experienced capital outflows. Appendix Figure A.III plots the rise of foreign ownership of RMB-denominated bonds issued in onshore capital markets at a quarterly frequency.

The process was gradual and featured some setbacks. There were two significant instances of foreign capital outflows over the last decade. The first occurred during the financial market turbulence of 2015-2016: between June 2015 and March 2016 the value of foreign holdings declined from $108 to $92 billion dollars, a 15% decline. This was a period of Chinese stock market volatility and depreciation of the Renminbi, and China intervened heavily in its financial markets. In particular, regulators introduced suspensions of share-trading following market drops and restricted domestic firms and investors from moving capital abroad. Despite the market turmoil and the sizable outflows, China did not introduce restrictions on foreign investors, including those in the bond market, from exiting the country. We explore this episode in detail in Section 5. The most recent period of outflows began in January 2022 and appears to be ongoing at the time of writing, with much of the data to analyze it still to be released.

Figure 1 decomposes foreign ownership of Chinese Renminbi bonds issued by China-resident entities into two components, central bank reserves and private investment. The initial rise in foreign investment is largely driven by central bank holdings. By far, the largest disclosed holder is the Central Bank of Russia. In 2017 and 2018, Russia dramatically cut its holdings of USD reserves and moved into RMB and EUR, apparently in response to U.S. sanctions and general wariness of relying on the dollar-based financial system. In particular, Russia increased its holding of RMB

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7The decline in the dollar value of foreign holdings includes both asset sales and valuation effects. Measured in RMB, foreign holdings declined by 11%.

8See Arslanalp, Eichengreen and Simpson-Bell (2022) for an analysis of the changing composition of global foreign exchange reserves.
denominated bonds from under $1 billion in the second quarter of 2017 to around $67 billion in the second quarter of 2018. Reserve holdings themselves may also understate the true importance of the Renminbi as a reserve asset.\footnote{As discussed in \textit{Bahaj and Reis (2020)} and \textit{Bahaj and Reis (2021)}, China has opened a number of swap lines with central banks around the world. Therefore, even if central banks do not hold Renminbi in their current reserves assets, they may be counting on Renminbi liquidity in a crisis.}

It is only in 2019 and 2020 that we see a more substantial increase in private foreign investment in RMB bonds. For 2021, the figure also displays the estimated private ownership of RMB bonds by investor country. We find that the investor base is broadly spread geographically with large private holdings of RMB bonds by the Euro Area, United States, Singapore, and Great Britain.\footnote{\textcolor{black}{Appendix Figure A.I reports our estimates of the geographic breakdown of holdings for the full period. See Appendix A.I.A for details on the estimates. We note that the private investment estimates are based in part on IMF CPIS data. These data exclude central bank holdings, but can include some public investment in the form of sovereign wealth funds, government pension funds, and state-owned enterprises. We confirmed, however, that for many countries the primary holders are mutual funds.}}

The aggregate investment pattern raises the question of what investors are actually purchasing within the class of RMB bonds. Using data from China Central Depository and Clearing, the top panel of Appendix Figure A.IV shows that China Government Bonds account for 67\% of of foreign investment in China, with 30\% of investment in Policy Bank Bonds, even though these two classes only account for a combined 62\% of the total bond market. Importantly, these are the two categories that are either direct liabilities (CGBs) or assumed to be implicitly guaranteed (PBBs) by the Central Government. By contrast, only 3\% of foreign investment goes to the 38\% of the market with significant private credit risk. These patterns highlight that, conditional on investing
in RMB, foreign investors mostly hold the safer assets denominated in that currency.

Foreign investment in RMB bonds is, of course, not the only way that foreign investors can lend to China. In Appendix A.I.B, we document the changing importance of offshore bond issuance in both RMB and foreign currency by Chinese entities. In particular, we show that for foreign mutual funds the share of investment in Chinese bonds denominated in RMB issued offshore (the CNH market) compared to total holdings (onshore plus offshore) fell from over 80% in 2014 to under 10% by 2020. Despite this rise in the importance of onshore relative to offshore RMB financing, Appendix Figure A.V shows that throughout the full sample period mutual funds continued to invest more in China in foreign currency via international capital markets than they did in the onshore RMB market. See Coppola, Maggiori, Neiman and Schreger (2021) and Eichengreen, Macaire, Mehl, Monnet and Naef (2022) for a more detailed exploration of foreign investment in China via the offshore bond market.

2.1 Selecting the Foreign Investor Base

In the previous subsection, we documented the holdings of RMB bonds in China by reserve managers and foreign private investors. Here, we turn to understanding how China selected which type of investors would be able to invest in its bond market over time. To do so, we create a new monthly dataset of the investor composition of the four access methods to the Chinese bond market discussed in Section 1: QFII, RQFII, CIBM Direct, and Bond Connect. For each of the programs, the regulatory agency either directly reports the investor name and the month that particular investor gained access to the program, or they release a series of monthly reports of investors with access, and we infer the month of access based on the first appearance on the regulatory filing. Based on investor name, we merge these investor lists with Factset to collect investor information, such as country of residency, nationality, and industry classification. We then classify them as “Stable” investors, “Flighty” investors, or “Banks.”

Figure 2 displays the cumulative distribution function (CDF) of investors’ entry into the Chinese bond market for Stable and Flighty investors from 2003 to 2021. It shows a striking difference between the entry pattern for the two types of investors, with Stable investors generally entering earlier in the sample period followed by a rapid increase in Flighty investors over the most recent years. At the launch of RQFII and CIBM Direct, we observe increased entry of the Stable investors. By contrast, in the wake of the introduction of Bond Connect and China’s inclusion in key bond indices, we observe a quicker entry of the Flighty investors.

11“Stable” investors include central banks, legislative bodies, international organizations like the IMF, university endowments, non-profits, pension funds, and insurance companies. “Flighty” investors are those in the investment advice or portfolio management industry. “Banks” include investment banks, commercial banks, and broker dealers. For more details, see Appendix A.I.C.

12Appendix Figure A.VIa repeats the exercise for each of the underlying categories. It shows the heterogeneous process followed by different sub-types of investors in entering this market. Appendix Figure A.VIb breaks down Flighty investors into Mutual and Hedge Funds.
Notes: Figure plots the share of each investor type that had entered the market by a given date. The share is expressed as a fraction of investors by type that had entered by 2021.

We view these patterns as the result of conscious policy choices by the Chinese government that selected and grew its foreign investor base over the last two decades. As discussed above, the early entry and growth of the Stable investors was engineered via quota programs in which each investor separately applied for market access, while the later entry and growth of the Flighty investors is largely the result of more open and lightly regulated access programs like Bond Connect that allows access without any lock-up period. Our model, introduced in Section 3, both draws from this evidence in featuring two different classes of foreign investors, one stable and the other flighty, and provides an explanation of why China has followed this sequential opening up strategy to internationalize its bond market.

2.2 EM, DM, and Renminbi Bonds in Private Portfolios

The progressive integration of the Chinese domestic bond market into global capital markets would represent a potentially large shift in the set of investable assets. We investigate below whether these new assets are attracting capital from private investors that specialize in developed markets or emerging markets bonds. We use micro-data on portfolio investment from foreign investors via mutual funds and ETFs domiciled in over 50 countries, excluding China. The data include for each fund their complete worldwide holdings at the security level. We supplement the data with information on the asset class, currency, market of issuance, nationality and residency of the issuer.

13 The country of origin of the investment is taken to be the country of domicile of the fund making the investment.
and its ultimate parent company, and other security characteristics.\textsuperscript{14}

**Portfolio Holdings.** We start our analysis by examining, conditional on funds holding bonds in a particular currency, what other type of foreign currency bonds are they likely to hold. This provides an intuitive way to characterize whether bonds in a given currency, and in particular in Renminbi, are held together with those denominated in developed or emerging market currencies in global portfolios. Focusing on portfolio quantities has a specific advantage in this context since investors overall specialize in broad categories, like emerging-market or developed-market focused funds. Since Chinese Renminbi bonds are a relatively new asset for global investors, it is informative to observe which type of investors are buying them. This “revealed preference approach” presents an advantage over simply investigating ex-post returns of the bonds given the short sample and the possibility of “peso problems.”

We begin by sorting currencies according to whether they are a developed market (DM) currency or an emerging market (EM) currency, treating the RMB as its own category.\textsuperscript{15} For each fund and currency, we then calculate the share of the fund’s total foreign currency investment in EM currencies, DM currencies, and the selected currency (with that currency omitted from the relevant EM/DM calculation). For each fund, we omit holdings of domestic currency bonds and any equities from the calculations.\textsuperscript{16} We measure the correlation between the share of a foreign portfolio invested in that currency with the share of the remaining foreign currency portfolio invested in EM currencies or DM currencies across the universe of mutual funds and ETFs. More formally, for each fund $i$ and currency $c$, we compute the share of the foreign currency bond portfolio in that currency:

$$\alpha_{c,i} = \frac{\sum_{b \in B_c} MV_{b,i}}{\sum_{c' \in FC_i} \sum_{b \in B_{c'}} MV_{b,i}}$$

where $MV_{b,i}$ is the market value of holdings (measured in USD) that fund $i$ has in bond $b$, $B_c$ denotes the set of bonds denominated in currency $c$, and $FC_i$ the super-set of bonds in foreign currency from the perspective of fund $i$. The denominator, therefore, is the value of holdings of foreign currency bonds by fund $i$. In addition, for each fund $i$ and currency $c$ we compute the share of the remaining foreign currency bond portfolio in DM currencies as

$$\alpha_{DM,c,i} = \frac{\sum_{d \in \{DM_i/c\}} \alpha_{d,i}}{(1 - \alpha_{c,i})}.$$ 

We exclude currency $c$ if it is a developed currency, so that $\{DM_i/c\}$ is the set of developed

\textsuperscript{14}See Maggiori, Neiman and Schreger (2020) and Coppola, Maggiori, Neiman and Schreger (2021) for details on the data and the many sources combined in assembling it.

\textsuperscript{15}DM currencies are the so-called G10 currencies, and EM currencies are the ones from countries in the MSCI or IMF list of Emerging Markets. See Appendix A.I.D.

\textsuperscript{16}We define domestic currency to be the currency of the country in which the fund is domiciled. In Appendix A.I.D we explore robustness of this choice by also excluding the currency in which the fund reports its returns.
currencies excluding \( c \). We re-scale shares by \((1 - \alpha_{c,i})^{-1}\) so that they reflect the portfolio excluding currency \( c \). Finally, we compute the summary statistic of interest: the correlation across funds of the share invested in currency \( c \) and the share invested in (other) developed currencies

\[
\rho_{c,DM} = \text{corr}_i(\alpha_{c,i}, \alpha_{DM,c,i})
\]

where the notation \( \text{corr}_i \) emphasizes that the correlation is cross-sectional over funds \( i \) at a point in time. We make two further refinements. First, in our baseline analysis we restrict the focus to the government bonds of the country issuing each particular currency.\(^{17}\) For example, for the dollar we restrict the attention to U.S. government bonds and exclude bonds denominated in dollar but issued by other sovereigns. The focus on local-currency sovereign bonds in our baseline empirical analysis follows the rationale of our model since, as discussed above, these assets are the most directly sensitive to the reputation of a government (as opposed to corporate bonds and equity, for example). Appendix A.I.D provides more details on the procedure and highlights the impacts of expanding the types of assets included.

Second, we exclude from our analysis funds that specialize in any particular currency, which we define as funds that have more than 50% of their foreign currency bond portfolio in a single currency. We do so because these funds are most likely to have too specific a mandate to reliably contribute to the correlation estimation. We also leave out funds with a small foreign currency portfolio (i.e., less than $20 million of foreign currency investment), since these small investments are more likely to be noisy and reflect residual positions. Based on our focus on foreign currency bonds and sample cleaning, the resulting dataset includes 828 investment funds, adding up to just over $1.6 trillion dollar of assets under management. As we show below, this is a large sample with substantial investment heterogeneity and Appendix A.I.D provides further sample summary statistics.

Figure 3 illustrates our estimates of this correlation measure. We plot the portfolio shares for bonds in three currencies: the Brazilian Real (BRL) in Panel (a), the RMB in Panel (B), and the Japanese Yen (JPY) in Panel (c). Each observation represents the holdings of a particular fund in December 2020, with the share of the fund's foreign bond holdings invested in DM currencies on the x-axis and the share invested in the government bonds of the selected currency on the y-axis.

In Panel (a), we see a negative relationship between the DM currency share and the share in BRL. In Panel (c), we see precisely the reverse pattern for the Yen, with funds investing more in JPY putting a higher share of their non-JPY funds in other DM currencies. In Panel (b) China lies in the middle between these two extremes, with no strong relationship between the DM share and holdings of RMB. This shows that RMB-denominated Chinese government bonds are held together with developed and emerging market government bonds in global portfolios, while Brazilian government bonds are mostly held by EM focused funds, and Japanese mostly held by

\(^{17}\)In the case of China we classify PBBs as government debt, as these are assumed to be implicitly guaranteed by the Central Government.
Figure 3: Portfolio Shares by Currency

(a) BRL  
(b) CNY  
(c) JPY

Notes: In each panel, observations are the portfolio holding shares of a particular fund in December 2020. The vertical axis is the portfolio share in BRL in the left panel, CNY in the middle panel, and JPY in the right panel. The horizontal axis in all panels is the portfolio share in developed markets currencies. In each panel, the blue dot represents the holdings of the PIMCO Emerging Markets Local Currency and Bond Fund and the red dot represents the holdings of the T. Rowe Price International Bond Fund. Data from December 2020.

Figure 4: Portfolio Similarity with Developed Countries’ Local Currency Government Bonds

Notes: Figure reports the correlation between the holdings of bonds in each currency and holdings in Developed Markets (DM) currencies. The set of funds for measuring the correlation are restricted to non-specialists (less than 50% of its AUM in any single foreign currency) and those that have more than $20 million of foreign currency investment. Gray lines correspond to 95% confidence intervals computed via bootstrapping.
Notes: Figure displays the timing of the stage game within each date $t$.

DM focused funds.\textsuperscript{18}

In each panel, we also highlight two specific funds to help illustrate how heterogeneity in investor portfolios is driven by different relative preferences for investing in countries of various reputation levels. The first fund (red dot) is the T. Rowe Price International Bond Fund: it reports the Bloomberg Global Aggregate ex-USD Bond Index as its benchmark and it describes its investment objective as “seeking the above-average total return potential from international bonds.” This fund largely focuses on DM currency debt, with these bonds accounting for almost 62% of its FC portfolio. The second fund (blue dot) is the PIMCO Emerging Markets Local Currency and Bond Fund: it reports the J.P. Morgan Government Bond Index-Emerging Markets as its benchmark and it describes its investment objective as “tapping into opportunities for higher yields and currency appreciation through an actively managed portfolio of local currency-denominated emerging markets (EM) debt.” This fund has less than 1% of its portfolio in DM currencies. In Panels (a) and (c) these two funds are at opposite extremes, reflecting their different specializations, but in Panel (b) their holdings of RMB are somewhat similar.

To illustrate more systematically the relation between DM currencies shares and holdings of each one of the currencies, Figure 4 reports the estimated correlations using December 2020 holdings data for all emerging and developed markets in our sample. We find that the Chinese RMB ranks in between emerging market and developed market currencies in terms of its correlation with DM bond portfolio shares. In particular, China ranks close to the most developed among “emerging markets” issuers: Singapore, Israel and South Korea. As one would expect, emerging markets’ currencies have low and negative correlation with DM shares. Similarly, major DM currencies, like the Euro and the U.S. Dollar, have a positive and high correlation. These patterns in the data reflect the specialization of investors, with some funds more emerging market focused and some funds more developed market focused.

\textsuperscript{18}Appendix Figure A.VII plots this underlying data for all currencies in our sample.
3 Reputation in the International Financial System

We organize the empirical patterns documented above around stylized facts that inform our theory. First, the Chinese domestic bond market has progressively opened up to foreign participation. Second, this gradual opening up process was shaped by government policies aimed at selecting an investor base: starting with stable long-term investors and progressively letting in flightier private investors. Third, when flightier private investors were let in, foreigners did not exclusively hold RMB debt as part of emerging market debt portfolios, but also as part of developed market debt portfolios. We think of China as a country that has the potential to become the provider of a safe asset because of its economic size and geopolitical importance, but does not yet have a reputation for providing such a safe store of value. The model helps us think about how the country might build this reputation over time, the setbacks it might face, and the gradual policies it might choose.

In Section 3.1 we describe the model setup, focusing on the foundations of the stage game, and in Section 3.2 we present a reduced form of this stage game that captures its essential features. We embed the stage game in the full dynamic model in Section 4.

The model is infinite horizon and time is discrete \( t = 0, 1, \ldots \). Within each date we embed a financial intermediation model with costly liquidations, while across dates we develop a dynamic reputation model.

3.1 Stage Game Setup

Each date \( t \) is divided into a beginning, middle, and end of the date. There is a country with a government and a representative financial intermediary, both of which are risk neutral. There are foreign investors who live for one date.\(^{19}\) There is measure one of stable foreign investors, \( i = s \), and measure one of flighty foreign investors, \( i = f \). Investor type is observable.

At the beginning of each date, the government’s type is either committed or opportunistic. The government’s type is not observable to foreign investors. We assume that the government controls all decisions within the country, so that we refer to the country level actions and objectives as if the government was implementing them directly. At the beginning of date \( t \), governments make a financing decision for the country on behalf of its domestic intermediaries. Governments also make a strategic choice of whether or not to impose a capital control tax on outflows in the middle of date \( t \). The tax has two levels, denoted \( \tau \in \{0, \tau\} \). We assume that committed governments always choose \( \tau = 0 \). Figure 5 summarizes the timeline of date \( t \) and the actions taken at each point in time by each of the agents, which are described in detail below.

Payoff from Financial Intermediation. The government’s stage game payoff at date \( t \) is the end of date equity payoff of the intermediary, denoted \( c_t \). There is no consumption in the middle

\(^{19}\)Our focus is on raising debt financing from foreign investors. We extend the framework to have a separately meaningful role for domestic investors/households in Appendix A.II.I1 and Section A.III.
or beginning of the date. We derive this payoff below.

At the beginning of the date, the intermediary borrows short-term debt due in the middle of the date. We denote by amount $D_i^t \geq 0$, $i \in \{s, f\}$, from the two types of investors at endogenous interest rates $R_i^t$. Denote $D_t = D_s^t + D_f^t$ to be total foreign debt borrowed at the beginning of date $t$ and $R_t = \frac{R_s^t D_s^t + R_f^t D_f^t}{D_s^t + D_f^t}$ the average interest rate on debt. The intermediary uses its debt $D_t$ and an exogenous endowment of inside equity, $A \geq 0$, to undertake real projects of scale $I_t = A + D_t$.

Real projects have a return $Q \geq 1$ if held to the end of the date. The projects yield no payoff in the middle of $t$, but can be liquidated at an exogenous discount $\gamma < 1$ per unit of final project payoff. Denote $L_t \leq QI_t$ the liquidations and $\gamma L_t$ the liquidation value that accrues to the intermediary.

The government can choose to roll over or repay the intermediary foreign debt in the middle of $t$. Denoting $D^\ell_t = D^\ell_s + D^\ell_f$ to be total debt that is rolled over, it must satisfy the budget constraint $D^\ell_t = R_t D_t - \gamma L_t$. The intermediary cannot discriminate between investor types in the middle of $t$, that is the intermediary must deliver the same terms to all investors. Denote $R^\ell_t$ the common endogenous interest rate for debt rollover. We assume that debt rollover is subject to a pledgeability constraint,

$$R^\ell_t D^\ell_t \leq (1 - h_t)(QI_t - L_t),$$

where $h_t \in (0, 1)$ is the fraction of intermediary end of date cashflows that is not pledgeable.

End of date intermediary payoff is given by $c_t = QI_t - L_t - R^\ell_t D^\ell_t$. We assume that the pledgeability constraint binds in the middle of $t$. Substituting the rollover budget constraint $D^\ell_t = R_t D_t - \gamma L_t$ and the pledgeability constraint (equation 2) into the final payoff yields

$$c_t = \frac{h_t}{\gamma - \frac{1 - h_t}{R^\ell_t}} \left( \gamma QI_t - R_t D_t \right).$$

The final payoff $c_t$ can be written as the product of two terms: (i) a net worth multiplier; and, (ii) the liquidation value of the bank’s inside equity. The net worth multiplier falls when pledgeability is lower and when the rollover interest rate $R^\ell_t$ is higher, because both tighten the pledgeability constraint and force more liquidations.

**Interest Rate Determination.** Foreign investors are risk neutral but have a quadratic cost of lending to the intermediary at the beginning of the date. In the middle of the date, their preferences are linear. Investors do not discount payoffs between the beginning, middle, and end of $t$. Stable and flighty investors have identical preferences over (monetary) payoffs.

Investors at the beginning of $t$ have wealth $w$, which they allocate between lending to the intermediary, $D_i^t$, at promised interest rate $R_i^t$, and allocating to an outside asset with exogenous expected return $\overline{R} > 0$. In the middle of the date, investors choose to roll over or repatriate their debt based on the promised rollover interest rate and on whether a capital control tax on outflows has been imposed by the government.

The pledgeability requirement for debt rollover depends on which investor type the country has
borrowed from at the beginning of the date. In particular,
\[
h_t = \begin{cases} 
    h^s, & D_t^f = 0 \\
    h^f, & D_t^f > 0 
\end{cases}
\]
(4)

where \( h^f \geq h^s \), that is higher pledgeability (lower debt-to-asset ratio) is required when borrowing from flighty investors. Flighty investors are therefore flightier in the sense that they require the intermediary to maintain lower debt levels to be willing to roll over debt. Attracting flighty investors requires adopting the tighter pledgeability constraint at \( h_t = h^f \), that is the presence of flighty investors raises the pledgeability for the entire market.\(^{20}\)

In the middle of \( t \), an investor of type \( i \) with a debt repayment due of \( R_{i,t}^D \) pays a tax \( \tau \) on net outflows, \( \max(R_{i,t}^D - D_{i,t}^f, 0) \), where \( D_{i,t}^f \) is the new debt and \( \tau \in \{0, \bar{\tau}\} \) depends on whether the government has imposed a capital control. Withdrawn funds can be stored in an outside asset with unit return until the end of the date and then consumed. Investor \( i \) receives payoff \( R_{\ell,t}^i \) per unit rolled over in the middle of \( t \). Investors solve the following problem:

\[
\max_{D_{i,t}^f \geq 0} \ c_{t,i}^{\ast} = (R_{\ell,t}^i - 1)D_{i,t}^{\ell,i} - \tau \max(R_{i,t}^D - D_{i,t}^{\ell,i}, 0) + R_{i,t}^D D_{i,t}^f + \bar{R}(w - D_{i,t}^i)
\]

Intuitively, since in equilibrium investors have to be indifferent between rolling over and not rolling over debt, the interest rate is \( R_{\ell,t}^i = 1 - \tau \) (see the proof of Lemma 1).

At the beginning of \( t \), investors take as given the promised interest rate \( R_{i,t}^D \) and have a common belief \( M_t \in [0, 1] \) that the government will not impose capital controls in the middle. They solve the following problem:

\[
\max_{D_{i,t}^f \geq 0} \bar{R}w + (R_{i,t}^D E[1 - \tau] - \bar{R})D_{i,t}^f - \frac{b}{4 \omega(M_t)} D_{i,t}^{2,f},
\]

where the first two terms are the expected monetary payoff at the end of the date, \( E[c_{t,i}^{\ast}] \), and where \( E[1 - \tau] = M_t + (1 - M_t)(1 - \bar{\tau}) = 1 - (1 - M_t)\bar{\tau} \). The last term is a utility holding cost of investing, with \( b > 0 \) a slope coefficient, and \( \omega(M_t) > 0 \) an exogenous cost/taste function that we assume to be continuous and weakly increasing in the probability \( M_t \) that the government does not impose the capital control. For most of the paper, we think of \( \omega(M_t) \) as being constant at 1, but an increasing function allows us to also capture the disproportionately higher demand faced by issuers of very safe bonds (high \( M \)).

We collect the solution to the investor problem into the Lemma below.

\(^{20}\)This assumption helps us capture the market reforms that in practice allow a government to let in new types of investors. These reforms apply to the entire market, not just to the new investor type. We view this as capturing the spirit of the evidence in Section 1 and Section 2.1 documenting the gradual process by which China has progressively and selectively allowed different types of foreign investors into its domestic bond market, both by directly restricting the type of investors eligible for a given program, and by adopting policies like a fixed lock-up period which only certain types of investors can realistically agree to.
Lemma 1 The foreign investors’ optimization problems in the beginning and middle lead to the following interest rate schedules:

\[ R^i_t = \frac{\bar{R} + \frac{b}{2} \omega(M_t) D^i_t}{1 - (1 - M_t)\bar{\tau}} \]  \hspace{1cm} (5) \\
\[ R^f_t = 1 - \tau \]  \hspace{1cm} (6)

Intuitively, the middle date interest rate (equation 6) is depressed whenever capital controls are imposed, \( \tau = \bar{\tau} \), since controls worsen the investor outside option. The beginning of date interest rate schedule (equation 5) has a lower intercept and slope the lower the probability that capital controls are imposed ex-post (even when taking \( \omega(M_t) \) to be constant). A higher probability \( M_t \) improves borrowing terms in that interest rate schedules start lower and increase slower as the amount of debt increases.

**Optimal Debt Policy of the Committed Type.** The solution of the model can be analyzed by first determining what the committed type of government optimally chooses to do in each date. Opportunistic types then decide to either mimic the committed type or deviate.

As in much of the literature, we assume the committed government does not internalize the impact of its decisions on the behavior of an opportunistic government. In particular, we assume the committed government behaves myopically and maximizes its static payoff, taking as given the entire path of investor beliefs \( M_t \). As a consequence, the problem of the committed government at date \( t \) is to choose debt policies \((D^s_t, D^f_t)\) in order to maximize its date \( t \) objective (equation 3 with \( R^f_t = 1 \), that is \( \tau = 0 \)), subject to the interest rate schedules of stable and flighty investors (equation 5) and to the pledgeability determination (equation 4), taking investor beliefs \( M_t \) as given. The proposition below characterizes the optimal policy choices of a committed government.

**Proposition 1** There exists a unique opening up threshold \( M^* \in [0, 1] \) such that optimal policies of a committed government are

\[ D^s(M_t) = \frac{\omega(M_t)}{b} \left[ \gamma Q (1 - (1 - M_t)\bar{\tau}) - \bar{R} \right] \]

\[ D^f(M_t) = \begin{cases} 
0, & M_t \leq M^* \\
D^s(M_t), & M_t > M^* 
\end{cases} \]

and the resulting interest rate is \( R(M_t) = \frac{1}{2} \frac{\bar{R}}{1 - (1 - M_t)\bar{\tau}} + \frac{1}{2} \gamma Q, \) and \( R(M_t) = R^s(M_t) = R^f(M_t) \).

The proof is in Appendix A.II.C. The key property of Proposition 1 is the opening up threshold \( M^* \), below which the government does not borrow from flighty investors and above which the government borrows equally from both types. The intuition follows a typical fixed cost problem: the presence of flighty investors leads to a larger deleveraging in the crisis for the same total amount of debt. In deciding whether or not to open up to flighty investors, the government trades off this greater crisis...
severity against the benefits of expanding its capital base to the new class of investors. The benefit of attracting more capital increases when investor beliefs $M_t$ rise because its interest rate schedule becomes more favorable. This leads to a threshold rule for opening up.

We are now ready to define the indirect utility function of the committed government over the date $t$ payoff as

$$V(M_t) = \frac{h(M_t)}{\gamma - (1 - h(M_t))} \left( \gamma QI(M_t) - R(M_t)D(M_t) \right)$$

which substitutes the policy functions from Proposition 1 into the objective function (equation 3) and sets $\tau = 0$. We have: $h(M_t) = h^s$ for $M_t \leq M^*$ and $h(M_t) = h^f$ for $M_t > M^*$; $I(M_t) = A + D(M_t)$; and $D(M_t) = D^s(M_t) + D^f(M_t)$.

Opportunistic Government Payoff and Strategies. An opportunistic government always mimics the debt issuance policy of a committed government at the beginning of each date to avoid revealing itself before any debt has been raised. However, an opportunistic government additionally chooses whether to impose capital controls in the middle of date $t$.

If the opportunistic government does not impose capital controls at date $t$ its payoff at the end of the date coincides with that of a committed government given by $V(M_t)$ in equation 7. If instead the opportunistic government imposes capital controls, its payoff rises to $g(M_t)V(M_t)$ for $g(M_t) > 1$ a function derived below. The end of date payoff for an opportunistic government is:

$$V^{Opp}(M_t, \tau) = \begin{cases} V(M_t), & \tau = 0 \\ g(M_t)V(M_t), & \tau = \tau^* \end{cases}$$

where

$$g(M_t) = \frac{\gamma - (1 - h(M_t))}{\gamma - \frac{1-h(M_t)}{1-\pi}}.$$  \hspace{1cm} (9)

Importantly, $g$ is a decreasing function of $h(M_t)$, that is the presence of flighty investors lowers the proportional gains from imposing capital controls.

We study strategies of the opportunistic governments that are Markov in the common beginning-of-period belief $\pi_t$ that foreign investors assign to the government being the committed type. Investors have beliefs $m(\pi_t) \in [0,1]$ that if the government is opportunistic it will not impose capital controls in the middle of date $t$. Therefore, investors believe that the government will not impose capital controls with probability $M(\pi_t) = \pi_t + (1-\pi_t)m(\pi_t)$. We refer to $M(\pi_t)$ as the government’s reputation and use the lighter notation $M_t$ in the equations whenever the explicit reminder that $M_t$ depends on $\pi_t$ is not necessary for clarity.

We define a strategy of the opportunistic government to be a probability $m^{opp}(\pi_t) \in [0,1]$ that it will not impose capital controls in the middle of the date when investors hold beliefs $\pi_t$ at the

\footnote{We assume that investors hold off-path beliefs $\pi = M = 0$ for any government that does not mimic the issuance of a committed government. Appendix A.II.E verifies that these beliefs are sufficient in equilibrium to ensure the opportunistic type always mimics issuance.}
beginning of that date.\footnote{Values of \(m^o = 0\) and \(m^o = 1\) correspond to the pure strategies of deviating for sure (certainty of capital controls) or mimicking for sure (certainty of no capital control), respectively. Interior values of \(m^o\) correspond to mixed strategies. Within a date, for given investor beliefs, the opportunistic government does not suffer from time inconsistency. It sets the strategy \(m^o(\pi_t)\) at the beginning of the date and then randomizes accordingly when deciding whether to impose capital controls in the middle of the date.}

### 3.2 Reduced Form Stage Game

It is convenient to collect the results presented thus far into a reduced form representation of the date \(t\) stage game. Investors believe that the government is committed at the beginning of date \(t\) with probability \(\pi_t\). Consider strategies that are Markov in \(\pi_t\). Let \(\tau \in \{0, \bar{\tau}\}\) denote a capital control decision by the government. A committed government sets \(\tau = 0\) by assumption. Denote \(m(\pi_t)\) to be investors’ belief about the probability that an opportunistic government sets \(\tau = 0\). Define \(M(\pi_t) = \pi_t + (1 - \pi_t)m(\pi_t)\) to be the government’s reputation for setting \(\tau = 0\). A committed government follows an exogenous debt policy \(D^i_t = D^j(M(\pi_t)), i \in \{s, f\}\), as given by Proposition 1. Given interest rate \(R_t\), the payoff to the committed type is \(c_t = n_t(\gamma QA + (\gamma Q - R_t)D_t)\), where \(n_t = n^s > 0\) if \(D^j_t = 0\) and \(n_t = n^f\) (where \(0 < n^f \leq n^s\)) if \(D^j_t > 0\). \(\gamma Q\) is an exogenous value. The opportunistic government mimics the debt policy of the committed government (see Appendix A.II.E). The opportunistic government receives payoff \(c_t\) if it sets \(\tau = 0\) and \(g_t c_t\) if \(\tau = \bar{\tau}\), where \(g_t = g^s\) if \(D^j_t = 0\) and \(g_t = g^f\) if \(D^j_t > 0\), with \(g^s \geq g^f \geq 1\). Investor \(i\) receives payoff from lending equal to \(R^i_t D^i_t\) if \(\tau = 0\) and \((1 - \bar{\tau})R^i_t D^j_t\) if \(\tau = \bar{\tau}\), and her beginning of period expected utility is \(\bar{w} + (R^i_t E[1 - \tau] - R)D^j_t - \frac{1}{4} \omega(M(\pi_t)) D^j_t^2\). The interest rate is \(R_t = R(M(\pi_t))\), given by Proposition 1. An opportunistic government’s strategy is the probability \(m^o(\pi_t) \in [0, 1]\) of setting \(\tau = 0\).

The reduced form of the stage game makes clear the essential elements that we carry to the dynamic reputation game next. Governments face a trade-off between a better ex-ante interest rate schedule when they borrow from both stable and flighty investors, and more deleveraging ex-post if they borrow from flighty investors. Committed governments never impose capital controls ex-post and borrow from flighty investors (in addition to stable ones) once their reputation is sufficiently high. Imposing ex-post capital controls leads to a short-run gain for an opportunistic government by reducing forced liquidations, but as we show next it comes with the cost of revealing its type.

### 4 Dynamics of Reputation Building

We now study the dynamic game of reputation building, and characterize optimal strategies and equilibrium. We assume that at the end of date \(t\), after payoffs have been distributed, the government may be dissolved. Committed governments are dissolved with probability \(\epsilon^C > 0\) while opportunistic governments are dissolved with probability \(\epsilon^O > 0\), with \(\epsilon^C + \epsilon^O < 1\). Governments that are dissolved are replaced by the opposite type government, and place no value on their successor.
Investors know these switching probabilities but actual changes in government are not observable to them. Let $\beta^* < 1$ be the government discount factor, then define $\beta \equiv \beta^*(1 - \epsilon^O)$ to be the effective opportunistic government discount factor that accounts for switching probability. We build on Phelan (2006) and Amador and Phelan (2021) by analyzing the implications of exogenous government type-switching. This plays an important role in the dynamics of reputation in the model even for small probabilities of types switching.

Investor posterior beliefs at the end of date $t$ (i.e., prior beliefs at the beginning of $t+1$) about the government type are formed from Bayes’ rule. If a government did not exercise the capital control in the middle of $t$, then

$$\pi_{t+1} = \epsilon^O + (1 - \epsilon^C - \epsilon^O) \frac{\pi_t}{M(\pi_t)}. \quad (10)$$

If, on the other hand, a government exercised the capital control, then $\pi_{t+1} = \epsilon^O$, reflecting that the government revealed itself as opportunistic but may have been dissolved and switched types.

It is natural in this model to index strategies and beliefs with respect to the number of dates passed without the capital control having been imposed, which we term “steps” and denote by $n$. Note that $\pi_0 = \epsilon^O$. Henceforth we will focus on steps $n$ rather than calendar dates $t$.

At step $n$, the opportunistic government takes as given investor belief $M(\pi_n)$ and chooses its own strategy $m^O$. This decision is characterized by the Bellman equation,

$$W(\pi_n) = \max_{m^O_n \in [0,1]} m^O_n \left( V^{Opp}(M(\pi_n), 0) + \beta W(\pi_{n+1}) \right) + (1 - m^O_n) \left( V^{Opp}(M(\pi_n), \bar{\tau}) + \beta W(\pi_0) \right). \quad (11)$$

A mixed strategy $m^O_n \in (0,1)$ requires indifference between exercising and not exercising the capital control, that is,

$$V^{Opp}(M(\pi_n), 0) + \beta W(\pi_{n+1}) = V^{Opp}(M(\pi_n), \bar{\tau}) + \beta W(\pi_0).$$

By contrast, a pure strategy of exercising the control, $m^O_n = 0$, requires a weak preference for the capital control, whereas a pure strategy of not exercising the capital control, $m^O_n = 1$, requires a weak preference for not exercising it. We can now define a Markov equilibrium of the model.

**Definition 1** A Markov equilibrium of the model is a path of debt issuance of the committed government $\{D^C_n, D^H_n\}$, a path of debt purchases of stable and flighty investors such that debt markets clear at interest rates $\{R_n\}$, a path of strategies $\{m^O(\pi_n)\}$ of the opportunistic government, and a path of investor beliefs about government type $\{\pi_n\}$ and strategies $\{m(\pi_n)\}$, such that:

1. Debt issuances are optimal for the committed government
2. Debt purchases are optimal for investors
3. $m^O(\pi_n)$ is an optimal strategy of the opportunistic government at step $n$
4. $\pi_n$ is consistent with Bayes’ rule in equation 10 with $\pi_0 = \epsilon^O$

5. Investor beliefs are rational about government strategies: $m(\pi_n) = m^o(\pi_n)$

Consistent with Phelan (2006), we conjecture and solve for an equilibrium that takes the form of a cycle, $n = 0, ..., N$ for $N \geq 0$. Opportunistic governments play a mixed strategy, $m(\pi_n) \in (0, 1)$ at steps $n < N$. At $N$, opportunistic governments play a pure strategy of exercising the capital control, $m(\pi_N) = 0$. As in the previous literature, we refer to $N$ as the “graduation step,” at which a committed type government gains the highest possible beliefs and reputation. Committed types that continue to each step $n > N$ either switch types and play the pure strategy $m(\pi_n) = 0$, or remain committed and continue at the constant beliefs and reputation, $\pi_n = M_n = 1 - \epsilon^C$. We refer to this form of equilibrium as a graduation step Markov equilibrium.

An important step in the cycle is the earliest step $N^*$ at which the government lets in flighty investors, that is $M_n < M^*$ for $n < N^*$. We verify that $M_n \geq M^*$ for $n \geq N^*$, that is an economy that opens up stays open. We refer to $N^*$ as the “opening up step,” since the government is opening up to a new class of investors.

4.1 Paths of Reputation Building

In our conjectured equilibrium, the opportunistic government plays either a mixed strategy or a pure strategy of exercising the capital control at every step. Recalling the notation $M_n = M(\pi_n)$, we must have

$$W(\pi_n) = g(M_n)V(M_n) + \beta W(\pi_0),$$

for all $n$. Focusing in particular on the first step $n = 0$, we have

$$W(\pi_0) = \frac{1}{1 - \beta} g(M_0)V(M_0).$$

This condition says that the lifetime value that accrues to a specific opportunistic government at the beginning of the cycle under the optimal strategy is equal to the value it would achieve if it followed the strategy of imposing the capital control at every date forever.

As characterized above, a mixed strategy requires the indifference condition $V(M_n) + \beta W(\pi_{n+1}) = g(M_n)V(M_n) + \beta W(\pi_0)$. We can therefore substitute equations 12 and 13 into this indifference condition to obtain the representation

$$V(M_{n+1}) = \frac{g(M_n)}{g(M_{n+1})} \rho(M_n)V(M_n) + \frac{g(M_0)}{g(M_{n+1})} V(M_0)$$

where we have defined $\rho(M_n) = \frac{1}{\beta} \frac{g(M_n) - 1}{g(M_n)}$. Equation 14 characterizes the indifference path of

\[23\] As long as $\epsilon^O \leq M^* < 1 - \epsilon^C$, such a step exists in the conjectured equilibrium of this form. Note that it is possible for $N^* = 0$, that is opening up happens immediately, or for $N^* = N + 1$, that is opening up happens after graduation.
our conjectured equilibrium in terms of indirect utility $V(M_n)$, rather than in terms of the value function $W_n$. It tells us, for a given initial reputation $M_0$, opening up step $N^*$, and graduation step $N$, what the path of reputation $M_1, ..., M_N$ must be to sustain a mixed strategy by the opportunist government up until the graduation step. This path is characterized by an AR(1) process in indirect utility $V(M_n)$. However, as we describe in detail below, the coefficients of the AR(1) process change when the government opens up due to the change in investor composition. We build more intuition for this equation below as we decompose its dynamics in the different regions. To simplify notation, we denote $\rho_s = \rho(M_n)$ and $g_s = g(M_n)$ for $M_n \leq M^*$ so that $h(M_n) = h^s$. Correspondingly, we denote $\rho_f = \rho(M_n)$ and $g_f = g(M_n)$ for $M_n > M^*$ so that $h(M_n) = h^f$. Note that $\rho_f < \rho_s$ since $g_f < g_s$.

Equation 14 governs the dynamics for $n < N$. To complete the argument, a pure strategy of $m_N = 0$ requires that $V(M_N) + \beta W(1 - \epsilon^C) \leq g(M_N) V(M_N) + \beta W(\pi_0)$. An opportunist government also plays a pure strategy at $n > N$, meaning that $W(1 - \epsilon^C) = g(1 - \epsilon^C) V(1 - \epsilon^C) + \beta W(\pi_0)$. Combining these conditions with equation 12 yields

$$V(1 - \epsilon^C) \leq \frac{g(M_N)}{g(1 - \epsilon^C)} \rho(M_N) V(M_N) + \frac{g(M_0)}{g(1 - \epsilon^C)} V(M_0).$$

(15)

Equation 15 parallels equation 14. Intuitively, it states that graduation occurs once the required indirect utility $V$ to sustain a mixed strategy exceeds the upper bound on indirect utility $V(1 - \epsilon^C)$ attainable in the conjectured equilibrium. Once the transition path exceeds this threshold, indifference can no longer be maintained and graduation occurs. Observe that graduation cannot occur at a prior point on the indifference path. If we conjectured an earlier graduation step, equation 14 implies there is an indirect utility $V \leq V(1 - \epsilon^C)$ that makes an opportunist government indifferent between imposing and not imposing the capital control. But this means the opportunist government strictly prefers not exercising the capital control and achieving reputation $1 - \epsilon^C$ to exercising it, a contradiction.

### 4.2 Model Equilibrium

To build intuition for the model dynamics, we consider first the simpler case in which foreign investors are homogeneous.

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24If $N^* < N + 1$, then equation 15 is a sufficient condition for a pure strategy $m_n = 0$ for $n > N$ to be optimal. If $N^* = N + 1$, then the equilibrium also must satisfy $V(1 - \epsilon^C) \leq \beta g(M_0) V(M_0)$, which guarantees optimality of pure strategy after graduation. In general, we approach the model by solving for an equilibrium of the model not subject to this constraint, and then verifying that this constraint holds if the conjectured equilibrium has $N^* = N + 1$.

In the homogeneous investors case, $N^* = 0$. Therefore, a pure strategy at $N$ implies a pure strategy at $n > N$. 

---
Homogeneous Investors. We set \( h^s = h^f \) so that all investors are equally flighty. The transition dynamics of equation 14 simplify to:

\[
V(M_{n+1}) = \rho^f V(M_n) + V(M_0).
\]

(16)

The transition path of indirect utility \( V(M_n) \) follows an AR(1) with a constant coefficient, \( \rho^f = \frac{1}{\beta} \frac{g^f - 1}{g^f} \). The rate of convergence decreases in the discount factor \( \beta \), reflecting that as opportunistic governments become more patient they require smaller increases in reputation to be willing not to impose the capital control. It increases in the value \( g^f \) of imposing the capital control, reflecting that a higher value increases the foregone benefits of imposing the control today and so requires a larger increase in reputation to maintain indifference. Similarly, the analog of the graduation condition 15 is\(^{25}\)

\[
V(1 - \epsilon^C) \leq \rho^f V(M_N) + V(M_0).
\]

(17)

In our conjectured equilibrium, the graduation step \( N \) is determined, starting from the initial reputation \( M_0 \), as the first step \( N \) at which equation 17 is satisfied.\(^{26}\) The proposition below characterizes this equilibrium.

**Proposition 2** If investors are homogeneous \( h^s = h^f \), there exists a unique graduation step Markov equilibrium.

Proposition 2 (see proof in the Appendix) verifies that a graduation step Markov equilibrium does in fact exist, and that it is the unique equilibrium of this form. Intuitively, uniqueness arises because the path of reputation described by equation 16 and the path of beliefs described by equation 10 have different responses to a change in the initial government reputation \( M_0 \). An increase in initial reputation \( M_0 \) means that all future reputations \( M_n \) must be higher to maintain the indifference condition. By contrast, a higher initial reputation means that posterior beliefs \( \pi_1 \) are lower, as more opportunistic governments are not imposing the capital control. This means that the future path of beliefs is also everywhere lower. In other words, the path of reputation \( M_n \) increases at every \( n \) in the initial reputation \( M_0 \), whereas the path of beliefs \( \pi_n \) determined by Bayes’ rule falls at every \( n \) in the initial reputation \( M_0 \). This gives rise to a crossing point of these two paths at any conjectured graduation step \( N \) (i.e., such that \( m_N = 0 \)). The terminal condition of graduation, equation 17, then pins down the step \( N \) at which these two paths not only cross, but also graduation is feasible, giving rise to existence. At this point, a lower initial reputation would be required to graduate at a later step, due to the indifference path. However, a lower initial reputation implies that beliefs build faster, and so overshoot reputation. This gives rise to uniqueness. Appendix A.II.I3 illustrates a numerical solution of this model.

\(^{25}\)As noted above, equation 17 also guarantees that \( m_n = 0 \) is optimal for \( n > N \).

\(^{26}\)If \( \rho^f > 1 - \frac{V(\epsilon^C)}{V(1-\epsilon^C)} \), the proof of Proposition 2 additionally shows that it must be the case that \( N < \infty \).
Heterogeneous Investors. We now analyze the model with heterogeneous investor types. As discussed above, we assume that $\epsilon^O < M^* < 1 - \epsilon^C$, so that a committed government with reputation $\epsilon^O$ would not open up whereas a committed government with reputation $1 - \epsilon^C$ would open up. This ensures that our conjectured equilibrium has a well defined opening up step $0 \leq N^* \leq N + 1$.

If $N^* = 0$, then the economy is always open and the transition dynamics and graduation condition are given by equations 16 and 17. We now characterize the case $0 < N^* \leq N + 1$. The transition dynamics of equation 14 can be written separately in two regions (some of which may be empty in equilibrium). As characterized below, there is a lower region of low reputation and a fast rate of convergence. There is an upper region of high reputation and a slow rate of conversion. At the boundary between the two regions, an upward jump occurs in the transition dynamics.

The lower region is the (possibly empty) set of cycle steps $N_1 \equiv \{n|n + 1 < N^*\}$. For any $n \in N_1$, the economy has not yet opened up to flighty investors at either $n$ or $n + 1$, and so $h_n = h_{n+1} = h^s$. As a result, the transition dynamics in equation 14 reduce to

$$V(M_{n+1}) = \rho^s V(M_n) + V(M_0).$$

(18)

The dynamics in this region carry the same intuition as the dynamics in the homogeneous investor model.

The boundary between the lower region and the upper region is the step prior to opening up, $N^* - 1$. When $N^* > 0$, this step always exists in our conjectured equilibrium. This is the unique step $n$ of our conjectured equilibrium such that the economy is not open to flighty investors at $n - 1$ but is open to flighty investors at $n$. This means that $h_{N^*-1} = h^s$ but $h_{N^*} = h^f$. Therefore if $N^* < N + 1$, the transition dynamics of equation 14 reduce to:

$$V(M_{N^*}) = \frac{g^s}{g^f} \left(\rho^s V(M_{N^*-1}) + V(M_0)\right).$$

(19)

The opening up step $N^*$ has the same transition dynamics as before opening up, but is scaled by the relative value $g^s/g^f$ of imposing the capital control before and after opening up. We have that $g^s > g^f$: for a given inside equity, imposing capital controls before rather than after opening up increases the government’s utility more. Intuitively, this occurs because flighty investors are more inelastic in their debt rollover decisions, thus making imposing capital controls ex-post less advantageous for the government.

Opening up is a disproportionately expensive action for the opportunistic types to take. In reputation games, taking this type of expensive action comes with a jump up in reputation. Formally, this manifests as a larger increase in the indirect utility $V(M_{N^*})$ at opening up $N^*$ relative to the dynamics before opening up. Capital inflows jump up on opening up for two reasons: (i) flighty investors are let in for the first time and due to the fixed-cost nature of this decision there is a lumpy capital inflow (see Proposition 1); (ii) both stable and flighty investors respond to the endogenous jump up in the country’s reputation by increasing their lending.
The upper region is the (possibly empty) set of cycle steps after the economy has opened up but before graduation, \( N_2 \equiv \{ n | N^* \leq n < N \} \). In this region, the economy is open at both \( n \) and \( n + 1 \), so that \( h_n = h_{n+1} = h^f \). As a result, the transition dynamics of equation 14 reduce to

\[
V(M_{n+1}) = \rho^f V(M_n) + \frac{g^s}{g^f} V(M_0).
\]

Intuitively, a government that imposes the capital control at \( n \) also benefits from the higher proportional value of imposing the capital control when it resets to reputation \( M_0 \). This leads to the scaling of \( V(M_0) \) by \( g^s/g^f \). The rate of convergence also shifts from \( \rho^s \) to \( \rho^f \), reflecting that the smaller proportional value of imposing the capital control slows the required increases in reputation needed to make the government willing not to impose the capital control today.

Finally, opportunistic governments must be willing to graduate at \( N \), that is equation 15 must hold at \( N \). As in the one investor model, graduation occurs when reputation implied by the indifference path exceeds the highest possible reputation \( 1 - \epsilon_C \). If \( N^* < N + 1 \), then the graduation condition is

\[
V(1 - \epsilon_C) \leq \rho^f V(M_N) + \frac{g^s}{g^f} V(M_0).
\]

If instead \( N^* = N + 1 \), then the graduation condition is

\[
V(1 - \epsilon_C) \leq \frac{g^s}{g^f} \left( \rho^s V(M_{N^* - 1}) + V(M_0) \right).
\]

Relating back to the intuition behind equation 19, the loss in value of the capital control may be sufficiently large that the opportunistic government cannot be incentivized to play a mixed strategy at the date prior to opening up. In this case, opening up occurs after graduation.

The proposition below characterizes this equilibrium.

**Proposition 3** There is at most one graduation step Markov equilibrium associated with an opening up step \( N^* \).

The model with heterogeneous investors might feature multiple equilibria with different opening up steps, but given an opening up step there is at most one equilibrium of this form associated with that step. In some sense, the logic of uniqueness of the equilibrium in the special case of homogeneous investors carries over to this setup with multiple classes once the opening up step is fixed. The multiplicity, if present, arises from setting two different opening up steps. Technically, the possibility of multiple equilibria arises from the fact that reputation grows faster before opening up, but the jump up of reputation upon opening up is smaller the longer opening up is postponed. Intuitively, at a conjectured opening up step there might be two possible outcomes. The first is that the economy opens up and reputation experiences a larger jump according to equation 19, carrying it to \( M_{N^*} > M^* \). This then rationalizes the decision of committed governments to open up at \( N^* \). However, it can also be possible that if there were no jump and equation 18 governed the dynamics,
we would have $M_{N^*} < M^*$. This in turn rationalizes the decision of committed governments not to open up.\footnote{This further clarifies uniqueness in the homogeneous case, $h^s = h^f$, where there is no shift in transition dynamics.}

**Numerical Illustration.** Figure 6 provides a numerical example of the equilibrium. Our model is intentionally stylized and qualitative, so all figures depicting equilibria of the model are to be taken as pure illustration without a quantitative focus. In this case, the economy opens up at $N^* = 3$ and graduates at $N = 12$. The upper left panel plots the evolution of reputation $M_n$ and beliefs $\pi_n$. Beliefs and reputation start low at $n = 0$ because, at this point, investors are relatively sure that the government is opportunistic; in this example, prior beliefs at $n = 0$ are $\pi_0 = \epsilon^O = 0.001$. Intuitively, most governments at $n = 0$ are those that exercised capital controls last period, thus revealing themselves to be opportunistic, and the only uncertainty about their type this period is due to the exogenous switching probability. At low levels of reputation letting in the flighty investors is sub-optimal since total desired borrowing is small. As reputation builds further and consequently the interest rate schedule shifts downwards, both because of the direct effect of reputation and because we set $\omega(M)$ to increase in $M$, desired borrowing increases to the point that the government decides to let in the flighty investors. As discussed above, the decision to open up endogenously causes a jump up in reputation since it is disproportionately expensive for the opportunistic governments to mimic this decision. Reputation building slows down substantially after opening up as seen in the top left panel of Figure 6. The bottom right panel of Figure 6 confirms the intuition that the government upon opening up to flighty investors wants to borrow a lot more. Part of the increase is due to the “fixed-cost” nature of letting in the flighty investors, part of the increase is due to the endogenous jump up in reputation. The bottom left panel shows that the equilibrium interest rate falls even as debt increases.

After opening up, foreign debt continues to increase and interest rates continue to fall, but the movements are much less pronounced since the further building of reputation occurs slowly. At higher reputation the government contemporaneously sustains more foreign debt and lower interest rates, which is intuitive since higher reputation is a shift downward in the interest rate schedule. Eventually the economy reaches a level of debt and reputation at which further gains would be too small and all opportunistic governments decide to impose capital controls if a crisis occurs, thus restarting the reputation cycle. The presence of stable investors, rather than just one homogeneous class of flighty ones, allows the country to grow reputation faster before opening up. After opening up, the growth rate of reputation is the same as the homogeneous model. Appendix A.II.I4 provides further numerical examples allowing for heterogeneous parameters in investor demand curves, a cap on the size of the stable investors, and variation in the taste for safe assets (the weights $\omega(M)$).

**Interpreting China’s Experience** The model captures salient empirical features documented in Sections 1 and 2. Foreign entry into the Chinese market is a slow building process. In the model,
Figure 6: Equilibrium Reputation Cycle: Heterogeneous Foreign Investors

Notes: Numerical illustration of the equilibrium of the model when foreign investors are heterogeneous. The $N^*$ dashed-green and $N$ dashed-red lines are the opening up and graduation steps, respectively.
investors “experiment” with this new market: they start with a cautious view ascribing a low reputation to the country. They then test the country’s commitment: they pull out their capital and pay attention to the reaction of the Chinese government and the well-functioning of the bond market.

The model also highlights the importance of building the investor base as a country internationalizes its bond market. The trade-offs highlighted in the model between accessing more foreign capital and increasing the risk for capital flight should apply to any country considering bond market liberalization. Within the spectrum of this trade-off, China appears to have been able to attract a large amount of capital inflows from stable investors even at low levels of reputation. In particular, because China has the characteristics (e.g. size, military power) that make it a potential global safe asset provider, it may have been particularly capable of attracting large central bank reserve inflows relatively early in the liberalization process. This explains its strategy to selectively allow investment from stable investors before opening up. Most other countries, especially small emerging markets, likely can only attract a more limited amount of investment from stable investors. Such countries may choose to open up more quickly to flightier foreign capital to attract significant amounts of investment.\footnote{Appendix A.II.I4 considers an extension of the model with a cap on the total investment that a country can attract from stable investors.}

The model raises the question of where in the reputation cycle China currently stands. Although there are many reasons for investors to hold a given asset, we find it informative that Chinese government Renminbi bonds fall between developed and emerging markets in global investors’ portfolios, as highlighted in Section 2.2. In particular, while many funds specialize in holding either emerging or developed market bonds, China is held by both types of funds. One potential difference in how investors view developed markets (like the U.S., Eurozone, and Japan) and emerging countries is in their reputation for maintaining free capital flows during crises. We interpret China’s position in global bond portfolios as suggestive evidence that it is viewed as having an intermediate reputation by global investors.

Discussion of Modeling Choices The model shows how hard it is to build a reputation for being a safe asset provider. At a basic level, the rule of law and financial market development are important characteristics, on which China still has much progress to make. But being an international safe asset provider goes even further, it is a promise to foreign investors of a store of value in a crisis. Many government actions, such as ex-post capital controls, currency depreciation and/or inflation, or arbitrary administrative orders rather than respecting market mechanisms, can impair such a promise without constituting a deviation from the rule of law per se. Investors buying an international reserve asset do so for its safety and liquidity and we think of these characteristics as being very sensitive to the reputation of the government. This view drives the focus of the paper on foreign investment in domestic currency bonds, rather than equity or foreign direct investment (FDI) where there is no expectation of stable returns regardless of the level of financial development.
or reputation. China also opened up its equity (Stock Connect programs) and FDI markets to foreigners, and in many respects those liberalizations came earlier but do not load as heavily on policy commitments.

We focus on the uncertainty that investors face about a country like China and abstract from uncertainty that the country might have about investor behavior. In practice, we believe China can observe the behavior of large investors, like foreign central banks or large investment management groups, in many other countries that receive foreign portfolio investments. Investors, on the other hand, face the unique situation of a very large country beginning to open up its markets under the shadow of substantial political risk and a lack of transparency. Therefore, while China has a myriad of ways to learn about investors’ tendencies in related contexts, it is hard to see how investors can assess what the Chinese government is likely to do in a future crisis other than by observing how it acted in past and current crises. It is this uncertainty and learning that our model focuses on.

We chose to model the willingness to impose ex-post capital controls as the defining characteristic of an opportunistic government because it captures a salient feature of foreign investors’ fears about investing onshore in China: the ability to “get the money out” in a future crisis. Outright default, and inflation or exchange rate depreciation are other ways to alter repayments to foreign bondholders that also carry reputational losses. As detailed in Appendix A.I.G, foreign investors in the Chinese bond market emphasize uncertainty over “repatriation risk” or whether China will “lock the gates” in bad times. While there are, of course, the standard currency and interest rate risks of investing in RMB, a salient risk in the context of China is the possibility that investors will not be able to get their money out in bad times. We model this as the risk that China institutes an ex-post capital outflow tax, although it could be re-framed as a quantity restriction on outflows.

Allowing the committed type to take into consideration its market impact has two advantages for us. First, it connects to the economics of reserve currencies as special assets whose issuers receive an exorbitant privilege via monopoly rents and opens up the possibility of studying competition among issuers (Farhi and Maggiori (2018); Choi, Kirpalani and Perez (2022)). Second, it allows for some degree of ex-ante macro-prudential policy to have already taken place in the model, sharpening the difference between ex-ante prudential measures and ex-post capital controls. Ex-ante capital controls do not carry the same reputational stigma because they are known at the time of investment.  

29For instance, a number of funds discuss concerns over the custodian or beneficial ownership arrangement of their bonds purchased via Bond Connect or CIBM Direct. With these untested markets, investors are not sure they will actually be able to sell the bonds they own in all market conditions. Another concern is generally referred to as a “suspension of trading.” Although adopted more frequently so far in equity markets, investors in Chinese bond markets report fears that in times of market stress, China will halt trading on the bond market, making them unable to repatriate their capital.

30In a paper reviewing the IMF policy stance on capital controls over time, Ostry (2022) writes: “the poor reputation of outflow controls is widespread in both academic and policy circles (and is not confined to the IMF). Indeed, the bad name of capital controls historically stems more from the reputation of outflow controls than inflow measures. The former are often seen as tantamount to expropriation of foreign investors, of changing the rules of the game after the money has already entered the country. And those concerns are legitimate.”
Intuitively, a competitive intermediary sector would issue too much debt and reach the competitive interest rate, not internalizing its impact on the equilibrium borrowing rate. The government behaves as a monopolist and imposes ex-ante controls on intermediary borrowing in order to force them to internalize the price impact of borrowing (Lorenzoni (2008); Bianchi (2011); Guerrieri and Lorenzoni (2017); Bianchi and Lorenzoni (2021)).

In general, governments have a number of other ex-post policies that would interact with ex-post capital controls. Bailout policy, either financed by ex-post taxes or ex-ante reserve accumulation, is a particularly relevant one since the government could prevent liquidations by bailing out the intermediation sector, formally bypassing the pledgeability constraint. Such bailouts have fiscal costs and can induce future moral hazard, so that there is a policy trade-off. For example, one can think of the U.S. bailing out its financial intermediaries during the 2008 financial crisis while not tampering at all, and in fact supporting, the payoff and market access to U.S. Treasuries by foreigners. One possible extension of the model is to allow for reserve accumulation as a mechanism to “build” reputation.

Another interesting mechanism for gradualism is the adaptation of local financial institutions to new markets and new (foreign) investors. In our model foreign investors cause a form of price volatility that is particularly undesirable: when they flee, some projects have to be liquidated at a low value to repay the debt. We focused on reputation affecting liquidity via the slope and level of the interest rate schedule. A potentially related channel would be for reputation to affect the extent of fire sales, so that higher reputation issuers suffer less from the volatility of financing induced by flighty investors.

China is one of the world’s largest foreign creditors. At the same time, it is letting foreigners participate in its domestic bond markets. In the model, we have focused on the decision to borrow from foreigners. In Appendix A.III we consider the interrelated decision of letting domestic savers invest abroad. These two-way capital flows are important in understanding China’s motivation for opening up its bond market because they distinguish the net foreign asset position (net borrowing at the country level) and current account from the gross assets and liabilities positions and changes in gross positions. We show that, as reputation builds, increased investment by foreigners in the domestic bond market coincides with increased foreign investment by domestic households (savers). Internationalizing the bond market is not about net-borrowing per se (i.e., the current account or net foreign assets), but is instead more linked to gross positions.

31In the model, liquidations happen at an exogenous price $\gamma$. If we made the price a decreasing function of the size of liquidation ($\gamma(L_t)$), then the model would feature pecuniary externalities in the spirit of the macro-prudential literature. In our baseline, instead, the desire of the government to limit borrowing ex-ante compared to the competitive equilibrium is driven by the monopoly rents.
5 Crises and the Growth of Reputation

In this section, we extend the model to understand how reputation can be built or lost more rapidly in crises and relate it to the 2015-16 capital flight from China. We extend the model to have normal times (“high state”) and crisis times (“low state”). Our baseline model can be understood as one in which the probability that a crisis occurs each period goes to one.

Starting from the reduced form model of Section 3.2 we introduce a state that is realized in the middle of each date. The state is High with probability $p$ and Low with probability $1 - p$. The Low state set-up is identical to the reduced form described in Section 3.2. With the High state, we want to capture the economy being in a boom, investors not fleeing, and the government having no temptation to impose capital controls. In reduced form, we can capture this by making the High state largely inactive. Formally, we assume that the net worth multiplier $n_t = n^H$ is high and that it does not depend on whether flighty investors have been let in. We further assume that capital controls have no effect on intermediary value: $g_t = g^H = 1$. It follows that the opportunistic government’s pure strategy in the High state is to not exercise the capital control. We assume that a government that is dissolved following the High state does not switch type, capturing the idea that governments are far more likely to undergo radical change during crisis episodes. Therefore, given a pure strategy of not exercising capital controls in the High state, no information is revealed to investors about government type in the High state. Appendix A.II.H1 maps this reduced form into the micro foundations used in Section 3.1. In our microfoundation, intermediaries in the High state can undertake a valuable new investment project, and cashflows are fully pledgeable to investors. We show this generates the reduced form described above.

The expected date $t$ payoff to the committed type is $c_t = E[n_t](\gammaQA + (\gammaQ - R_t)D_t)$, where $E[n_t] = pn^H + (1 - p)n^I$ with $n^I = n^s$ if only stable investors have been let in and otherwise $n^I = n^f$. The interest rate schedule faced by the government in the beginning is now

$$R_t = \frac{\bar{R} + \frac{1}{2}bD_t}{1 - (1 - M_t)\tau}$$

where $M_t = p + (1 - p)M_t$ is the probability that the government does not exercise the capital control across either state, and where $M_t = \Pr(\tau = 0|L)$. When $p = 0$, this is the same as equation 5. $M_t$ is increasing in $M_t$, so a better reputation improves borrowing terms as in the baseline model. Holding fixed $M_t$, a higher probability of the good state $p$ increases the probability of repayment and so improves borrowing terms.

This simple setup provides interesting endogenous dynamics. First, the entire reputation cycle is affected by the presence of the High state, since a government that builds a reputation in a crisis now benefits from the possibility of extended periods of an economic boom to follow. In the extended model, capital flows have positive momentum, in the sense that investors pile into a country as it builds its reputation, and sudden reversals if the reputation collapses when the government is found to be opportunistic. Second, we show below that the model can generate V-shaped capital flow
patterns during crises, but not in normal times, and that these are a prominent feature of the data. Appendix A.II.H shows how our main analysis of Section 4 extends to the model with a High state. Here we focus on the dynamics of the model over a calendar step distinguishing three possibilities: (i) an economic boom, (2) a capital flight but no ex-post capital controls, and (iii) a capital flight with ex-post capital controls. The Proposition below highlights the key dynamics.

**Proposition 4** Let a government be at step $0 < n < N$ of the reputation cycle at date $t$.

1. If the High state is realized, then $D_t = D_t+1$ and $D_t^\ell = R_tD_t$.
2. If the Low state is realized and $\tau = 0$, then $D_t < D_t+1$ and $D_t^\ell|_{\tau=0} < R_tD_t$.
3. If the Low state is realized and $\tau = \tau$, then $D_t > D_t+1$ and $D_t^\ell|_{\tau=\tau} > D_t^\ell|_{\tau=0}$.

Figure 7 illustrates the debt dynamics of the model from Proposition 4. Consider an opportunistic government that at date $t$ is at step $0 < n < N$ of its reputation cycle and denote its foreign debt $D_n$. Over date $t$ there are three possible scenarios: no crisis, a crisis without the imposition of ex-post capital controls, and a crisis with the imposition of ex-post capital controls.

The green dotted line in Figure 7 presents the first scenario: with no crisis, there is no reputation updating, and debt stays constant ($D_t+1 = D_t = D_n$).\footnote{Formally, in the middle of the date we have $D_t^\ell = R_tD_t$, and the picture is drawn for $R_t = 1$ to stress that debt levels remain constant.} Indeed, the model was built, for simplicity, to generate no updating in good times. The blue-squared line presents the second scenario: in the middle of date $t$ there is a crisis and foreigners pull out by not rolling over some of the short-term

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**Figure 7: V-Shaped Recoveries and Reputation Crashes**

Notes: Illustration of the foreign debt dynamics of the model over a date $t$ and reputation step $n$. The figure is purely illustrative and not drawn to scale in the interest of easier visualization.
debt. The foreign debt levels fall due to the capital flight. In this scenario, the government suffers through the crisis and does not impose ex-post capital controls. This builds higher reputation into the next period. Once the crisis has passed at $t+1$, reputation is now higher and foreign capital not only comes back but is even higher than before, so that $D_{t+1} = D_{n+1} > D_n = D_t$. This scenario presents a typical V-shaped pattern in capital flows: foreigners panic and pull out during a crisis, but after the crisis has passed, if investors judge the country to be a solid investment, they return and often increase their investments beyond the original scale. The government has been tested but resisted temptation, increasing investor confidence in government behavior in future crises. We discuss in Section 5.1 below how this can make sense of the 2015 V-shaped capital flow pattern in China.

The red-triangle line presents the last scenario: a crisis occurs but now the government responds by introducing capital controls on outflows. These capital controls limit the amount of capital the foreigners pull out during the crisis, leading to a shallower movement in external debt. This offers a short-run benefit to the country since it reduces costly liquidations. However, the imposition of capital controls has a long-run cost: it resets the reputation of the government so that next period foreign borrowing continues to fall $D_{t+1} = D_0 < D_n = D_t$. The government has been tested and found to be opportunistic.

5.1 Understanding the Capital Flight of 2015-16

The introduction of a High state to our benchmark model allows for a more direct analysis of the 2015-16 period when China experienced a large and sudden capital flight. In early 2015, foreign investors started to rapidly withdraw funds from China in response to the increased risks in the Chinese markets and regulatory uncertainty. Focusing specifically on foreign ownership of Renminbi denominated bonds, foreigners sold 11% of their holdings between 2015Q2 and 2016Q1.\(^{34}\) The flight subsequently stopped and reversed, and by 2016Q2 foreign holdings were above the previous high and kept raising rapidly in future years.

This episode marked a significant shift in investor confidence and exposed vulnerabilities in China’s financial system. In a report about RMB internationalization, Standard Chartered, one of the most active foreign banks in Chinese bond markets, wrote that “with continued downward pressure on the RMB, investors have feared a potential closure of investment channels resulting in an inability to access or repatriate funds.”\(^{35}\) The possibility of China imposing outflow controls was also openly discussed by policymakers. For instance, the Governor of the Bank of Japan Haruhiko

\(^{33}\)For simplicity, we considered a model with only net flows. Here the net foreign assets (NFA) and current account are tightly related to external debt levels. In Appendix A.III, we relax this assumption by allowing for two-way capital flows. This is important in the context of China, since the country is liberalizing its domestic bond market while being a large external creditor and running a current account surplus. In the extended model, Figure 7 can be thought to reflect the dynamics of NFA.

\(^{34}\)The dollar value of holdings (including valuation effects) declined by 15%.

\(^{35}\)See: RMB Internationalization in 2017: Change, alignment and maturity.
Figure 8: Foreign Ownership of China’s Domestic Bonds in the 2015-16 Capital Flight

Notes: This figure reports foreign holdings of China’s domestic bonds valued in RMB (left axis) and USD (right axis). Data is from Shanghai Clearing House (SHCH) and China Central Depository & Clearing (CCDC).

Kuroda suggested that China enact capital controls to stop outflows, saying “Capital controls could be useful.”\textsuperscript{36} The Financial Times Editorial Board supported this position, writing that “Capital controls may be China’s only real option.”\textsuperscript{37}

In the following months, China instituted restrictions on outflows to stem the tide of the crisis, but focused on restricting domestic residents from moving capital abroad. China appeared to deliberately avoid imposing new controls on foreign investors’ ability to sell their Chinese assets and repatriate the capital.\textsuperscript{38} While China never had a particularly strong reputation for allowing its citizens and firms to take capital out of the country, it appeared quite reluctant to undo the progress it had made in internationalizing the country’s domestic markets. Indeed, the government responded to the capital flight by trying to further court foreign investors, for instance by easing foreign investors’ quotas on bond and stock markets.\textsuperscript{39}

As capital outflows slowed in the middle of 2016, the Financial Times succinctly summarized the reputational challenge that China was facing: “For that capital to come in once more, foreign

\textsuperscript{36} \textit{See: Financial Times Article.}
\textsuperscript{37} \textit{See: Financial Times Article.}
\textsuperscript{38} Danese (2016) writes on the differential restrictions on outflows for domestic residents and foreign investors: “This is important since, as a result of capital outflows, Chinese authorities have been clamping down on all existing channels for moving capital out of the country. This has included suspending issuance of new quotas for outbound programmes, such as the qualified domestic institutional investor (QDII) scheme, as well as issued window guidance to banks restricting how much foreign exchange (FX) corporates can remit out of the country. For CIBM, the rules did not include any such provisions, possibly in a bid to assuage concerns by index provider MSCI, which decided in June not to include A-shares in its emerging market index.”
\textsuperscript{39} \textit{See: Financial Times Article 1 and Financial Times Article 2.} There were some instances of foreign firms mentioning challenges in repatriating their profits (Financial Times Article 3), but Chinese authorities swiftly reassured foreign firms they would be free to repatriate profits (Financial Times Article 4).
investors must be convinced: [...] that the money they put into China will not be stuck behind a financial Great Wall.” (FT article). Ultimately, investors were convinced and rapidly re-entered the country’s bond market and the crisis passed by late 2016. In the context of our model, the crisis and the policy response of China helped persuade foreign investors of China’s commitment not to impose capital controls in future crisis. The reputational improvement led investors to not only return to the Chinese market, but to actually increase their positions. With China avoiding widespread capital controls on foreign investor outflows, the IMF included the Renminbi in the SDR basket in September 2016, announcing “The IMF’s determination that the RMB is freely usable reflects China’s expanding role in global trade and the substantial increase in the international use and trading of the Renminbi.”

Through the lens of the model, we view these renewed inflows as investors positively updating on China’s reputation because it avoided locking the gates on foreigners during the crisis. China’s improved reputation endogenously reduces the interest rate schedule at which foreigners will lend to China, making increased borrowing more appealing. At this higher reputation, China then decides to further liberalize access and increase the scale of its foreign borrowing, welcoming in a new class of flightier foreign investors via the Bond Connect Program. This decision parallels our model in which governments only choose to open up to flightier forms of capital once their reputation has reached a sufficiently high level.

In 2022-23, China’s domestic bond market and currency once again came under stress, with large capital outflows in the wake of the Zero Covid policy and the deterioration of the real estate sector. While so far China has allowed foreign capital to leave unobstructed, the capital flight is still ongoing and it is an open question whether China will make it through this episode while avoiding the temptation to impose further controls. As in 2015-16, China appears thus far to be courting foreign investors and aiming to reassure them, for example through the launch of Swap Connect in May 2023, a step towards giving foreign investors access to the domestic derivatives market.

6 Conclusion

This paper characterizes China’s strategy for internationalizing its bond market through controlling the set of investors that can access its domestic capital market. While China has a long way to go to rival the U.S. as an international safe asset provider, China’s real economic size and the size of its capital market could make the integration of its bond market into global financial markets a major shift in the international financial system. We explain China’s gradual approach to liberalizing capital inflows as balancing the desire to gain an international investor base against the risks of sudden capital outflows that come with foreign portfolio investment. By beginning with allowing investment from more stable investors and only later allowing in flightier ones, China has put itself on a path towards becoming a provider of an international safe asset while trying to minimize the risks it faces on the transition path. Whether it is able to achieve this while avoiding costly episodes

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of capital flight and the imposition of capital outflow controls is an open question.

References


A.I  Further Details on Data and Estimates

This Appendix contains further details on the data sources and estimates underlying the empirical results of the paper.

A.I.A  Aggregate and Bilateral Bond Holdings

This section outlines the methodology for estimating the breakdown between central bank reserves and private holdings of RMB bonds, as well as their split by country of holder. Before detailing the methodology, we first define some concepts that will be useful throughout this entire section to understand data on bond markets. Some characteristics describe the issuer of the bond: country of residency of the immediate issuer of a bond (residency), country of residency of the ultimate parent entity controlling the immediate issuer of a bond (nationality), and the sector of the issuer (corporate, government, etc...). Some characteristics describe the bond itself: the currency of the bond (CNY, CNH, foreign currencies) and the market of issuance (onshore or international/offshore). Some characteristics describe the holder of the bond: domestic or foreign investors and the sector of the holder (central bank, other official investors, private investors). The characteristics illustrated above are not exhaustive and the aim here is not to review them in detail, but just to use them to guide the reader through this appendix. Our main focus is on bonds denominated in RMB, issued onshore by Chinese resident entities, and held by foreign investors.

One of our main data sources is the IMF’s Coordinated Portfolio Investment Survey (CPIS). These data include the bond portfolio holdings of each foreign country in China. More precisely, the issuers are domiciled in China (resident in China irrespective of nationality); the bonds can be issued in any market and denominated in any currency; the bonds include all bond types by sector (government, corporate, etc...); and the holder in each country excludes the central bank. CPIS data is a proxy for private holdings. It does, however, include the holdings of some state entities, for example the sovereign “oil fund” of Norway. Non-private investors are, in this section, mainly central banks. In the specific case of China, these portfolio holdings are most likely to be concentrated in bonds denominated in RMB, issued onshore by Chinese resident entities (also by nationality). We maintain this assumption throughout and provide some supporting evidence in the next subsection.
CPIS also contains additional information on the Currency Breakdown of Investment by asset class (CPIS Table 2). These data are at the same investor and asset class level as the data above, but the issuers are now the universe of all issuers. For example, RMB denominated bond holdings of the U.S. include: bonds denominated in RMB issued by any entity (Chinese resident or otherwise) and held by investors domiciled in the U.S. This is a superset of the RMB denominated bonds held by each investor country onshore in China.

We start our analysis by collecting and combining different data sources to estimate the RMB holdings by central banks. The main source comes directly from the IMF Currency Composition of Official Foreign Exchange Reserves (COFER), which includes data on foreign reserve holdings of RMB. COFER data are reported to the IMF on a voluntary basis, but data for individual countries are strictly confidential. In 2022 there were 149 COFER reporters, i.e., countries disclosing the currency composition of their holdings to the IMF. This subset of countries accounts for the “Allocated Reserves” and (for this subset) it is possible to directly observe their combined aggregate holdings in RMB since the fourth quarter of 2016. Prior to that date, holdings of RMB were aggregated into “Other Currencies.” Based on a 2015 ad-hoc survey of the IMF (Fund (2015)) we obtained that 0.57% and 0.95% of foreign currency reserves were held in Renminbi in 2013 and 2014, respectively. Overall, this provides us with the level and share of COFER reserve holdings in RMB from 2013 to the present, except for 2015, a year for which we interpolate the data based on the 2014 and 2016 data.

While most countries only report their holdings to COFER on a confidential basis such that the underlying bilateral data is not disclosed, some countries are also Special Data Dissemination Standard (SDDS) Plus adherents and disclose their positions denominated in RMB. In addition, and in order to obtain the most detailed breakdown by country of official holdings in RMB, we separately collected the currency breakdown directly from central banks’ documents for non-SDDS reporters. Using these combined data sources, we were able to observe the country breakdown for almost 40% of the total RMB official holdings in 2020.

There is a subset of countries that report their total reserve holdings in the International Financial Statistics (IFS), but do not report the currency breakdown to COFER. These countries are classified as “Unallocated Reserves” in COFER. By the end of 2020, about 6.6% of total reserves reported to IFS were from non-COFER reporters and therefore “Unallocated Reserves.” We estimate the RMB holdings for these countries by multiplying their total reserves by the share of RMB in total “Allocated Reserves” excluding China. China became a COFER reporter between 2015 and 2018 (Arslanlap et al. (2022)) but does not disclose what share of its reserves it reported to COFER at any point in time during the transition. We assume that it increased its disclosure share at a constant rate between 2015 and 2018 (25% at end of 2015, 50% at end of 2016, 75% at end of 2017, and 100% at end of 2018). Since we assume the PBoC does not hold any RMB denominated assets

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1 The non-SDDS countries for which documentation was manually collected are: Czech Republic, Italy, Kazakhstan, Romania, South Africa, Spain, Tanzania and United Kingdom.
as reserves, we then remove China’s reserves from the IMF’s Allocated and Unallocated reserve totals to calculate the share of RMB in Allocated reserves excluding China. We estimate this share to be 3.1% in 2020. We then use this share of RMB to estimate the level of RMB holdings in Unallocated reserves to be $26 billion. Figure 1 labels as “Other Reserves” the sum of: “Allocated Reserves” for which the country of holder cannot be inferred, and our estimate of the RMB portion of “Unallocated Reserves.”

For private holders, we distinguish three groups of countries depending on data availability. The first group is countries that report in CPIS Currency Breakdown of Investment by asset class (CPIS Table 2) the RMB bond holdings. The second group is countries for which the CPIS dataset only includes portfolio holdings into China but does not provide a currency breakdown, but for which we can provide an estimate based on commercial micro data. The third group is the same as the second, except that micro data does not provide sufficient coverage of bond holdings.

For countries in the first group we obtain the CPIS Currency Breakdown of Investment by asset class (CPIS Table 2), which allows us to directly identify bond holdings in RMB by investor country.\footnote{For the U.S. in 2020, we use Treasury International Capital (TIC) data instead of IMF CPIS data.} As explained above, these data include all bonds denominated in RMB irrespective of the issuer. In this case, we assume that all RMB holdings are onshore. The next subsection provides some supporting evidence for this assumption.

For countries in the second group, we build an estimate by multiplying the level of bond holdings in China from CPIS (which includes bonds denominated in all currencies) with the percentage that we estimate to be RMB-denominated using micro data. We estimate this percentage using commercial security-level data on the positions of mutual funds and ETFs from Morningstar. We merge these data with CUSIP Global Services and Bloomberg FIGI security-level master files that include the currency of denomination as well as the residency of the immediate issuer. The combined dataset was previously used and is described in detail in Maggiori et al. (2020) and Coppola et al. (2021). In order to use the commercial data when the CPIS data on currency breakdown is unavailable, we require that we observe in the micro data at least 20% of the country’s bond investment in China (residency) as reported in CPIS. In sum, for these countries we measure in each year the fraction of bond investment in China on a residency basis that is denominated in RMB and apply this fraction to the total bond holdings in CPIS. The countries with largest holdings in this second group are Luxembourg and Ireland.\footnote{The set of countries in the second group changed over time depending on data availability. In 2020, the countries in this group were Switzerland, Denmark, Ireland, Lichtenstein, Luxembourg, Mauritius, New Zealand and Taiwan.} We estimate that these two alone held about $35 billion in RMB bonds in 2020. Because the Morningstar data ends in 2020, we estimate the 2021 values for Luxembourg and Ireland based on their 2020 shares. Because Taiwan is not a CPIS reporter, we carry forward Taiwan’s 2020 holding levels to 2021.

For countries in the third group, the coverage in the micro data is not sufficiently high to estimate the share of investment in China that is RMB-denominated. For these countries, our
estimate of the fraction of bonds in RMB is simply the average share of countries in group one and two above. More precisely, we compute the average fraction of bond investment in China (residency) that is denominated in RMB in each year across the countries in the first and second groups. We then multiply this average fraction by the level of bond holdings in China from CPIS (which, again, includes bonds denominated in all currencies) for each country of the third group to obtain the estimate of RMB-denominated bond holdings. Results are similar when we instead use the aggregate share (i.e., total RMB holdings over total investment in Chinese bonds).

Finally, we impose the restriction that the sum of central bank and private holdings (which we call the disaggregated total) has to sum to total foreign holdings. For total foreign holdings, we combine data from a Chinese official source (Bond Connect) on onshore holdings with data from the BIS Debt Securities Statistics to obtain the internationally issued RMB debt outstanding from Chinese issuers in a given year. Bond Connect foreign holdings refer to the total onshore foreign holdings, including but not limited to holdings through Bond Connect. From the BIS, we collect the total amount of international debt securities (IDS) issued by Chinese residents outside the local market of the country where the borrower resides (China) in RMB (about $16 billion by the end of 2020). This assumes that internationally issued RMB bonds that are classified as China by residency are entirely owned by foreign investors. In matching total foreign holdings in RMB from Bond Connect plus BIS IDS with the holdings we have obtained above from COFER, CPIS, and IFS (the disaggregated total), there is an approximation error due to mismatches in the concepts of residency of the issuer, currency, and market of issuance, in each of the datasets used. For most of the years in our analysis, the disaggregated total is greater than the sum of Bond Connect and BIS IDS Chinese international issuance in RMB. We then compute the share of each country-investor type as a percent of a given year’s disaggregated total and apply those percentages to total foreign holdings obtained as the sum of the Bond Connect and BIS IDS series. By doing so, we obtain an estimate for the breakdown between central bank reserves and private holdings of RMB bonds, and their split by country of holder as shown in Figure 1.

Figure 8 and Figure A.III plot the Bond Connect data (post-June 2017) and the sum of CCDC and SHCH prior to June 2017 without combining it with IDS or performing any scaling. These data are an approximation to total foreign holdings of onshore RMB bonds issued by Chinese entities. They have the advantage of being available at a higher frequency, with new releases available almost immediately. We therefore use it whenever higher frequency or the availability of the most recent data are desirable.

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4Bond Connect data is publicly available online and corresponds to the sum of foreign holdings through the Shanghai Clearing House (SHCH) and the China Central Depository & Clearing (CCDC).

5For example, this misclassifies any foreign ownership of onshore bonds issued by non-China resident issuers (so-called “Panda” bonds) or bond issued offshore by non-China entities (so-called “Dim Sum” bonds).

6As described above, Bond Connect data corresponds to the sum of CCDC and SHCH. We complement with CCDC and SHCH data to obtain a longer time series.
In this subsection, we explore foreign investor holdings of Chinese bonds along several dimensions discussed in the previous subsection. We begin by classifying every bond issued in RMB into whether it was issued in onshore Chinese markets or offshore in international capital markets. To do so, we classify any security denominated in CNH (offshore Chinese Yuan) as being issued offshore. However, in order to avoid relying entirely on the reported currency, we combine open-source data from FIGI and additionally classify bonds with a security type of Eurobond or Global from FIGI as being issued offshore. We then merge this mapping of all RMB securities into onshore/offshore with the Morningstar data on bond holdings by mutual funds and ETFs. We measure the dollar value of end-of-year holdings of foreign funds in onshore and offshore bonds, and calculate the share issued offshore in foreign holdings. Appendix Figure A.Va documents a substantial decrease in the share of foreign-owned RMB denominated bonds that were issued offshore: from more than 80% in 2014 to less than 10% in 2020. Recall that the level of overall RMB (onshore or offshore) holdings was minimal in 2014 and much larger in 2020. This result provides support for the (imperfect) assumption in the previous subsection that all bonds in RMB held by foreign investors are assumed to be onshore.

Additionally, we classify all bonds issued by a Chinese entity on a nationality basis by the source of issuance on a residency basis according to whether it was issued by a Chinese resident entity or an international entity (based in Hong Kong, tax havens, or any other country) and utilize the residency-to-nationality algorithm of Coppola et al. (2021) to measure the foreign investors' holdings of bonds that on an ultimate-parent nationality basis are issued by a Chinese entity or were issued in RMB. Appendix Figure A.Vb shows for foreign mutual funds and ETFs: (i) the largest holdings are foreign currency issued by entities not resident in China but controlled by a Chinese entity (i.e., foreign by residency, but China by nationality); (ii) the holdings of onshore RMB have increased substantially in recent years; (iii) the holdings of onshore bonds issued by China-resident entities in foreign currency are small; (iv) the holdings of offshore issued RMB are small. This analysis provides support for the (imperfect) assumption in the previous subsection that all bonds issued by China-resident entities and held by foreign investors are assumed to be denominated in RMB.

The analysis, furthermore, shows the importance of the offshore issuance in foreign currency by foreign resident entities that are ultimately controlled by a Chinese entity. These holdings are not the focus of the current paper and Coppola et al. (2021) show that they are mostly bonds issued in dollars (or other major currencies) by affiliates domiciled in tax havens (like Cayman Islands and British Virgin Islands) of Chinese technology groups (Alibaba, Tencent), real estate groups (Evergande), or state-owned enterprises.

\footnote{We consider foreign all funds excluding those domiciled in China or Hong Kong.}
A.I.C Investor Entry Database

In this subsection we provide details regarding the construction of our investor entry data, as well as some additional analyses of the foreign investor base introduced in Section 2.1. As discussed in the main text, we created a new monthly dataset of investor composition. First, we collected reports on the four access methods to the Chinese bond markets: QFII, RQFII, CIBM Direct, and Bond Connect. For each method of entry, we obtained investors’ name and date of registration in the program. This date refers to the month a participant gained access to the Chinese bond market through that particular program, even if no actual investment in made. While CIBM Direct was launched in February 2016, they only report their first participants beginning in February 2017. We therefore assume that the investors we observe as participating in CIBM Direct in February 2017 entered gradually between March 2016 and February 2017.

For each investor, we consider the earliest date an investor appears in one of the programs as its entry date. Then, based on investor name, we used the Factset Entity API to collect additional information, such as SIC and NAICS codes, entity structure (parent company name and information), as well as country of residency and nationality. For the few observations the API didn’t find a match, we manually searched for this additional information.

Equipped with this list of investors, we classified each one based on the firms’ NAICS classification into investment advice, investment bank, government related, portfolio management, pension funds, brokerage firms, foundations, university endowments, insurance companies, and international organizations. We used this classification for constructing Appendix Figure A.VIa. We also created a broader group classification, used in Figure 2, by defining as “Stable” investors all participants classified as government related (including central banks, legislative bodies), international organizations (like the IMF), foundations, university endowments, pension funds, and insurance companies. We called “Flighty” investors those in the investment advice or portfolio management industry. In this broad categorization, “Banks” included include investment banks, commercial banks, and broker dealers. The category of "Portfolio Managers" includes both mutual funds and hedge funds, so we further break down this category into those two subtypes in Appendix Figure A.VIb. Whenever an entity has both mutual and hedge funds, we classified it as belonging to the category with the highest share in AUM.

A.I.D Empirical Implementation: Portfolio Correlation Measure

In this subsection, we provide details and additional specifications for the correlation measure introduced in Section 2.2. As discussed in the main text, the idea behind the empirical measure is to inspect what other type of foreign currency bonds (DM or EM) funds holding bonds in a particular currency are likely to hold. Our focus is on the foreign currency (FC) portion of the portfolios, which we define as holdings in a currency that is not the currency of the country where the fund is domiciled. We restrict our sample to funds that have at least $20 million in FC holdings.
in local-currency government bonds and exclude specialist funds in any particular currency, which we define as funds that have more than 50% of their foreign currency bond portfolio in a single currency. As shown in Appendix Table A.I, in 2020 our sample after all the restrictions are applied contains 828 funds with an average of $1.970 billion in assets under management each, although with considerable dispersion. Of total AUM, 74% on average is in FC assets and on average 57% of the FC assets are government bonds in the local currency of the issuing country (for example, Brazilian government bonds in BRL). The major fund domiciles are the United States and the Eurozone. As is well known, funds in the Eurozone are heavily concentrated in Luxembourg and Ireland as domiciles, and then distribute to the rest of the Eurozone (as well as outside the Eurozone). In Table A.I, of the 429 funds domiciled in the Economic and Monetary Union (EMU), 263 are domiciled in Luxembourg and 108 in Ireland. The sample focuses on funds that have major investments in foreign currency government bonds, and while this is clearly a small subset of the universe of funds (which includes equity funds, and funds that only invest in particular currencies), it is a sufficiently large and heterogeneous sample for our estimation purposes.

Next, we classify all currencies (except the RMB) with at least $1 billion in foreign investments in Morningstar in December 2020 as either developed market (DM), emerging market (EM), or frontier market currency. We take a narrow definition of DM currencies to be those issued by G10 countries. Frontier and emerging markets are classified according to the MSCI’s list. We conduct our analysis focusing on DM and EM currencies, leaving out frontier currencies since funds investing in those usually have a very specific mandate.⁸

Complementing the analysis in the main text, we recalculate our measures for a number of different subsets of the data. The subsets considered are:

(a). **U.S. Treasuries as Reference Asset**: taking U.S. Treasury debt as the sole reference asset.

(b). **Weighting by FC AUM of the funds**: weighting funds’ portfolio shares by their foreign currency investment holdings in computing the correlation.

(c). **Excluding Index Funds**: exclude funds classified as index funds in Morningstar (variable index_fund flag equal to “Yes” indicating a “pure index fund”).

(d). **Intensive Margin**: including only funds with strictly positive holdings in a particular currency in computing the correlation for that currency.

(e). **Higher Specialist Threshold**: defining as specialist funds that have more than 98% of their foreign currency bond portfolio in any single currency, rather than 50% in our baseline analysis.

(f). **Alternative Minimum FC AUM**: including funds with at least $10 million in holdings of FC government bonds issued in their own currency.

⁸DM currencies are AUD, CAD, CHF, DKK, EUR, JPY, NZD, NOK, GBP, SEK, USD. EM currencies are BRL, CLP, COP, CZK, HUF, IDR, ILS, INR, KRW, MXN, MYR, PEN, PHP, PLN, RUB, SGD, THB, TRY, ZAR.
(g). **Alternative Foreign Currency Definition:** excluding the currency in which the fund reports its returns (as opposed to excluding the currency of the country in which the fund is domiciled).

We summarize the results of these alternative specifications in Appendix Table A.II. For each alternative specification, we sort the estimated correlations in descending order and compute the average rank of DM and EM currencies, as well as the ranking of the CNY. Appendix Table A.II shows that, while there is clearly substantial variation in the estimates, the baseline result extends to these specifications in the sense that the Chinese RMB ranks between EM and DM currencies. The number of funds in subsets (c), (e), (f) and (g) changes due to the different selection criteria for the sample. Excluding index funds (e) reduces the sample size in about 8%, to 762 funds, while the alternative foreign currency definition (g) increases it in about 9% to 901 funds. Cases (e) and (f) impose less restrictive criteria than the baseline resulting in larger sample sizes: 1407 and 954 funds, respectively. In Appendix Figure A.VIII we report the cross-sectional estimates of these alternative specifications.

Apart from specialization, there are, of course, other factors determining global portfolios. To evaluate the robustness of our correlations, we additionally control for other determinants of fund-level portfolios that the literature has found to be important. In particular, we control for gravity variables commonly used in the literature to explain differences in bilateral cross-border investments between the domicile of the fund (investor origin) and the country issuing currency c (destination of the investment). We define:

- **DIST**<sub>Dom<sub><sub>,c</sub>,c</sub>: Log Distance between the domicile country of fund <i>i</i> and the country issuing currency <c.
- **TRADE**<sub>Dom<sub><sub>,c</sub>,c</sub>: Absolute value of the sum of imports and exports between country of domicile of fund <i>i</i> and the country issuing currency <c as a share of the investor country GDP.
- **LEGAL**<sub>Dom<sub><sub>,c</sub>,c</sub>: Dummy that is 1 if the country of domicile of fund <i>i</i> and the country issuing currency <c have same legal system origin.

All three variables are measured using data from the CEPII Gravity database based on the work in Conte et al. (2022). We treat the Eurozone and the EUR as a single location, and so if the investor country or the destination of the investment belongs to the EMU we apply variables calculated with respect to the Eurozone.

Using our baseline sample, we run the following cross-sectional regression in each year:

\[
\alpha_{c,i} = \beta_{AUD}^{AUD} \text{DMShare}_{AUD,i} + \beta_{BRL}^{BRL} \text{DMShare}_{BRL,i} + \ldots + \beta_{ZAR}^{ZAR} \text{DMShare}_{ZAR,i} + \\
\hspace{1cm} + \beta_{DIST}^{DIST} \text{DIST}_{Dom,i,c} + \beta_{LEGAL}^{LEGAL} \text{LEGAL}_{Dom,i,c} + \beta_{TRADE}^{TRADE} \text{TRADE}_{Dom,i,c} + \epsilon_{c,i}
\]

A.8
where

\[
\text{DMShare}_{k,i} = \begin{cases} 
\alpha_{DM,k,i}, & \text{if currency } k = c \\
0, & \text{otherwise}
\end{cases}
\]

Recall that, as defined in Section 2.2

\[
\alpha_{c,i} = \frac{\sum_{b \in B_c} MV_{b,i}}{\sum_{c \in FC_i} \sum_{b \in B_c} MV_{b,i}},
\]

is the share of the foreign currency bond portfolio in currency \( c \) for fund \( i \). Similarly,

\[
\alpha_{DM,c,i} = \frac{\sum_{d \in \{DM/c\}} \alpha_{d,i} (1 - \alpha_{c,i})}{1 - \alpha_{c,i}},
\]

is the share of the remaining (once we exclude currency \( c \)) foreign currency bond portfolio in DM currencies.

In Appendix Table A.III we report the regression coefficients from the gravity regressions using our baseline sample and the year 2020. As expected, countries that are geographically closer, that trade more goods, and have a common legal system all tend to increase portfolio holdings between the two countries. More importantly, we find that adding gravity variables to the regression version of our analysis does not meaningfully change the relative ranking of China. To facilitate exposition in the table, instead of reporting the estimate for each currency we report \( \beta_{DM} \) for selected currencies (BRL, CNY, and JPY). \( \beta_{BRL}^{DM} \) is negative and statistically significant at the 1% confidence level, meaning that funds that have a higher share in BRL have a lower share of their remaining portfolio allocated to bonds denominated in DM currencies. \( \beta_{JPY}^{DM} \), on the other hand, is positive and statistically significant at the 1% confidence level, meaning that funds that have a higher portfolio share in JPY allocate a higher portion of the rest of their portfolio in other DM currencies. \( \beta_{CNY}^{DM} \) is slightly negative, and its estimated beta is significantly different than that of both the BRL and JPY. Unlike classic EM and established DM currencies, the Chinese RMB is present in both EM and DM focused portfolios. Similarly to our baseline correlation estimates, \( \beta_{CNY}^{DM} \) is in between the EM and DM currencies after controlling for gravity variables. In Appendix Figure A.IXa we plot the estimated coefficients using the most complete specification (column (8) of Appendix Table A.III) for each currency. The coefficients in these regressions will not correspond to our correlations because the regression betas and correlations differ by the ratio of the variances. Nevertheless, we see that the ordering continues to be largely preserved.

To account for the fact that our dependent variable (\( \alpha_{c,i} \)) is censored between 0 and 1, we also evaluate the gravity regressions using a Tobit model. Appendix Figure A.IXb shows that this does not qualitatively change the relative position of the Chinese RMB.

In Figure A.X, we plot the time series of portfolio correlations with DM for the 31 currencies reaching the thresholds for inclusion. The estimated correlations are overall stable within currencies.
over time. Aside from Chinese RMB, there are a few other currencies that display notable movement in sample. For instance, see the Korean Won increase its correlation with DM portfolios. By contrast, the Chilean Peso decreases its correlation with DM portfolios around the time its weight in the JP Morgan GBI Index increased significantly.

Finally, we calculate our correlation for two additional asset classes: USD-denominated corporate bonds (Appendix Figure A.XIa) and equities (Appendix Figure A.XIb). In both cases we conduct the analysis by the nationality of the issuer. For corporate bonds, we focus on USD-denominated bonds to avoid capturing the disparity in holdings by foreigners in local versus hard currency. We focus on foreign bonds holdings which means bonds issued by firms that are not (by nationality) based in the same country as the domicile of the fund. Interestingly, in both cases Chinese securities behave more like those of emerging markets in contrast to our results for local currency government bonds. In other words, Chinese USD-denominated corporate bonds and equities are more frequently held by investors that own more emerging market rather than developed market securities. We view this as consistent with two observations we made in the main paper: (i) that foreign investors largely do not buy corporate bonds issued domestically in China, and (ii) that foreign investors do buy bonds issued by Chinese firms via subsidiaries in offshore financial centers. This might reflect foreign investors’ uncertainty and low-reputation beliefs for bankruptcy procedures and shareholder/bondholder rights in China’s domestic courts.

A.I.E Price Evidence

Evidence on bond returns is hard to provide given the short sample, the likelihood of peso problems (crisis out-of-sample), and the possible endogeneity of return dynamics to the size of foreign holdings. We provide here a brief analysis focusing on government bonds (see also Carpenter et al. (2022)).

We estimate bond return loadings on risk factors that are commonly used in the literature. We begin our sample in 2010, the year when China’s peg against the U.S. dollar was first relaxed. We measure quarterly dollar returns of holding a three-month tenor bond in currency $i$ as $R_{i,t+1} = i_t - i^*_t - \Delta e_{t+1}$. We then regress the returns $R_{i,t}$ on a risk factor $f_t$ to estimate the currency-specific loading on the factor, $\beta_i$, from a linear regression $R_{i,t} = \alpha_i + \beta_i f_t + \epsilon_{i,t}$.

Figure A.XII reports the regression coefficient $\beta_i$ for a range of countries. We consider two risk factors. The first factor, HML, follows the work of Lustig, Roussanov and Verdelhan (2011) and constructs the return of investing in the currencies in the top 25% of currencies in terms of their interest rate and shorting the bottom 25%. The bottom panel runs the same regression but uses the quarterly log change in the VIX as the factor. Since an increase in HML occurs in good times and a spike in VIX in bad times, the rankings in the top and bottom panels are roughly reversed. In both cases, we find that RMB bonds in sample are estimated to be among the safest, if not the safest, returns. Of course, much of the measured safety of RMB comes from the fact that the exchange rate was managed against the U.S. Dollar (and a basket of other currencies) throughout the sample period, making it among the least volatile currencies in the world. In addition, our sample ends in
2021, and we would expect the Renminbi to register as a riskier currency during recent years. It is important to emphasize that both the portfolio quantity and price evidence are statements about the market behavior over a short sample in which internationalization was starting to occur. As the model in the next section emphasizes, market beliefs about the safety of these assets might turn out to be quite wrong ex-post when crises occur, and China could decide to either directly or indirectly penalize foreign investors. Obviously, should those events materialize the return dynamics of the bonds would look dramatically different.

A.I.F  Index Inclusion and Shifting Portfolio Investment

One of the key drivers of the increase in private investment in 2019 and 2020 was the inclusion of Chinese bonds in major bond indexes. In particular, in April 2019 Chinese RMB bonds were added to the Bloomberg Global Aggregate Bond Index and in February 2020 Chinese RMB bonds were added to the JP Morgan Government Bond Index - Emerging Markets (GBI-EM). These index inclusions were not sudden decisions of the index providers, but rather the result of a series of significant reforms to market access discussed in Section 1. Restrictions on entry and exit from Chinese bond markets for private investors had long meant that it would be uncertain whether foreign investors could actually achieve the returns of any potential bond index. For instance, if there were quotas and lock-up periods, it was not certain whether a fund could make the investments needed to follow any index, or whether it could liquidate the investments as needed to satisfy investor redemption demands. The decisions of index providers to include Chinese RMB bonds in their indices came with an assessment that these barriers had been sufficiently removed.

Prior to 2019Q1, funds that benchmark to the Bloomberg Global Aggregate Index owned very few Chinese RMB bonds. There is a steady rise in holdings of RMB by funds that benchmark to this index over the subsequent years, consistent with Bloomberg’s announcement of a 20-month phase-in period, with portfolio weights scheduled to increase 0.30% per month.\footnote{Pensions & Investments.} By contrast, the FTSE World Government Bond Index (WGBI), a major competitor for the Bloomberg index, did not include Chinese RMB bonds in the index until October 2021. Indeed, in Morningstar data, we see that funds benchmarked to Bloomberg Global Aggregate held more than $10 billion of RMB-denominated bonds by the end of 2020 while funds benchmarked to the FTSE WGBI held only trivial amounts.

Aside from the benchmark driven rebalancing, the inclusion of China in benchmark indices appears to also account for a large extent of the other inflows. The largest single holder of RMB in the global mutual fund and ETF data is the $6.32bn held by the iShares China Bond ETF. While this fund does not benchmark against the Bloomberg Global Aggregate, it instead tracks the Bloomberg China Treasury and Policy Bank Index. This index was introduced in November 2016, and the fund itself was launched in July 2019, shortly after the inclusion of China in the Bloomberg Global Aggregate. As of December 2021, it had nearly doubled its AUM to $12.1bn, making it the
second-largest European exchange-traded fund. Because the creation of ETFs and other country-specific tracking indices followed the Renminbi’s inclusion in world indices, index inclusion appears to have an important effect on channeling foreign capital to China above and beyond the direct index inclusion effect.

A.I.G Investor Discussion of Risk of Capital Outflow Restrictions

While in the theoretical framework, we model capital outflow controls as a tax on repatriation, as discussed in Section 3.1 there are a number of ways in practice that the Chinese government could restrict capital outflows by foreign investors. In this subsection, we document a number of instances in which important foreign investors explicitly flag the risk of not being able to get their capital out of China. We primarily rely on the discussion of risks in the “Statement of Additional Information” (SAI) that fund managers file to the SEC. Investors in China frequently feature a separate section of risk disclosures related to China.

In the 2022 SAI of the BlackRock Strategic Global Bond Fund, BlackRock discusses risks in China and is quite explicit about how it fears repatriation risks of the kinds we model. They write “The Renminbi (‘RMB’) is currently not a freely convertible currency and is subject to foreign exchange control policies and repatriation restrictions imposed by the Chinese government. The imposition of currency controls may negatively impact performance and liquidity of the Funds as capital may become trapped in the PRC. The Funds could be adversely affected by delays in, or a refusal to grant, any required governmental approval for repatriation of capital, as well as by the application to the Funds of any restrictions on investments.” (Page II-41). BlackRock’s SAI continues to discuss a number of additional risks.

• Under the heading “Risk of Investing in the China Interbank Bond Market through Bond Connect,” BlackRock writes “The precise nature and rights of a Fund as the beneficial owner of the bonds traded in the China Interbank Bond Market through CMU as nominee is not well-defined under PRC law. There is a lack of a clear definition of, and distinction between, legal ownership and beneficial ownership under PRC law and there have been few cases involving a nominee account structure in the PRC courts. The exact nature and methods of enforcement of the rights and interests of a Fund under PRC law are also uncertain.” (Page II-43)

• “In the event that the relevant authorities suspend account opening or trading on the China Interbank Bond Market, a Fund’s ability to invest in the China Interbank Bond Market will be adversely affected and limited. In such event, the Fund’s ability to achieve its investment objective will be negatively affected and, after exhausting other trading alternatives, the Fund may suffer substantial losses as a result. Further, if Bond Connect is not operating, a Fund

may not be able to acquire or dispose of bonds through Bond Connect in a timely manner, which could adversely affect the Fund’s performance.” (II-44)

PIMCO writes of the risks of investing in China similarly. Its SAI has a section on “Investments in the People’s Republic of China” and in the 2021 disclosure, they note

- “Chinese regulators may suspend trading in Chinese issuers (or permit such issuers to suspend trading) during market disruptions, and that such suspensions may be widespread. In addition, certain securities are, or may in the future become, restricted, and a Fund may be forced to sell such restricted security and incur a loss as a result.” (Page 51)

- “In addition, there also exists control on foreign investment in the PRC and limitations on repatriation of invested capital. Under the FII program, there are certain regulatory restrictions particularly on aspects including (without limitation to) investment scope, repatriation of funds, foreign shareholding limit and account structure. Although the relevant FII regulations have recently been revised to relax certain regulatory restrictions on the onshore investment and capital management by FIIs (including but not limited to removing investment quota limit and simplifying routine repatriation of investment proceeds), it is a very new development therefore subject to uncertainties as to how well it will be implemented in practice, especially at the early stage... As a result of PRC regulatory requirements, a Fund may be limited in its ability to invest in securities or instruments tied to the PRC and/or may be required to liquidate its holdings in securities or instruments tied to the PRC.” (Page 52)

- “Currency repatriation restrictions may have the effect of making securities and instruments tied to the PRC relatively illiquid, particularly in connection with redemption requests.” (Page 53)

- Under the heading of “Investing through CIBM Direct,” Pimco warns “The CIBM Direct Rules are relatively new and are still subject to continuous evolvement, which may adversely affect the Fund’s capability to invest in the CIBM.” (Page 53)

- Under the heading of “Investing Through Bond Connect,” Pimco warns “In addition to the risks described under “Foreign Securities” and “Investments in the People’s Republic of China,” there are risks associated with a Fund’s investment in Chinese government bonds and other PRC-based debt instruments traded on the CIBM through the Bond Connect program... Trading through Bond Connect is subject to a number of restrictions that may affect a Fund’s investments and returns...While the ultimate investors hold a beneficial interest in Bond Connect securities, the mechanisms that beneficial owners may use to enforce their rights are untested and courts in the PRC have limited experience in applying the concept of beneficial ownership. As such, a Fund may not be able to participate in corporate actions
affecting its rights as a bondholder, such as timely payment of distributions, due to time constraints or for other operational reasons.” (Page 54)

Similarly, Vanguard includes a section on “Foreign Securities—China Bonds Risk.” They write

• “The Chinese legal system constitutes a significant risk factor for investors. The interpretation and enforcement of Chinese laws and regulations are uncertain, and investments in China may not be subject to the same degree of legal protection as in other developed countries. In the event account opening or trading is suspended on the CIBM, a fund’s ability to invest in securities traded on the CIBM will be adversely affected and may negatively affect the fund. Furthermore, if Bond Connect is not operating, a fund may not be able to acquire or dispose of bonds through Bond Connect in a timely manner, which could adversely affect the fund’s performance.’ (Page B-12)

• “Bond Connect trades are settled in RMB, which is currently restricted and not freely convertible. As a result, a fund’s investments through Bond Connect will be exposed to currency risk and incur currency conversion costs, and it cannot be guaranteed that investors will have timely access to a reliable supply of RMB.” (Page B-13)

A.II  Proofs and Further Details on the Theory

A.II.A  Derivation of $c_t$

Here we provide a step by step derivation of $c_t$ and other key variables. Recall that the intermediary pledgeability constraint in the middle of date $t$ is

$$R_t^e D_t^e \leq (1 - h_t)(QI_t - L_t)$$

and the intermediary budget constraint in the middle of date $t$ is

$$D_t^e + \gamma L_t = R_t D_t.$$

The intermediary pledgeability constraint binds and liquidations are positive when

$$(1 - h_t)QI_t < R_t^e R_t D_t,$$

that is the total cost of rolling all debt exceeds the pledgeable cashflows. Given that $I_t = A + D_t$, this can be rearranged to

$$A < \left[ \frac{R_t^M}{(1 - h_t)Q} R_t - 1 \right] D_t,$$

which provides an upper bound on inside equity (equivalently, a lower bound on leverage) such that the pledgeability constraint binds. This upper bound is positive so long as $h^*$ is sufficiently
large, $h^s > 1 - \frac{R_t}{(1-h_t)Q}R_t$. Thus, in our numerical illustrations, we restrict parameters so that $h^s$ is sufficiently large and inside equity is below the threshold such that the pledgeability constraint binds.

Under the conjecture that the pledgeability constraint binds, we have

$$D_t^\ell = \frac{(1-h_t)}{R_t^\ell}(QI_t - L_t).$$

From here, we can substitute into the budget constraint and rearrange to obtain project liquidations,

$$L_t = \frac{R_tD_t - (1-h_t)QI_t}{\gamma - \frac{(1-h_t)}{R_t^\ell}}.$$

Finally, we know that the final payoff to the intermediary at the end of date $t$ is

$$c_t = QI_t - L_t - R_t^\ell D_t^\ell$$

Substituting in, we have

$$c_t = QI_t - L_t - R_t^\ell \frac{(1-h_t)}{R_t^\ell} (QI_t - L_t)$$

$$= h_t \left( QI_t - L_t \right)$$

$$= \frac{h_t}{\gamma - \frac{1-h_t}{R_t^\ell}} \left( \gamma QI_t - R_tD_t \right)$$

which gives the result for $c_t$.

**A.II.B Proof of Lemma 1**

We solve the investor problem backwards starting from the rollover decision in the middle of the date. If the intermediary offers contracts that violate the pledgeability constraint, then no debt is rolled over $D_t^{\ell,i} = 0$. For contracts that offer sufficient pledgeable cashflows, investors solve:

$$\max_{D_t^{\ell,i} \geq 0} c_t^{*,i} = (R_t^\ell - 1)D_t^{\ell,i} - \tau \max(R_t^{i}D_t^{i} - D_t^{\ell,i}, 0) + R_t^{i}D_t^{i} + \overline{R}(w - D_t^{i}).$$

The first order conditions imply: (i) indifference to any roll over amounts $D_t^{\ell,i} \in [0, R_t^{i}D_t^{i}]$ if $R_t^\ell = 1 - \tau$; (ii) a corner solution at $D_t^{\ell,i} = 0$ for $R_t^\ell < 1 - \tau$; (iii) $D_t^{\ell,i} = R_t^{i}D_t^{i}$ if $R_t^\ell \in (1 - \tau, 1)$; (iv) indifference to any level of $D_t^{\ell,i} \geq R_t^{i}D_t^{i}$ for $R_t^\ell = 1$; (v) infinite lending for $R_t^\ell > 1$. Solutions (ii) to (v) cannot be an equilibrium, and so we restrict the attention to solution (i) and express the
resulting interest rate schedule as: \(^{11}\)
\[
R^\ell_t = 1 - \tau.
\]

Each investor’s total monetary payoff at the end of date \(t\) can therefore be written as
\[
c^*_{i,t} = Rw + (R^i_t(1 - \tau) - \bar{R})D^i_t,
\]
which, all else equal, is lower when the capital control is imposed, \(\tau = \bar{\tau}\).

At the beginning of \(t\), investors solve:
\[
\max_{D^s_t, D^f_t} Rw + (R^i_tE[1 - \tau] - \bar{R})D^i_t - \frac{1}{4} \frac{b}{\omega(M_t)} D^i_t^2.
\]

The first order condition for type \(i\) yields
\[
0 = (R^i_tE[1 - \tau] - \bar{R}) - \frac{1}{2} \frac{b}{\omega(M_t)} D^i_t,
\]
which rearranges to the result.

### A.II.C Proof of Proposition 1

Take as given a reputation level \(M_t\). The objective of the committed government is:
\[
\max_{D^s_t, D^f_t} c_t = \frac{h_t}{\gamma - (1 - h_t)} \left( \gamma Q I_t - R_t D_t \right)
\]
subject to the pledgeability determination
\[
h_t = \begin{cases} 
  h^s, & D^f_t = 0 \\
  h^f, & D^f_t > 0
\end{cases}
\]
and subject to the interest rate schedules (when borrowing from investors of type \(i\))
\[
R^i_t = \bar{R} + \frac{1}{2} \frac{b}{\omega(M_t)} D^i_t.
\]
Where the project funding constraint is \(I_t = A + D_t\), the total debt definition is \(D_t = D^s_t + D^f_t\), and the average interest rate is \(R_t = \frac{R^s_t D^s_t + R^f_t D^f_t}{D^s_t + D^f_t}\). Note that the objective reflects that the committed

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\(^{11}\)Solution (v) in the aggregate violates the pledgeability constraint. Under solution (iv), both the intermediary and investors are indifferent between \(D^\ell_{t,i} = R^i_t D^i_t\) and \(D^\ell_{t,i} > R^i_t D^i_t\) for \(R^\ell_t = 1\), and so we can rule it out by ruling out \(D^\ell_{t,i} = R^i_t D^i_t\). We can rule out (iv) by noting that (i) with \(R^\ell_t = 1 - \tau \leq 1\) sustains \(D^\ell_{t,i} = R^i_t D^i_t\) at lower borrowing cost to the intermediary. We can rule out (iii) by the same argument. Finally, (i) is weakly preferable to (ii) because the intermediary is indifferent between no rollover with \(R^\ell_t = 1 - \tau\) and no rollover with \(R^\ell_t < 1 - \tau\).
government sets \( \tau = 0 \) and so \( R^s_t = 1 \).

It is convenient to denote \( n(h) = \frac{h}{\gamma - (1-h)} \) to be the net worth multiplier when pledgeability is \( h \). We have

\[
c_t = n(h_t) \left( \gamma Q I_t - R_t D_t \right)
\]

Note that we have \( n(h^s) \geq n(h^f) \), that is the net worth multiplier is larger when there are only stable investors.

The proof strategy proceeds as follows. We first find the optimal strategy if borrowing only from stable investors and the optimal strategy if borrowing from both investor types. We then find the maximum between the two to complete the characterization.\(^{12}\)

**Borrowing only from stable investors.** If the committed type only borrows from stable investors, the net worth multiplier is a positive constant and hence the committed type can equivalently maximize the liquidation value of inside equity, \( \gamma Q I_t - R_t D_t \). Given only borrowing from stable investors, \( R_t = R^s_t \). Given the interest rate schedule, the first order condition is

\[
\gamma Q = R_t + \frac{\partial R_t}{\partial D^s_t} D^s_t
\]

Given \( \frac{\partial R_t}{\partial D^s_t} = \frac{1}{2} \frac{b}{\omega(M_t) 1 - (1 - M_t) \tau} \), substituting in and rearranging obtains

\[
D^s(M_t) = \frac{\omega(M_t)}{b} \left( \gamma Q(1 - (1 - M_t) \tau) - R \right).
\]

From here, substituting into the interest rate schedule, we obtain

\[
R(M_t) = \frac{1}{2} \frac{R}{(1 - (1 - M_t) \tau)} + \frac{1}{2} \gamma Q
\]

Finally, we can substitute into the objective function to obtain

\[
V^s(M_t) = n(h^s) \left( \gamma QA + \left( \gamma Q - R(M_t) \right) D^s(M_t) \right)
\]

**Borrowing from stable and flighty investors.** If the committed type also borrows from flighty investors, then as before the net worth multiplier is a constant, and we can equivalently maximize the liquidation value of inside equity. Noting that we have

\[
\gamma Q I_t - R_t D_t = \gamma QA + \sum_{i \in \{s,f\}} (\gamma Q - R^i_t) D^i_t
\]

\(^{12}\)Note that it is never optimal to borrow only from flighty investors and not from stable investors.
then we have that the committed type optimally borrows the same amount from each investor type, \( D_t^s = D_t^f = \frac{1}{2} D_t \) and \( R_t^s = R_t^f = R_t \). Thus the objective function is equivalent to \( 2(\gamma Q - R_t^s)D_t^s \), and so optimal policy sets \( D^s(M_t) \) and \( R^s(M_t) \) as before, and moreover sets \( D^f(M_t) = D^s(M_t) \) and \( R^f(M_t) = R^s(M_t) \). Therefore, \( D(M_t) = 2D^s(M_t) \), and so indirect utility is

\[
V^f(M_t) = n(h^f) \left( \gamma Q A + 2 \left( \gamma Q - R(M_t) \right) D^s(M_t) \right).
\]

Choosing what type of investor to borrow from. Note that the policies \( D^s \) and \( R \) have already been characterized in accordance with the proposition. All that remains in the proof is to characterize whether the committed government borrows from only the stable investors, or also from the flighty investors. The committed type only borrows from stable investors when \( V^s(M_t) \geq V^f(M_t) \), or equivalently when \( \Delta(M_t) \equiv V^s(M_t) - V^f(M_t) \) is positive. We show that \( \Delta(M_t) \) generally has a single crossing condition. By Envelope Theorem, we have

\[
\Delta'(M_t) = -n(h^s) \frac{\partial R^s}{\partial M_t} D_t^s + n(h^f) \sum_{i \in s,f} \frac{\partial R^i_t}{\partial M_t} D_t^i
\]

where \( \frac{\partial R^i_t}{\partial M_t} \) is the partial derivative at fixed debt. Given identical policy functions at the same reputation, then debt \( D^s_t \) and the interest rate derivative \( \frac{\partial R^s_t}{\partial M_t} \) factor out, and hence

\[
\Delta'(M_t) = \left[ -n(h^s) + 2n(h^f) \right] \frac{\partial R^s_t}{\partial M_t} D_t^s(M_t).
\]

Lastly, note that \( \frac{\partial R^s_t}{\partial M_t} < 0 \) as \( \omega(M_t) \) is nondecreasing. Therefore, \( \Delta' \) is monotone.

Recall that \( n(h^f) \leq n(h^s) \). If \( n(h^s)/n(h^f) = 1 \), then opening up always dominates not opening up (no pledgeability difference) and opening up is immediate. Hence we can define \( M^* = 0 \) and the result follows.

If \( 1 < n(h^s)/n(h^f) < 2 \), then \( \Delta' < 0 \), and hence we have a single crossing property in \( M_t \). Hence we can define an opening up threshold \( M^* \). In this case, the value of higher borrowing grows in reputation relative to the pledgeability difference, leading to opening up once reputation is sufficiently high. Appendix A.II.I2 further generalizes this idea and shows how it results from investors’ preferences featuring increasing differences in \( \langle D_t^s(M_t) \rangle \).

If \( n(h^s)/n(h^f) \geq 2 \), then we can return to the characterization of \( \Delta \) to write

\[
\Delta(M_t) = \left( n(h^s) - n(h^f) \right) \gamma Q A + \left( n(h^s) - 2n(h^f) \right) \left( \gamma Q - R(M_t) \right) D^s(M_t) \leq 0,
\]

and hence we can define \( M^* = 1 \) (the economy never opens up).
In sum, there exists a unique crossing point $M^*$ such that optimal policies are

$$D^s(M_t) = \frac{\omega(M_t)}{b} \left[ \gamma Q(1 - (1 - M_t)^{\tau}) - \bar{R} \right]$$

$$D^f(M_t) = \begin{cases} 
0, & M_t \leq M^* \\
D^s(M_t), & M_t > M^* 
\end{cases}$$

$$R(M_t) = \frac{\bar{R}}{2} \left( \frac{1}{1 - (1 - M_t)^{\tau}} + \frac{1}{2} \gamma Q \right)$$

This proves the result.

**A.II.D A Graphical Representation of the Opening Up Decision**

In Figure A.XIII, we present a graphical representation of the government’s opening up decision. The figure is split into three panels. In Panel (a), the government has a low reputation, defined by $M < M^*$. In Panel (b), the government has an intermediate reputation, $M = M^*$. In Panel (c), the government has a high reputation, defined by $M > M^*$. For illustration purposes we take an interior value $M^* \in (0, 1)$.

We begin by describing Panel (a) in which the government has a low reputation. The solid black line – $h^s$ indifference curve – is the pairs of (total) debt $D_t$ and interest rate $R_t$ that give the same payoff to the committed government when pledgeability is $h^s$. Given $h^s$, payoff increases as the interest rate falls and debt increases, that is as the government is able to select points towards the bottom right corner of the graph. The solid red line, denoted by $R^s$, is the interest rate schedule available to the government if it borrows only from stable investors. The point $A$ is the point $(D, R)$ where the stable-only interest rate schedule is tangent to the $h^s$ indifference curve, and so represents the optimal borrowing decision when only borrowing from stable investors.

To visualize the opening up decision, we ask whether the government can achieve higher utility by borrowing from flighty investors and incurring the lower pledgeability. The black dashed line is the indifference curve of pairs $(D, R)$ that deliver the same payoff to the committed government when the pledgeability is $h^f$, as pairs on the solid black indifference curve did at the higher pledgeability $h^s$. The $h^f$ indifference curve lies everywhere below and to the right of the $h^s$ indifference curve, reflecting that either a higher debt level or lower interest rate is required to compensate for the lower pledgeability.

The final part of the graph is the solid blue line, which is the interest rate schedule available to the government if it borrows from both stable and flighty investors. Here, we already imposed the optimality condition that, if it borrows from both investors, the government borrows the same amount from both investors, equalizing the interest rate it pays across the two investor types.

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13 In other words, the black and black dashed indifference curves are a single indifference curve in the $(D, R, h)$ space, $h \in \{h^s, h^f\}$, that is projected down into the $(D, R)$ space.

14 Here, we already imposed the optimality condition that, if it borrows from both investors, the government borrows the same amount from both investors, equalizing the interest rate it pays across the two investor types.
than the red line, reflecting the additional borrowing from flighty investors. At low reputation $M$, the blue line lies above the $h^f$ indifference curve: that is, no points on the $h^f$ indifference curve are attainable to the government even when borrowing from both investor types. This tells us that the government obtains lower payoff by opening up, reflected in that the optimal borrowing decision from both types, point $B$, lies above and to the left of the $h^f$ indifference curve. This rationalizes the government’s decision to only borrow from stable investors.

Panel (b) displays the same exercise, but conducted at a threshold $M^*$. As reputation increases, the interest rate schedule of borrowing from both types (solid blue line) flattens, and eventually becomes tangent to the $h^f$ indifference curve. At this reputation $M^*$, both the red and blue lines are, respectively, tangent to the $h^s$ and $h^f$ indifference curves. This reflects that at $M^*$, the government achieves the same optimal payoff regardless of whether or not it opens up. The government is indifferent to opening up or not at $M^*$.

Panel (c) displays the same exercise, but for reputation higher than $M^*$. At higher reputation, continual flattening of the blue line means that it now intersects but is not tangent to the $h^f$ indifference curve. At this point, the government can achieve a point on the $h^f$ indifference curve by opening up, but can also achieve points downward and to the right of the $h^f$ indifference curve. The point $B$ reflects the optimal borrowing decision when borrowing from both types, which lies downward and to the right of the $h^f$ indifference curve. The government is therefore strictly better off by opening up.

Comparing across the three panels of Figure A.XIII, we can clearly see how higher reputation changes the borrowing incentives of the government. As reputation increases, the interest rate schedules are both shifting downwards and flattening. With the optimal borrowing amount from both investors always double what the government would borrow from stable investors alone, and the different pledgeability levels acting as a fixed cost, the government switches to borrowing from both types of investors as its reputation increases because it has a more favorable interest rate schedule at these higher reputation levels. The benefit of borrowing from both investors increases in the desired amount of borrowing, and so we see that the shift in the budget sets (interest rate schedules) generates an endogenous opening up threshold. Of course, these figures alone only show the possibility of a unique opening up threshold. Proposition A.XIII proves that the intuition provided by these figures is indeed general, with $M^*$ as the unique opening up threshold.

A.II.E Verifying Opportunistic Government Mimics Issuance

We now show that the off-path beliefs $\pi = M = 0$ under our conjectured equilibrium induce the opportunistic government to mimic issuance. Suppose that at step $n$, the opportunistic government deviated to an optimal issuance. Facing beliefs $\pi = M = 0$, the optimal issuance policy of an opportunistic government is actually the same as Proposition 1 with $M = 0$. It therefore receives indirect

\[15\] Note that because the red line also flattens, the $h^s$ indifference curve that the red line is tangent to shifts downwards and to the right, so the $h^f$ indifference curve also shifts downward and to the right.
utility \( V(0) \) if not imposing capital controls and \( g(0)V(0) \) if imposing capital controls. Investors’ posterior beliefs are \( \pi = \epsilon^O \) regardless of its capital control strategy, so that the continuation value to the opportunistic government is \( W(\epsilon^C) \). Therefore, the opportunistic government sets \( m = 0 \). Thus, the value from the deviation to the committed government is

\[
g(0)V(0) + \beta W(\epsilon^C) < g(\epsilon^C)V(\epsilon^C) + \beta W(\epsilon^C) \leq g(M_n)V(M_n) + \beta W(\epsilon^C)
\]

for any step \( n \). But then the strategy of mimicking issuance and then deviating for sure (\( m = 0 \)) dominates the strategy of deviating on issuance. Thus the opportunistic government mimics issuance.

A.II.F Proof of Proposition 2

We begin by making two observations about the behavior of a feasible candidate path \( \pi_0, ..., \pi_N \) and \( M_0, ..., M_N \). The first is that the transition dynamics (16) imply that every point \( M_n, ..., M_N \) of the path of reputation increases in the initial reputation \( M_0(\pi_0) \) (henceforth \( M_0 \)). The second is that Bayes’ rule (10) implies that the evolution of beliefs \( \pi_1, ..., \pi_N \) decreases in \( M_0 \), because \( \pi_{n+1} \) increases in \( \pi_n \) and decreases in all other factors.

It is convenient to define a candidate equilibrium in terms of the initial reputation \( M_0 \), with the path of reputation \( M_n \) defined from the transition dynamics and the path of beliefs \( \pi_n \) defined from Bayes’ rule. Moreover, given a candidate initial reputation \( M_0 \), we can also pin down the graduation step \( N \) as follows.

**Lemma 2** The graduation step \( N \) associated with an initial reputation \( M_0 \) is given by

\[
N = \sup \left\{ n \mid \frac{1 - (\rho^f)^{n+1}}{1 - \rho^f} V(M_0) < V(1 - \epsilon^C) \right\}
\]

**Proof of Lemma 2.** Suppose that we conjectured a graduation step \( N' < N \). Then, at the conjectured graduation step \( N' \), the value of waiting one step and then imposing the capital control,

\[
\frac{1 - (\rho^f)^{N'+1}}{1 - \rho^f} V(M_0) = V(1 - \epsilon^C)
\]

To see this, note that Bayes’ rule is \( \pi_{n+1} = \epsilon^O + (1 - \epsilon^C - \epsilon^O) \frac{\pi_n}{\pi_{n+1}} \). Thus if \( M_0 \) increases, given \( \pi_0 = \epsilon^O \) is fixed we have that \( \pi_1 \) decreases. Then consider the inductive step. Since \( M_0 \) increases, \( M_n \) increases for all \( n \) (equation 16). Thus if \( \pi_n \) decreases, then \( \pi_{n+1} \) also unambiguously decreases, completing the induction.

By convention, Lemma 2 defines \( N = +\infty \) if no such \( n \) exists, or if convergence happens to \( V(1 - \epsilon^C) \) only in limit.

Note that this definition embeds a tiebreaking rule: if there is a step \( N + 1 \) such that \( \frac{1 - (\rho^f)^{N+1}}{1 - \rho^f} V(M_0) = V(1 - \epsilon^C) \), then both \( N \) and \( N + 1 \) are valid graduation steps of our model (i.e., a measure zero set of opportunistic governments can be incentivized to mimic at step \( N \)). This tiebreaking rule is embedded through the inequality in the supremum. We adopt the convention that \( N \) is the graduation step in this case. Note also that this finite series is well defined for \( \rho^f > 1 \) and \( \rho^f < 1 \). In the knife edge case of \( \rho^f = 1 \), we have to instead define the finite series by the usual sum.

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rather than imposing it at the current step, is
\[
\frac{W_{N'}^0 - W_{N'}^N}{\pi_L} = V(M_{N'}) - g^f V(M_{N'}) + \beta \left[ W_{N'+1} - W_0 \right] \\
= \left( 1 - g^f \right) V(M_{N'}) + \frac{\beta g^f}{1 - \pi_H \beta} \left[ V(1 - e^C) - V(M_0) \right] \\
= \frac{\beta}{1 - \pi_H \beta} g^f \left[ V(1 - e^C) - \rho^f V(M_{N'}) - V(M_0) \right] \\
> 0
\]
so that the opportunistic type prefers not to graduate. The form of \( V(M_n) = \sum_{x=0}^n (\rho^f)^x V(M_0) = \frac{1 - (\rho^f)^{n+1}}{1 - \rho^f} V(M_0) \) used in the supremum is obtained in a standard manner by iterating the AR(1) process forward.\(^{19}\) QED

Lemma 2 implies that once we have a conjecture for \( M_0 \), we also have a graduation step. We now show that if the terminal condition \( m_N = 0 \), that is \( \pi_N = M_N \), holds, then all intermediate conditions \( \pi_n \leq M_n \leq 1 - e^C \) also hold.

**Lemma 3** If \( M_N = \pi_N \) for \( N < \infty \), then \( \pi_n < M_n < 1 - e^C \) for all \( n < N \).

**Proof of Lemma 3.** The proof proceeds by induction. By Lemma 2, we have \( \pi_N = M_N < 1 - e^C \). Suppose that at date \( n + 1 \), \( \pi_{n+1} \leq M_{n+1} \). Then by Bayes’ rule \( \pi_{n+1} = e^O + \frac{1 - e^O - e^C}{M_n} \pi_n \), we have
\[
\frac{M_n}{\pi_n} = \frac{1 - e^O - e^C}{\pi_{n+1} - e^O} \geq \frac{1 - e^O - e^C}{M_{n+1} - e^O} \geq \frac{1 - e^O - e^C}{M_n - e^O} > \frac{1 - e^O - e^C}{1 - e^C - e^O} = 1.
\]
The induction is then completed by the terminal condition \( M_N/\pi_N = 1 \), completing the proof. QED

Given these preliminary results, we can form a candidate equilibrium from an initial reputation \( M_0 \), which then has a graduation step, path of reputation, and path of beliefs as outlined. For our candidate to constitute an equilibrium of the model, it must be the case that it also satisfies the terminal condition \( \pi_N = M_N \) for graduation, in which case it also satisfies all intermediate conditions (Lemma 3) and so constitutes an equilibrium of the model. We are now ready to prove uniqueness and existence. We begin with uniqueness, and then prove existence.

Given we are defining candidate equilibrium from \( M_0 \) (implicitly, \( M_0(\pi_0) \), that is the step 0 strategy \( m_0(\pi_0) \)), we will abuse notation and write \( M_n(M_0) \) and \( \pi_n(M_0) \) to make clear how a

\(^{19}\) Conjecturing that \( V(M_n) = \sum_{x=0}^n (\rho^f)^x V(M_0) = \frac{1 - (\rho^f)^{n+1}}{1 - \rho^f} V(M_0) \), we have \( V(M_0) = \sum_{x=0}^0 (\rho^f)^x V(M_0) = V(M_0) \) and, by induction,
\[
V(M_{n+1}) = \rho^f V(M_n) + V(M_0) = \sum_{x=0}^{n+1} (\rho^f)^x V(M_0) = \frac{1 - (\rho^f)^{n+2}}{1 - \rho^f} V(M_0),
\]
giving the form of \( V(M_n) \) used in the supremum definition.
change in the initial conjectured reputation (implicitly, initial strategy/beliefs $m_0$) affects later parts of the path. One can equivalently think of this exercise as defining $\pi_1$ from $(\pi_0, M_0(\pi_0))$ using Bayes’ rule and $M_1(\pi_1)$ from the transition equation, and so on. Doing so implicitly defines the strategies $m_n(\pi_n)$.

A.II.F1 Uniqueness

Suppose that $M_0^*$ is an equilibrium with associated graduation step $N < \infty$. Any equilibrium of the model must satisfy $\Delta(N, M_0) = \pi_N(M_0) - M_N(M_0) = 0$. Notice that holding fixed $N$, $\Delta(N, M_0)$ is a decreasing function of $M_0$, since $\pi_N$ decreases in $M_0$ whereas $M_N$ increases in $M_0$ due to the transition dynamics and Bayes’ rule. Therefore, there is no other equilibrium with the same graduation step. Thus any other equilibrium must have a different graduation step. It suffices to show that there cannot be an equilibrium with a higher graduation step.

Suppose that there were another equilibrium with a higher graduation step. At the candidate equilibrium $M_0^{**}$ with graduation step $N^{**} > N$, note that we must have $M_0^{**} < M_0^*$ from Lemma 2. We also recall that $\pi_n$ is a decreasing function of $M_0$ from Bayes’ rule. Thus, we have for $M_0^{**} < M_0^*$

$$\pi_{N+1}(M_0^{**}) > \pi_{N+1}(M_0^*) = \epsilon^O + (1 - \epsilon^C - \epsilon^O) \frac{\pi_N(M_0^*)}{M_N(M_0^*)} = 1 - \epsilon^C$$

where the last equality follows from $\pi_N(M_0^*) = M_N(M_0^*)$, since $M_0^*$ was an equilibrium with graduation step $N$. But then $\pi_{N+1}(M_0^{**}) > 1 - \epsilon^C$, contradicting that $M_0^{**}$ is an equilibrium. Thus, if there is an equilibrium, it is unique.\(^{20}\)

A.II.F2 Existence

The proof strategy for existence will proceed as follows. We will partition the $M_0$ set into intervals associated with graduation steps. We will then show that for each possible graduation step, there must be a crossing point of $M$ and $\pi$ above $M_0 = \epsilon^O$. Finally, we will show that at one step, this solution must lie in the interval of graduation steps.

We begin with the possibility that $M_0 = \epsilon^O$. If we have

$$\rho^f \geq \rho^{f*} \equiv \frac{V(1 - \epsilon^C)}{V(\epsilon^O)} - 1$$

then we have an equilibrium with graduation at $N = 0$ and are done.

Next, we show existence for $\rho^f < \rho^{f*}$. We will break this into two subcases as follows. We define a threshold value $\overline{\rho}^f$ by

$$V(\epsilon^O) = (1 - \overline{\rho}^f)V(1 - \epsilon^C),$$

\(^{20}\)For completeness, note that the above argument rules out $N = \infty$ if a finite equilibrium exists, and also note that if there were hypothetically an equilibrium at $N = \infty$ it must be unique and associated with $\frac{1}{1 - \rho^f} V_0(M_0) = V(1 - \epsilon^C)$.

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which is the threshold rate of convergence such that there is a finite graduation step for any \( M_0 \) when \( \rho^f > \overline{\rho}^f \). Note that \( \overline{\rho}^f < 1 \) necessarily.

**Existence when \( \rho^{f*} > \rho^f > \overline{\rho}^f \).**

The first case is the case where \( \rho^f > \overline{\rho}^f \), that is \( V(\varepsilon^O) > (1 - \rho^f)V(1 - \epsilon^C) \). In this case, we know there is a graduation step \( N < \infty \) associated with \( \varepsilon^O \).

In other words, \( N \) is the largest possible date such that

\[
\frac{1 - (\rho^f)^{N+1}}{1 - \rho^f}V(\varepsilon^O) < V(1 - \epsilon^C).
\]

We now define the following indifferent points for each \( n \leq N \). We define \( M_0^n \) for \( n \leq N \) by

\[
\frac{1 - (\rho^f)^{n+1}}{1 - \rho^f}V(M_0^n) = V(1 - \epsilon^C),
\]

that is to say \( M_0^n \) is the highest value of \( M_0 \) such that graduation occurs at date \( n \). Because we have analogously defined \( M_0^{n+1} \) as the solution to

\[
\frac{1 - (\rho^f)^{n+2}}{1 - \rho^f}V(M_0^{n+1}) = V(1 - \epsilon^C),
\]

then we know that the interval \( M_n = [M_0^{n+1}, M_0^n] \) is the set of values \( M_0 \) such that graduation occurs at date \( n \). By convention, we define \( M_0^{N+1} = \varepsilon^O \), since all \( M_0 \in [\varepsilon^O, M_0^N] \) lead to graduation at \( N \) (and since any feasible equilibrium must have \( M_0 \geq \varepsilon^O \)).

We know there is not an equilibrium with graduation at \( N = 0 \) (given \( \rho^f < \rho^{f*} \)), and so we start at \( N = 1 \). Note that by construction, we have \( M_1(M_0^1) = 1 - \epsilon^C \) since \( V(M_1(M_0^1)) = V(1 - \epsilon^C) \). However, because \( M_0^1 > \varepsilon^O = \pi_0 \), we have

\[
\pi_1(M_0^1) = \varepsilon^O + \left(1 - \epsilon^C - \varepsilon^O\right)\frac{\pi_0}{M_0^1} < 1 - \epsilon^C = M_1(M_0^1).
\]

Given we know that \( M_1 \) increases in \( M_0 \), \( \pi_1 \) decreases in \( M_0 \), and \( \pi_1(\varepsilon^O) = 1 - \epsilon^C > M_1(\varepsilon^O) \), then by continuity there exists \( M_0^{1*} \in [\varepsilon^O, M_0^1]\) such that \( M_1(M_0^{1*}) = \pi_1(M_0^{1*}) \). If \( M_0^{1*} \geq M_0^2 \), then \( M_0^{1*} \in M_1 \) and so is a feasible graduation step. In this case, we have found an equilibrium. If not, then we have \( M_0^{1*} < M_0^2 \) and can proceed as follows.

The proof proceeds iteratively from here. Suppose that at \( N \) we have not yet found an equilibrium for any \( n < N \). By definition, we have \( M_N(M_0^N) = 1 - \epsilon^C \). Taking the solution \( M_0^{(N-1)*} < M_0^N \) from the previous step, we have

\[
\pi_{N-1}(M_0^N) < \pi_{N-1}(M_0^{(N-1)*}) = M_{N-1}(M_0^{(N-1)*}) < M_{N-1}(M_0^N),
\]

\[\text{[21] If } \rho^f \geq 1 \text{ then this follows trivially, while if } \rho^f < \rho^{f*} < 1 \text{ it follows since the limit of the finite series is } \frac{1}{1-\rho^f}V(\varepsilon^O) > V(1 - \epsilon^C).\]
and therefore we have from Bayes’ rule that \( \pi_N(M_0^N) < 1 - \epsilon^C \). Since \( \pi_N(\epsilon^O) \geq 1 - \epsilon^C \geq M_N(\epsilon^O) \), then there exists a crossing point \( M_0^{N*} \) at \( N \). If \( M_0^{N*} \in M_N \) then we are done, and if not we continue. Finally, observe that at \( N = \overline{N} \) we have \( M_{\overline{N}} = [\epsilon^O, M_0^{\overline{N}}] \). Thus if we find an equilibrium before \( \overline{N} \) we are done. If we have not found an equilibrium at \( \overline{N} \), then we have \( M_0^{\overline{N}*} \in M_{\overline{N}} \) and we have found a valid equilibrium. Therefore, an equilibrium exists if \( \rho^{f*} > \rho^f > \overline{\rho}^f \).

**Case of \( \rho^f \leq \overline{\rho}^f \)**

In this case, define the point \( M_0^\infty \) as the solution to \( \frac{1}{1 - \rho^f} V(M_0^\infty) = V(1 - \epsilon^C) \). The point \( M_0^\infty \) is the starting point such that \( M_n \to 1 - \epsilon^C \) as \( n \to \infty \). Now, consider the infinite sequence generated by starting point \( M_0^\infty \). We have evolution of reputation

\[
\pi_n = \epsilon^O + (1 - \epsilon^C - \epsilon^O) \frac{\pi_{n-1}}{M_{n-1}}.
\]

Given the limiting behavior of \( M_n \), the limiting fixed point of beliefs is \( \pi_\infty = 1 - \epsilon^C \). This tells us that \( M_n(M_0^\infty) \to 1 - \epsilon^C \) and \( \pi_n(M_0^\infty) \to 1 - \epsilon^C \) as \( n \to \infty \), so that beliefs and reputation converge to one another in limit. We now prove a result on how this convergence happens.

**Lemma 4** Suppose that \( M_0 = M_0^\infty \). Then if \( \pi_n > M_n \) for some \( n \), then \( \pi_{n+s} > M_{n+s} \) for all \( s \geq 0 \).

**Proof of Lemma 4.** If \( \pi_n > M_n \), then we have

\[
\pi_{n+1} = \epsilon^O + (1 - \epsilon^C - \epsilon^O) \frac{\pi_n}{M_n} > 1 - \epsilon^C > M_{n+1}
\]

where the last line follows since \( M_{n+1} \) converges to \( 1 - \epsilon^C \) from below. From here the argument follows immediately for all \( s > 1 \) from the same step. QED

Lemma 4 tells us that there are only two possible manners of convergence of \( \pi_n \) to \( \pi_\infty \). The first is convergence from below, in which case \( \pi_n \leq M_n \) for all \( n \). If it happens to be the case that convergence happens from below, then we would have an equilibrium with \( N = \infty \).

Otherwise, suppose that convergence is from above. We denote \( \overline{N} \) to be the first date at which \( \pi_N(M_0^\infty) \geq M_N(M_0^\infty) \) (note the deliberate weak inequality in this definition). This crossing point must satisfy \( \pi_N(M_0^\infty) < 1 - \epsilon^C \), since by definition of \( \overline{N} \) we have \( \pi_{N-1}(M_0^\infty) < M_{N-1}(M_0^\infty) \).

Note that it is not possible for an equilibrium to occur at any \( M_0 < M_0^\infty \). To understand why, for any such point the limiting behavior of the transition dynamics is \( M_\infty(M_0) < M_\infty(M_0^\infty) = 1 - \epsilon^C \), but the limiting behavior of beliefs lies above \( 1 - \epsilon^C \). Thus, we can restrict attention to \( M_0 \geq M_0^\infty \).

First, we note that it cannot be the case that graduation occurs for \( N < \overline{N} \). To understand why, by definition of \( \overline{N} \) we have \( \pi_N(M_0) < \pi_N(M_0^\infty) \leq M_N(M_0^\infty) \leq \pi_N(M_0) \) for \( N < \overline{N} \) and \( M_0 \geq M_0^\infty \).

Now, let us take the date \( \overline{N} \). Suppose first that we have a strict inequality, \( \pi_N(M_0^\infty) > M_N(M_0^\infty) \). We know that \( \pi_N(1 - \epsilon^C) < M_N(1 - \epsilon^C) \), so we know there exists a crossing point

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\[ M_0^{N^*} \in [M_0^\infty, 1-\epsilon^C] \]. We additionally know that this crossing point satisfies \( M_0^{N^*} < M_0^N \), where \( M_0^N \) is the threshold for graduation at \( N \) as defined in the previous part of the proof. To understand why this is the case, note that by definition \( M_N(M_0^{N^*}) = 1 - \epsilon^C \) and \( \pi_N(M_0^{N^*}) < 1 - \epsilon^C \), so because \( M_N \) is increasing in \( M_0 \) and \( \pi_N \) is decreasing crossing must happen below \( M_0^N \). If \( M_0^{N^*} \in M_N \), then we have found an equilibrium and are done. If \( M_0^{N^*} < M_0^{N+1} \), then we can proceed as follows. Define \( N > N \) to be the graduation step associated with \( M_0^{N^*} \), define \( M_n \) in the usual way for \( N + 1 \leq n \leq N - 1 \), and define \( M_N = [M_0^{N^*}, M_0^N] \). We have that \( \pi_n(M_0^{N^*}) \geq 1 - \epsilon^C > M_n(M_0^{N^*}) \) for all \( N \leq n \leq N \). Because \( M_0^{N^*} < M_0^{N+1} \), then \( \pi_{N+1}(M_0^{N+1}) < \pi_{N+1}(M_0^{N^*}) = 1 - \epsilon^C = M_{N+1}(M_0^{N+1}) \). Therefore, we have a single crossing point \( M_0^{(N+1)^*} \). From here, the argument proceeds as in the previous case, where we note that the condition \( \pi_N(M_0^{N^*}) \geq 1 - \epsilon^C > M_N(M_0^{N^*}) \) tells us that if we have not found an equilibrium by date \( N \), then we must have \( M_0^{N^*} \in M_N \), yielding a valid equilibrium.

It now remains only to handle the case where \( \pi_N(M_0^N) = M_N(M_0^N) \). We note that although these paths cross, this is not a valid equilibrium because \( N \) is not the graduation step of \( M_0^N \). In this case, we know that \( \pi_{N+1}(M_0^N) = 1 - \epsilon^C > M_{N+1}(M_0^N) \). Therefore, let us consider a point \( M_0^N = M_0^\infty + \epsilon \). For sufficiently small \( \epsilon \), by continuity we have \( 1 - \epsilon^C = M_{N+1}(M_0^{N+1}) > \pi_{N+1}(M_0^N) > M_{N+1}(M_0^N) \) and, since \( M_0^N < M_0^{N+1} \), we have \( \pi_{N+1}(M_0^{N+1}) < \pi_{N+1}(M_0^N) \). Therefore, we have a crossing point \( M_0^{(N+1)^*} \in [M_0^N, M_0^{N+1}] \). If \( M_0^{(N+1)^*} \in M_N \) we are done. Otherwise, we define \( N \) as the graduation step associated with \( M_0^{(N+1)^*} \) and define \( M_N = [M_0^{(N+1)^*}, M_0^N] \). From here the proof proceeds exactly as before.

Therefore, we also have an equilibrium for \( \rho^f \leq \bar{\rho}^f \). This completes the existence proof.

### A.II.G Proof of Proposition 3

The proof is essentially the same as the uniqueness proof of Proposition 2. Fixing an opening up step \( N^* \geq 0 \), suppose that \( M_0^N \) is an equilibrium with associated graduation step \( N \geq N^* \). As in the proof of Proposition 2, any equilibrium of the model must satisfy \( \Delta(N, M_0) = \pi_N(M_0^N) - M_N(M_0^N) = 0 \) and moreover \( \pi_N \) decreases in \( M_0 \) while \( M_N \) increases in \( M_0 \), meaning that there cannot be another equilibrium at \( N \). It again suffices to show there cannot be another equilibrium with a higher graduation step.

We can construct the graduation step associated with a pair \((M_0, N^*)\) as

\[
N = N^* + \sup \left\{ n \left| \left( \frac{1 - (\rho^f)^n}{1 - \rho^f} + (\rho^f)^n \frac{1 - (\rho^s)^{N^*+1}}{1 - \rho^s} \right) \frac{g^s}{g^f} V(M_0) < V_0(0, 1 - \epsilon) \right. \}
\]

where the proof follows from the same argument as Lemma 2. Therefore, higher \( M_0 \) is associated with a lower graduation step. Therefore, as in the proof of Proposition 2, a higher candidate graduation step \( N^{**} > N \) has a candidate initial reputation \( M_0^{**} < M_0^* \). From here, the contradiction proceeds from exactly the same steps as in the proof of Proposition 2.
A.II.H Derivations for Section 5 and Proposition 4

We begin with the optimal debt policy of the committed type. Let us define $M_t \equiv M(M_t) = p + (1 - p)\bar{n}^i \equiv p n^H + (1 - p)\bar{n}^f$ as the expected net worth multiplier. From here, the proof of Proposition 1 proceeds identically to its current proof, yielding a threshold rule $M^* \in [0, 1]$ for opening up. The debt policies are $D^i(M_t)$ and the interest rate is $R(M_t)$ for the same functions defined in Proposition 1. The indirect utility of the committed type government is

$$V(M_t) = \bar{n}(M(M_t)) \left( \gamma Q I(M(M_t)) - R(M(M_t)) D(M(M_t)) \right),$$

where we have $\bar{n}(M_t) = \bar{n}^s$ if $M_t \leq M^*$ and $\bar{n}(M_t) = \bar{n}^f$ otherwise. We analogously define $n(M_t) = n^s$ if $M_t \leq M^*$ and $n(M_t) = n^f$ otherwise.

As in the baseline model, the opportunistic government must mimic the issuance decision of the committed government to avoid revealing itself. If the High state is realized, because $g^H = 1$ the opportunistic government receives the same payoff as the committed government regardless of whether or not it imposes the capital control. In the Low state, its payoffs are analogous to the baseline model. Therefore, we can define the opportunistic government’s expected payoff as a function of whether or not it exercises the capital control in the Low state as

$$V^{opp}(M_t, \tau) = \begin{cases} V(M_t), & \tau = 0 \\ G(M_t)V(M_t), & \tau = \bar{\tau} \end{cases}$$

where in place of the multiplier $g(M_t)$ we now have the new multiplier

$$G(M_t) = \frac{p n^H + (1 - p)\bar{n}(M(M_t)) n(M(M_t))}{p n^H + (1 - p)\bar{n}(M(M_t))} \geq 1.$$ 

This new multiplier $G(M_t)$ reflects that the capital control is only applied in the Low state, and so the net worth multiplier is only elevated in the Low state but not in the High state. If $p = 0$, then $G(M_t) = g(M_t)$.

We now move to the reputation model. We study strategies that are Markov in $\pi_t$. The opportunistic government plays a pure strategy of $\tau = 0$ in the High state, since imposing the capital control reveals its type for no contemporaneous benefit. Its strategy for the Low state is a probability $m^i_t$ of not exercising the capital control. Following the High state, since governments that die do not switch type, no information is revealed about government type, hence posterior beliefs $\pi_{t+1}$ are the prior beliefs $\pi_t$. In the Low state, beliefs update according to Bayes’ rule.
Therefore, the corresponding Bellman equation is

\[
W(\pi_n) = \max_{m_n^o \in [0,1]} m_n^o \left( V^{opp}(M(\pi_n), 0) + \beta \left( pW(\pi_n) + (1 - p)W(\pi_{n+1}) \right) \right) + (1 - m_n^o) \left( V^{opp}(M(\pi_n), \tau) + \beta \left( pW(\pi_n) + (1 - p)W(\pi_0) \right) \right)
\]

under the new definition of \( V^{opp} \). Note that the contribution of \( \beta pW(\pi_n) \) to continuation value does not depend on strategy \( m_n^o \), so we can rearrange to obtain

\[
W(\pi_n) = \frac{1}{1 - \beta p} \max_{m_n^o \in [0,1]} m_n^o \left( V^{opp}(M(\pi_n), 0) + \beta(1 - p)W(\pi_{n+1}) \right) + (1 - m_n^o) \left( V^{opp}(M(\pi_n), \tau) + \beta(1 - p)W(\pi_0) \right),
\]

which reduces to equation 11 when \( p = 0 \).

We can now characterize the transition equation using analogous derivations to the baseline model. At step \( n = 0 \) we can use the weak preference for exercising the capital control to obtain

\[
W(\pi_0) = \frac{1}{1 - \beta} G(M_n) V(M_n).
\]

Then using the indifference condition at any \( n \) where a mixed strategy is played, we have

\[
W(\pi_{n+1}) = \frac{1}{\beta(1 - p)} (G(M_n) - 1) V(M_n) + W(\pi_0).
\]

Finally, using again the weak preference for exercising the capital control at any step \( n + 1 \), we have

\[
V(M_{n+1}) = \frac{G(M_n)}{G(M_{n+1})} \varrho(M_n) V(M_n) + \frac{G(M_0)}{G(M_{n+1})} V(M_0),
\]

where we have defined \( \varrho(M_n) = \frac{1 - \beta p}{\beta(1 - p)} \frac{G(M_n) - 1}{G(M_n)} \). This transition equation is precisely the same form as equation 14 from the baseline model, up to the changes in definitions. If investors are homogeneous \( (n^s = n^f) \), then this equation reduces to \( V(M_{n+1}) = \varrho(M_n) V(M_n) + V(M_0) \).\(^{22}\)

A.II.H1 A Simple Foundation

We provide a simple foundation for the reduced form description of the High state above. In the High state, the economy is in a boom, and the intermediary gains access to a valuable new investment project. This investment project converts one unit of the consumption good in the middle of date \( t \) into \( R^H > 0 \) units of the consumption good at the end of date \( t \). We assume that \( \gamma R^H > 1 \).

\(^{22}\)It is notable that it is no longer trivial that \( G^f < G^s \). The reason is that \( G^f > G^s \) given \( R_H \) is a positive constant, i.e., the proportional gains from the good state are higher when \( h_t \) is larger. As long as the effect of proportional gains from imposing capital controls dominates this latter effect, we have the same jump dynamics as in the baseline model.
We further assume that the cashflows of this new project are fully pledgeable to both classes of investors, that is \( h^H = 0 \) for new project cashflows regardless of the investor base. Since the new project has higher returns than the existing project and is fully pledgeable, the intermediary optimally redeploy all of its existing assets as well as any new borrowing to the new project. Let \( D_t^{i,H} \) be the intermediary debt level in the middle and \( R_t^{i,H} \) the interest rate on that debt. The High state pledgeability constraint is therefore \( R_t^{i,H} D_t^{i,H} \leq R^H (\gamma Q I_t - R_t D_t + D_t^{i,H}) \), where \( \gamma Q I_t - R_t D_t + D_t^{i,H} \) is total intermediary investment in the new project. As long as \( R_t^{i,H} \leq R^H \), any level of borrowing \( D_t^{i,H} \) satisfies the pledgeability constraint. The payoff to the intermediary in the High state is

\[
c_t^{i,H} = R^H (\gamma Q I_t - R_t D_t) + (R^H - R_t^{i,H}) D_t^{i,H},
\]

The solution to the intermediary borrowing problem in the High state is: (i) indifference to any borrowing if \( R_t^{i,H} = R^H \); (ii) \( D_t^{i,H} = 0 \) if \( R_t^{i,H} > R^H \); (iii) infinite borrowing if \( R_t^{i,H} < R^H \).

In the High state, foreign investors can either lend to the intermediary or invest in a project outside the country with return \( R^H \). The objective of investors is therefore

\[
\max_{D_t^{i,H,i}} c_t^{i,H,i} = (R_t^{i,H} - R^H) D_t^{i,H,i} - \tau R^H \max(R_t D_t - D_t^{i,H,i}) + R^H R_t D_t + R^H T (w - D_t).
\]

The first order conditions imply: (i) indifference to any roll over amounts \( D_t^{i,H,i} \in [0, R_t D_t] \) if \( R_t^{i,H} = R^H (1 - \tau) \); (ii) a corner solution at \( D_t^{i,H,i} = 0 \) for \( R_t^{i,H} < R^H (1 - \tau) \); (iii) \( D_t^{i,H,i} = R_t D_t \) if \( R_t \in (R^H (1 - \tau), R^H) \); (iv) indifference to any level of \( D_t^{i,H,i} \geq R_t D_t \) for \( R_t^{i,H} = R^H \) (v) infinite lending for \( R_t^{i,H} > R^H \).

The interest rate \( R_t^{i,H} \) is determined by market clearing. Regardless of \( \tau \), \( R_t^{i,H} < R^H \) cannot be an equilibrium: the intermediary demands infinite borrowing (intermediary case (iii)), while investors supply at most the finite amount \( R_t D_t \) (investor case (i), (ii), or (iii)). \( R_t^{i,H} > R^H \) also cannot be an equilibrium, since investors have infinite supply (investor case (v)) whereas intermediaries have no demand (intermediary case (ii)). On the other hand, \( R_t^{i,H} = R^H \) clears the market at \( D_t^{i,H,i} = R_t D_t \) regardless of the capital control choice. If \( \tau = 0 \), the bank is in case (i) and is indifferent to any borrowing level, while investors are in both cases (i) and (iv) and are indifferent to any borrowing level. If \( \tau = \tau \), then the bank is in case (i) and is indifferent to any borrowing level, while investors are in case (iv) and are indifferent to any level of at least \( R_t D_t \). In sum, we have

\[
R_t^{i,H} (\tau) = R^H, \quad \tau \in \{0, \tau\}
\]

Since the High state interest rate is \( R_t^{i,H} (\tau) = R^H \) for \( \tau \in \{0, \tau\} \), the payoff to intermediaries

\[A.29\]
in the High state is
\[ c_t^H = R^H (\gamma Q I_t - R_t D_t), \]
regardless of whether or not the capital control has been imposed. Without loss of generality, we let \( D_t^{H,t} = R_t D_t \).

Mapping into our reduced form approach, we therefore have \( n^H = R^H \) and \( g^H = 1 \).

A.II.H2 Proof of Proposition 4

If the High state is realized, then posterior beliefs are prior beliefs, \( \pi_{t+1} = \pi_t = \pi_n \). Therefore, \( D_{t+1} = D_t = D(M(\pi_n)) \). From Appendix A.II.H1, we have \( D_t^I = R_t D_t \). If the Low state is realized and \( \tau = 0 \), then \( \pi_{t+1} = \pi_0 > \pi_n = \pi_t \), \( M(\pi_{t+1}) > M(\pi_t) \), and therefore \( D_{t+1} = D(M_0) > D(M_n) = D_t \). From Section 3.1, the binding pledgeability constraint gives \( D_t^I \tau = 0 < R_t D_t \). Finally, if the Low state is realized and \( \tau = \overline{\tau} \), then \( \pi_{t+1} = \pi_0 < \pi_n = \pi_t \), \( M(\pi_{t+1}) < M(\pi_t) \), and therefore \( D_{t+1} = D(M_0) < D(M_n) = D_t \). However, since \( R_t^I = 1 - \overline{\tau} < 1 = R_t^I \tau = 0 \), then from the binding pledgeability constraint we have \( D_t^I \tau = \overline{\tau} > D_t^I \tau = 0 \).

A.II.1 Model Extensions

A.II.I1 Domestic Debt Issuance

Suppose that in addition to inside equity \( A \), there is also an amount \( D^d_t \leq D^d \) available to borrow from domestic households. Households inelastically save domestically at the equilibrium interest rate \( R_t \) (equivalently, the government can apply a tax/subsidy on savings). Moreover, there is financial repression: domestic households are forced to maintain their investment in the bank at date one regardless of pledgeability. It follows that from the government’s perspective domestic household savings and inside equity are equivalent given financial repression, and that the model is equivalent to one in which inside equity is \( A^* = A + D^d \). Financial repression forces households to roll over \( D^d \) at interest rate \( R_t^d \), which gives final payoff to households of \( R_t^d R_t D^d \) and reduces final payoff to intermediaries by the same amount.

A.II.I2 Investor Utility Functions and Opening Up

We now provide more general conditions on investor preferences under which staggered opening up occurs, that is generalizing Lemma 1. Each early generation investor \( i \in \{s, f\} \) has the utility function \( U(M_t, R_t^i, D_t^i) \), which has already internalized the budget constraint. If investor \( i \in \{s, f\} \) is allowed into the country, then her first order condition for optimal debt purchase is

\[ \frac{\partial U(M_t, R_t^i, D_t^i)}{\partial D_t^i} = 0, \]
which defines an optimal debt policy $D^i(M_t, R_t)$ as a function of reputation $M_t$ and the promised yield $R_t$. Note that $D^*(M, R) = D^f(M, R)$ for all $(M, R)$.

We make two key assumptions on the utility function $U$.

**Assumption 1** The utility function $U$ satisfies $\frac{\partial^2 U}{\partial D_t \partial R_t} > 0$ and $\frac{\partial^2 U}{\partial D_t \partial M_t} > 0$.

Assumption 1 implies increasing differences in $(D^i_t, R^i_t)$ and $(D^i_t, M_t)$, so that the optimal debt policy $D^i(M_t, R_t)$ increases in both the (promised) interest rate $R_t$ and the reputation $M_t$. The former is an intuitive assumption that a higher yield (all else equal) attracts more foreign investment. The latter is important to ensuring that countries benefit from a higher reputation, as it implies they can borrow more at the same interest rate as reputation builds. Note that the investor preferences in the baseline model satisfy Assumption 1, resulting in a debt policy that increases in both $R^i_t$ and $M_t$.

This environment allows us to prove the following generalization of Proposition 1 on staggered opening up by the committed type.

**Proposition 5** There exists a unique opening up threshold $M^* \in [0, 1]$ such that:

(a). The interest rate policy $R(M_t)$ is the solution to

$$\left[\gamma Q - R(M_t)\right] \frac{\partial D^*(M_t, R(M_t))}{\partial R} = D^*(M_t, R(M_t))$$

(b). The stable investor debt policy is $D^*(M_t) = D^*(M_t, R(M_t))$

(c). The flighty investor debt policy is

$$D^f(M_t) = \begin{cases} 
0, & M_t \leq M^* \\
D^*(M_t), & M_t > M^*
\end{cases}$$

**Proof of Proposition 5.** The proof follows similar steps as the proof of Lemma 1. Taking as given reputation $M_t$, the objective of the committed government is to:

$$\max_{D^i_t, D^f_t} c_t = \frac{h_t}{\gamma - (1-h_t)} \left(\gamma QI_t - R_tD_t\right)$$

subject to the pledgeability determination

$$h_t = \begin{cases} 
  h^s, & D^f_t = 0 \\
  h^f, & D^f_t > 0
\end{cases}$$

and subject to the demand functions $D^i_t = D^i_t(R_t, M_t)$ when an investor class is allowed into the country, to $I_t = A + D_t$, to $D_t = D^s_t + D^f_t$, and to $R_t = \frac{R^j_t D^j_t + R^i_t D^i_t}{D_t}$. As in the proof of Proposition A.31
1, we define $n(h)$ to be the net worth multiplier when pledgeability is $h$, so that

$$c_t = n(h_t) \left( \gamma Q I_t - R_t D_t \right)$$

Note that we have $n(h^s) \geq n(h^f)$. As in the baseline model, conditional on a choice of which investors to borrow from, the optimal borrowing rule maximizes the liquidation value of inside equity $\gamma Q I_t - R_t D_t$.

The proof proceeds as in the proof of Proposition 1: we first derive optimal issuance conditional on either borrowing only from stable or borrowing from both, and then we compare the two.

**Borrowing only from stable investors.** Given the demand function $D^s(M_t, R_t)$ of stable investors, the first order condition for the optimal promised interest rate $R_t = R^s_t$ (it is slightly more convenient to represent the equivalent decision problem of choosing the interest rate) is

$$\gamma Q \frac{\partial D^s(M_t, R_t)}{\partial R_t} = D^s(M_t, R_t) + R_t \frac{\partial D^s(M_t, R_t)}{\partial R_t}$$

This equation defines the optimal interest rate policy $R(M_t)$,

$$\left[ \gamma Q - R(M_t) \right] \frac{\partial D^s(M_t, R(M_t))}{\partial R_t} = D^s(M_t, R(M_t)).$$

From here, the optimal debt policy associated with this interest rate policy is $D^s(M_t) = D^s(M_t, R(M_t))$.

From here, we can substitute back into utility to obtain the indirect utility function in reputation,

$$V^s(M_t) = n(h^s)\gamma QA + n(h^s) \left( \gamma Q - R(M_t) \right) D^s(M_t, R(M_t)).$$

Finally, we note that by Envelope Theorem,

$$\frac{\partial V^s(M_t)}{\partial M_t} = n(h^s) \left( \gamma Q - R(M_t) \right) \frac{\partial D^s_t}{\partial M_t} > 0,$$

where for clarity we note that $\frac{\partial D^s_t}{\partial M_t}$ is the partial derivative in $M_t$ at a fixed interest rate $R_t$. Intuitively, indirect utility increases in reputation because, holding the interest rate fixed, an increase in reputation increases demand by stable investors, so that the country can borrow more at the same interest rate. This highlights the significance of Assumption 1.

**Borrowing from stable and flighty investors.** If the committed type also borrows from flighty investors, then the liquidation value of inside equity is $\gamma QA + \sum_i (\gamma Q - R^f_i) D^f_i(M_t, R^f_i)$. Therefore since $D^s = D^f$, we have $R_t = R^s_t = R^f_t$ given as above by $R(M_t)$. Intuitively, all debt-related components of the liquidation value of inside equity are simply scaled up by 2 relative to
the previous case, leading to the same rule. Thus, we can write the indirect utility function as

\[ V_f(M_t) = n(h^f) \gamma Q A + 2n(h^f) \left( \gamma Q - R(M_t) \right) D^s(M_t, R(M_t)). \]

In this case, note that by Envelope Theorem we have

\[ \frac{\partial V_f(M_t)}{\partial M_t} = 2n(h^f) \left( \gamma Q - R(M_t) \right) \frac{\partial D^s}{\partial M_t} > 0. \]

Choosing what type of investor to borrow from. We can now characterize what type of investors the committed government decides to borrow from. The committed type only borrows from stable investors when

\[ V^s(M) \geq V_f(M). \]

Begin first with the case in which \( n(h^s)/n(h^f) < 2 \). We show that \( \Delta(M) = V^s(M) - V_f(M) \) is monotone decreasing in \( M \), and hence there exists an \( M^* \in [0, 1] \) such that the result holds (where by convention, we denote \( M^* = 0 \) if the economy is always open and \( M^* = 1 \) if the economy is always closed). By Envelope Theorem we have

\[
\Delta'(M) = \frac{\partial V^s(M)}{\partial M} - \frac{\partial V_f(M)}{\partial M} = \left[ n(h^s) - 2n(h^f) \right] \left( \gamma Q - R(M_t) \right) \frac{\partial D^s}{\partial M_t} < 0
\]

where the final inequality follows since \( n(h^s)/n(h^f) < 2 \), \( R(M_t) < \gamma Q \), and \( \frac{\partial D^s}{\partial M_t} > 0 \). Hence, \( \Delta \) is decreasing and we can define such an \( M^* \), giving the result. Note that this highlights the importance of increasing differences, that is an increase in reputation increases investor borrowing for the same interest rate.

If instead \( n(h^s)/n(h^f) \geq 2 \), then note that we have

\[ V^s - V_f = \left( n(h^s) - n(h^f) \right) \gamma Q A + \left( n(h^s) - 2n(h^f) \right) \left( \gamma Q - R(M_t) \right) D^s(M_t) \geq 0 \]

and hence the country never opens up and we define \( M^* = 1 \).

Finally if \( n(h^s) = n(h^f) \), then \( V^s - V_f \leq 0 \), the economy is always open, and we define \( M^* = 0 \).

A.II.I3 Numerical Solution of the Model with Homogeneous Investors

Section 4.2 discussed the equilibrium of the model with homogeneous investors \( h^s = h^f \). We provide here the accompanying numerical solution. Figure A.XIV presents a numerical example of
the equilibrium. As in the main text, this is to be taken as an illustration and not a calibration. Since investors are homogeneous, the opening up date is $N^* = 0$ by definition. In this example, graduation occurs at $N = 16$. The upper left panel plots the evolution of reputation $M_n$ and beliefs $\pi_n$. Beliefs and reputation start low at $n = 0$ because, at this point, investors are relatively sure that the government is opportunistic; in this example, prior beliefs at $n = 0$ are $\pi_0 = \epsilon^0 = 0.001$. Intuitively, most governments at $n = 0$ are those that exercised capital controls last period, thus revealing themselves to be opportunistic, and the only uncertainty about their type this period is due to the exogenous switching probability. At $n = 0$ there is no reputational cost to imposing the capital controls because the posterior belief would coincide with the prior, and a large increase in reputation ($M_1$), and/or a much flatter future interest rate schedule (i.e., higher $\omega(M_1)$), is required for opportunistic governments to be willing to forgo imposing capital controls. In this example we set $\omega(M)$ to be a strictly increasing function of $M$. Furthermore, since the belief that the government is the committed type is very low, a small fraction of opportunistic governments mimicking generates a large increase in posterior beliefs (in percentage) and future reputation. This can be seen in the top left panel of Figure A.XIV in which a large gain in reputation $M_n$ occurs when moving from $n = 0$ to $n = 1$. The top right quadrant shows that this is supported by a relatively low value of the mimicking probability $m_0$. As beliefs build, reputation exceeds beliefs as more opportunistic governments are willing to defer employing capital controls to capitalize on the higher reputation and higher future benefits of imposing capital controls. This willingness declines as graduation approaches, reflecting the exponential convergence of the reputation building process.

The bottom left panel of Figure A.XIV shows the decline in the equilibrium interest rate $R_n$ as the reputation of the government improves. The bottom right panel shows the corresponding increase in foreign debt as reputation improves. At higher reputation the government contemporaneously sustains more foreign debt and lower interest rates, which is intuitive since higher reputation is a shift downward in the interest rate schedule.

A.II.I4 Further Heterogeneity in Demand Curves

Investor heterogeneity plays a crucial role in the dynamics of opening up. In this appendix we allow for further heterogeneity in terms of parameters of the demand curve, like slope and intercept, as well as capping the total amount of financing that can be obtained by stable investors. We think of the demand for the country’s bonds by stable investors even at low levels of reputation as a special characteristic of countries that could become a reserve currency, like China. Most other countries, like many emerging markets, do not have this option and instead open up directly facing flighty investors. We think of stable investors as cheaper than private flighty ones but also a smaller overall pool of capital.

Similarly we think that the pool of capital that a country can attract goes up as its reputation improves. Part of this occurs because investors tend to specialize and there are many more large(r) investors that target relatively safe debt. Part of this occurs, even within the same investor, because
as reputation increases the riskiness (variance and covariance with crisis) of the debt decreases, leading to a less steep demand function for the bonds (i.e., returns do not have to increase as much to generate a given increase in holdings).

In the paper, we put emphasis on simplicity and tractability and made the investor classes only different in their flightiness. In this appendix, we explore other ways to capture our view of investor heterogeneity discussed above.

**Heterogeneous Intercept, Slope, and Cap to Investors Demand Curves.** In addition to the differential flightiness, we can extend the model such that stable investors are also preferable to flighty investors from the perspective of investor borrowing costs. However, stable investors are capacity constrained and can only lend $D_s^t \leq \bar{D}^s$. We express the preferability of stable investors by the assumption that they always provide debt at a cheaper rate than the flighty investors, up to their debt capacity. Formally, we assume $R_s^t + \frac{1}{2} b_s^s \bar{D}^s \leq R_f^t$. We now assume that the country also cannot discriminate on promised interest rates, that is it must set a common interest rate $R_t$ for all investors allowed entry. This means that the country chooses to borrow from flighty investors only if it wishes to borrow more than the stable investors’ capacity. If it borrows more than $\bar{D}^s$, it borrows the full investment capacity of the stable investors, $D_s^t = \bar{D}^s$, and the rest from flighty investors, $D_f^t = D_t - \bar{D}^s$. For now, we take $\omega(M) = 1$ for all $M$ for both types of investors, and turn to those weights further below. As a result, we can express the promised interest rate schedule as

$$R_t = \begin{cases} \frac{R_s^t + \frac{1}{2} b_s^s D_t}{1 - (1 - M_t)^\tau}, & D_t \leq \bar{D}^s \\ \frac{R_f^t + \frac{1}{2} b_f^f (D_t - \bar{D}^s)}{1 - (1 - M_t)^\tau}, & D_t > \bar{D}^s \end{cases}$$

(A.1)

The interest rate schedule is discontinuous at $\bar{D}^s$ if $R_s^t + \frac{1}{2} b_s^s \bar{D}^s < R_f^t$, and has a kink in the slope at $\bar{D}^s$ if $b_f^f \neq b_s^s$. This interest schedule, together with the assumptions made in the main text on pledgeability, embeds an additional “fixed cost” to opening up to flighty investors in that it makes the interest rate schedule (in addition to pledgeability requirements) jump up on all debt when flighty investors are allowed to participate in domestic markets.

We assume single crossing continues to hold to simplify the analysis. In particular, we assume that there exists a crossing point $M^* \in (0, 1)$ such that optimal debt issuance $D_t(M)$ satisfies $D_t(M) \leq \bar{D}^s$ for $M \leq M^*$ and $D_t(M) > \bar{D}^s$ for $M > M^*$. Under this assumption there is a single crossing point at $M^*$ where the government shifts from borrowing from only stable investors to also borrowing from flighty investors. Given single crossing, the policy rule of the committed government as a function of $M_t$ can be determined by maximizing the liquidation value of the intermediary: $\gamma Q I_t - R_t D_t$. We also have that optimal policy maximizes $\gamma Q I_t - R_t D_t$ separately for $M_t \leq M^*$ and $M_t > M^*$.

First suppose that $M_t \leq M^*$ and so $D(M_t) \leq \bar{D}^s$. Then, we have $R_t = \frac{R_s^t + \frac{1}{2} b_s^s D_t}{1 - (1 - M_t)^\tau}$, and therefore
the FOC for optimal debt issuance at an interior solution \( D_t < \overline{D}^s \) is

\[
0 = \gamma Q - R_t - \frac{\frac{1}{2} b^s}{1 - (1 - M_t)\overline{\tau}} D_t
\]

\[
D(M_t) = \frac{1}{b^s} \left[ \gamma Q (1 - (1 - M_t)\overline{\tau}) - R^s \right].
\]

Substituting back into the interest rate schedule, we get

\[
R(M_t) = \frac{1}{2} \frac{R^s}{1 - (1 - M_t)\overline{\tau}} + \frac{1}{2} \gamma Q.
\]

Finally, note that this is applicable only as long as the debt cap does not bind, so we have a threshold \( M_* \) such that if \( M_* < M_0 \leq M^* \) then the cap binds. In this region, the interest rate is instead given by

\[
R(M_t) = \frac{R^s + \frac{1}{2} b^s \overline{D}^s}{1 - (1 - M_t)\overline{\tau}}.
\]

Next, suppose that \( M_t > M^* \) and so \( D(M_t) > \overline{D}^s \). In this case, we have \( R_t = \frac{R^f + \frac{1}{2} b^f (D_t - \overline{D}^s)}{1 - (1 - M_t)\overline{\tau}} \), giving

\[
0 = \gamma Q - R_t - \frac{\frac{1}{2} b^f}{1 - (1 - M_t)\overline{\tau}} D_t
\]

\[
D(M_t) = \frac{1}{b^f} \left[ \gamma Q (1 - (1 - M_t)\overline{\tau}) - \left( R^f - \frac{1}{2} b^f \overline{D}^s \right) \right]
\]

Finally substituting back into the interest rate schedule, we obtain

\[
R(M_t) = \frac{1}{2} \frac{R^f - \frac{1}{2} b^f \overline{D}^s}{1 - (1 - M_t)\overline{\tau}} + \frac{1}{2} \gamma Q.
\]

Taking this all together, we have that the optimal issuance decision is

\[
D(M_t) = \begin{cases} 
\frac{1}{b^s} \left[ \gamma Q (1 - (1 - M_t)\overline{\tau}) - R^s \right], & M_t \leq M_* \\
\overline{D}^s, & M_* < M \leq M^* , \\
\frac{1}{b^f} \left[ \gamma Q (1 - (1 - M_t)\overline{\tau}) - R^f \right] + \frac{1}{2} \overline{D}^s, & M > M^* 
\end{cases}
\]

where \( M_* \leq M^* \) is the point at which the capacity constraint begins to bind. The associated interest rate is

\[
R(M_t) = \begin{cases} 
\frac{1}{2} \frac{R^s}{1 - (1 - M_t)\overline{\tau}} + \frac{1}{2} \gamma Q, & M_t \leq M_* \\
\frac{R^s + \frac{1}{2} b^s \overline{D}^s}{1 - (1 - M_t)\overline{\tau}}, & M_* < M \leq M^* \\
\frac{1}{2} \frac{R^f - \frac{1}{2} b^f \overline{D}^s}{1 - (1 - M_t)\overline{\tau}} + \frac{1}{2} \gamma Q, & M > M^* 
\end{cases}
\]

Given the optimal issuance rule of the committed type, the analysis of the opportunistic type
behavior follows unchanged from the main text. Figure A.XV provides a numerical illustration of this equilibrium. The country starts at \( n = 0 \) borrowing only from stable investors and opens up at \( N^* = 2 \).

Compared to the model in the main text, this more general heterogeneity allows for a smaller jump in debt when the country opens up. The model in the main text features no difference, other than flightiness, among the investors. This means that upon opening up, debt at least doubles. It doubles because the flighty investors are completely untapped before that point, and upon opening up the country borrows exactly as much from them as it does from the stable ones. It more than doubles because opening up makes reputation jump up, and the higher reputation induces more borrowing from any type of investors. In this extended model, instead, we assume that the first unit of debt raised from the flighty investors is more expensive than the last unit raised from the stable ones: \( R^s + \frac{1}{2} b^sD^s \leq R^f \). This means that while debt does jump up upon opening up, because of the fixed cost nature of letting in flighty investors, the fraction of total debt that is raised by flighty investors is relatively low. This fraction then continues to rise for all steps until graduation \( n \in [N^*, N] \). This captures the pattern in the data of private investors becoming quantitatively more important as the country’s reputation improves.

**Investor Specialization and Taste for Different Levels of Reputation.** In the main text, we introduced the taste/holding cost function \( \omega_i(M) \) to allow for individual investors \( i \) to specialize in the debt of countries with varying levels of reputation. In the main text, we kept the investor class aggregate taste \( \omega(M) \) identical between stable and flighty investors. In this appendix, we discuss several possible extensions: allowing pairing between specific investors and countries, allowing aggregate taste to be different between stable and flighty investors, and the foundations and equilibrium effect of steeper or flatter parametrizations of \( \omega(M) \).

In the main model, investors hold identical amounts of debt by all countries with the same level of reputation \( M \). It is possible, however, to allow some investors to have preferences for particular countries while maintaining overall symmetry. For example, this would capture in reduced form that investors tend to prefer the debt of countries that are closer geographically, politically, and have stronger trade connections. Formally, we could introduce wedges in the portfolio shares of specific investors while making sure that, due to the law of large numbers, the wedges cancel out at the country level so that all countries face identical demand curves (just from a different subset of the investors).

The model can also allow for the investor class to have a different taste function \( \omega^s(M) \) and \( \omega^f(M) \). For example, if the two functions are affine transformations of each other, then the analysis is similar to the one discussed above in which the investors’ demand functions have heterogeneous intercepts and slopes.

Finally, it is interesting to discuss possible foundations and the equilibrium effect of the function \( \omega(M) \). For illustration purposes, Figures A.XIV and 6 are based on increasing \( \omega(M) \) while Figure
A.XV is based on a constant one. An increasing $\omega(M)$ provides more incentives for countries not to impose capital controls, since at each future step $n$ they face progressively better interest rate schedules. This captures the notion that countries want to establish themselves as a reserve currency to capture the “exorbitant privilege” of facing very high demand for their bonds once they have high reputation. A steeper, i.e., faster increasing $\omega(M)$ tends to generate longer graduation dates $N$. In the case of heterogeneous investors, if the increase in $\omega(M)$ is faster for relatively low values of $M$ (e.g., the function is increasing and concave) this tends to delay opening up (higher $N^*$) since the interest rate schedule that the country faces from stable investors improves faster with reputation.

Foundations for an increasing $\omega(M)$ and heterogeneity in this function across investor classes could come from habitat theories of the investor population and market segmentation with endogenous investor entry in different segments.

A.III Two-Way Capital Flows

The Chinese government is one of the largest holders of U.S. Treasuries and a major foreign investor in everything from direct financing of infrastructure projects to loans to emerging market economies. At the same time, it is letting foreigners participate in its domestic bond markets. In the model considered so far, we have focused on the decision to borrow from foreigners. We now consider the interrelated decision of letting domestic savers invest abroad. These two-way capital flows are important in understanding China’s motivation for internationalizing its currency because they distinguish the current account and net foreign asset position (net borrowing at the country level) from the gross assets and liabilities positions and changes in gross positions (see also Obstfeld et al. (2010) and Dooley et al. (2008)).

We show that, as reputation builds, increased investment by foreigners in the domestic bond market coincides with increased foreign investment by domestic households (savers). On the one hand, the model clarifies that internationalizing a currency is not about net-borrowing per se, i.e., the current account or net foreign assets, but more linked to gross positions. On the other hand, it draws an equilibrium connection between internationalization and, all else equal, the net desire to borrow. In net, as reputation builds, the country becomes more of a borrower (or at least less of a creditor) from the rest of the world. For example, starting from a large creditor position at low levels of reputation, like China’s present situation, there is a tendency toward becoming a debtor as reputation increases. Intuitively, reputation is like a pledgeable asset, it is valuable because one can borrow against it. The more it becomes valuable, the more the country wants to use it to lever up.

We return to the baseline model of Section 4.2 with heterogeneous investors. We generalize that model by assuming that domestic households have an endowment $W$ of liquid wealth at each date $t$. Households also own the intermediation sector, where $E_t \equiv V_t$ is the total value of the intermediation sector equity at date $t$. Thus, their total wealth position is $W + E_t$. At the beginning of each date,
households can invest an amount $K_t$ in illiquid foreign assets, which pay out $R^K$ at the end of the date. Households invest the remainder $W - K_t$ in illiquid non-intermediary investments, and we normalize the return of these assets to 1 for simplicity. In the main text we assume that shares in the intermediaries cannot be traded, since inside capital $A$ is fixed and domestically held. In Appendix A.III.1, we relax this assumption and show that it generates a jump in both gross assets and liabilities that occurs at the opening up step.

Households have an adjustment cost for sending capital abroad based on their total wealth, given by $\Psi(k_t)(W + E_t)$, where $k_t = \frac{K_t}{W + E_t}$ is the fraction of their total wealth that they send abroad and where $\Psi$ is increasing and convex. Given that households send a fraction $k_t$ of their wealth abroad, their total welfare, including the value $E_t$ of their intermediary equity, is given by:

$$R^K k_t - \Psi(k_t) + (1 - k_t)(W + E_t).$$

The optimal private allocation of domestic savings to foreign investment $k_t$ is constant, that is households always allocate a constant fraction of their total wealth to international investment. This optimal household allocation is given by $\Psi'(k) = R^K - 1$.

The government may encourage capital outflows by domestic savers to be higher or lower than the private optimum. On the one hand, the government may value investments that increase demand for the Renminbi as a global currency more so than individual households do, internalizing the benefits of a liquid market for its currency. The benefits might come in the form of a shift downward in the demand curve of foreign investors, who have higher incentives to invest in Renminbi as a result of Chinese foreign investment. The benefits might also arise from gains in geopolitical importance or independence arising from building an international payment system in which the Renminbi is an accepted store of value and means of payment. On the other hand, individual savers may value exporting capital more than the government if they fear that capital held domestically will be captured by the government for its own private benefits. The government may have perverse incentives to restrict private outflows of capital if it can divert part of that capital to its private benefit.

To capture the wedge between private and government incentives, we assume that the government obtains a proportional benefit $B$ from all savings kept at home, which yields a total benefit to the government of $B(1 - k_t)(W + E_t)$. A value of $B > 0$ can stand in for government corruption, or more benigmly, benefits from keeping the savings domestic that are not internalized by households. A value of $B < 0$ helps us capture the extra value attributed by the government compared to households to investments abroad that help build the currency globally. Given the government’s objective, its optimal allocation is $\Psi'(k_t) = R^K - (1 + B)$. If $B > 0$, then the government chooses to send less capital abroad than households would have privately chosen, and it imposes limits on domestic capital flowing abroad concurrently with the limits on inflows by foreigners (this latter part has been the focus of our model so far).\footnote{We assume that there is a very large penalty associated with $K_t > W$ and focus for simplicity on solutions in which this constraint does not bind.}

\footnote{In practice the government might simultaneously limit some forms of domestic capital outflows and incentivize others. For example, it might limit private holdings of foreign assets and, at the same time,
Solving the model with two-way asset holdings follows the same steps as the model solution in Section 4.2. Since \( k_t \) is constant over time, the government’s objective function is an affine transformation of \( E_t = V_t \) generating similar dynamics. We further impose a realistic restriction that the marginal value of an additional unit of inside equity is less than two, so that the marginal return on an additional unit of inside equity is less than one hundred percent.\(^{26}\) We summarize the dynamics in the proposition below.

**Proposition 6** In the model with two-way capital flows, both gross foreign assets and liabilities increase in reputation. The country’s net foreign assets deteriorate as reputation improves.

As reputation builds up, gross flows happen simultaneously: foreigners hold more of the domestic bond market and domestic capital flows abroad. Foreign assets, \( K_t = k(W + E_t) \), increase in constant proportion \((k < 1)\) to the equity value of the intermediation sector. Intuitively, as reputation builds, the equity value of the intermediation sector also builds, and so does household net worth, making it more attractive to send more wealth abroad. Foreign liabilities \( D_t \) increase faster than the value of intermediation (see proof of Proposition 6 in the Appendix). The country is leveraging to extract the highest possible value out of its reputation, and becomes more levered as reputation increases. The net foreign asset position, therefore, deteriorates as reputation increases.

The model can make sense of a country like China that is a net foreign creditor at low levels of reputation: imagine that \( W \) is much larger than \( E_t \) at low levels of \( M \). Even at low levels of reputation, and while being a net foreign creditor, the country chooses to borrow some capital from foreigners in order to start building future reputation. As that reputation is built, the desire for borrowing increases faster than the desire to invest domestic savings abroad, leading to a net foreign asset deterioration. The model captures the tendency of countries that are established reserve currency providers, like the U.S., to be net foreign debtors and characterizes their dynamic adjustment toward this position.

**A.III.1 Opening Up Step and Two-Way Flows**

In the main text analysis of two-way flows, the intermediation sector inside equity is fixed and capital sent abroad is drawn from other domestic investments. Foreign assets are a constant percent of domestic wealth. When the country opens up to flighty foreign investors there is a jump up in the total value of the intermediation sector which increases foreign assets via its effect on wealth. Here we allow households to extract some of the intermediation sector inside equity and redeploy the capital abroad. This leads to a more than proportional increase in foreign assets when the country invest abroad via state-owned entity projects that the government selects. In the case of China, for example, there are tight controls on private holdings of foreign securities, but at the same time entities like SAFE and AIIB make large investments abroad using domestic savings. This could be accommodated in our framework by introducing two types of foreign investments, one over which \( B \) is positive and one over which it is negative.

\(^{26}\)See the proof of Proposition 6 in Appendix A.III.A for discussion of where this condition applies.
lets in flighty investors. To focus solely on this effect, we assume, for simplicity, that any money kept in the domestic economy is invested in the intermediation sector.

The household now allocates its resources $W$ each period between bank equity, $A_t$, and foreign investment, $K_t$, that is to say $A_t + K_t = W$. We define the wealth of the household to be $K_t + E_t$, accounting for its equity wealth and its foreign investment wealth. Given the adjustment cost of sending capital abroad, the welfare of the household can now be written as

$$R^K K_t - \Psi(k_t) \left( K_t + E_t \right) + E_t,$$

where $k_t = \frac{K_t}{K_t + E_t}$ is the fraction of wealth invested abroad. Notice that $E_t$ depends on inside equity, $A_t = W - K_t$, and so is endogenous to $K_t$. Taking the optimality condition of the committed type government for foreign investment, we obtain the solution

$$\frac{R^K - \left( 1 + \Psi'(k_t) \right)}{\Psi'(k_t) k_t - \Psi(k_t) + 1} = -\frac{h_t}{\gamma - (1 - h_t) \gamma Q - 1} \left( \text{Return on Inside Equity} \right)$$

(A.2)

Equation A.2 shows that $k_t$ depends on the return on intermediary inside equity.\(^{27}\) The LHS increases in $k_t$, so that a decrease in the return on inside equity leads to an increase in foreign investment in percent terms, $k_t$. Since the marginal return on inside equity falls at opening up due to the higher $h_t$, this means that foreign investment is a constant $k^s$ before opening up and is a constant $k^f$ at and after opening up, with $k^s < k^f$ indicating that there is a disproportionately large increase in outflows from the domestic economy after opening up.

Intuitively, opening up to flighty investors increases the overall value of the intermediation sector by increasing its scale, but the increase in scale also decreases its marginal returns. Domestic capital moves abroad for two distinct reasons: a wealth effect and a rebalancing effect. The wealth effect we described in the model in the main text. Here, we add a marginal decision for domestic households between investing domestically in the intermediation sector or investing abroad. Since the marginal returns at home decrease, the households optimally rebalance by investing more of their savings abroad as a fraction of total wealth.

We discuss below how this affects the full dynamics of the reputation model. The opportunistic type must send the same amount $K_t$ of capital abroad to mimic the committed type and retain the same inside equity stake $A_t = W - K_t$.\(^{28}\) In particular, the new transition dynamics can be written as

$$V(M_{n+1}) = \frac{g(h_n)}{g^*(h_{n+1})} \rho(h_n) V(M_n) + \frac{g^*(h_0)}{g^*(h_{n+1})} V(M_0)$$

\(^{27}\)If the (marginal) return on inside equity is one, then the RHS is zero and we obtain the same first order condition as the previous specification with constant inside equity.

\(^{28}\)For simplicity, we assume that the adjustment cost for the opportunistic type is determined based on the market value $E_t$ that arises if the capital control is not imposed.
where we have defined \( g^*(M_n) \equiv \frac{R^K k_n - \Psi(k_n)}{1 - k_n} + g(M_n) \). The transition dynamics are the same as before, except for replacements of \( g(M_n) \) with \( g^*(M_n) \). This change has two effects. The first effect is that it further dampens the slope of the AR(1) process both before and after opening up, since \( g^*(h_n) > g(h_n) \) due to the added value from sending a fraction of wealth abroad. Intuitively, as the country begins deriving more value from sending wealth abroad, it needs smaller increases in the value of inside equity to compensate for greater reputation.

The second effect comes from the change in the coefficient on \( V(M_0) \) to \( g^*(h_0) > g(h_0) \) from \( g(h_0) \). This coefficient is still equal to one before opening up. After opening up, there are two competing effects that determine whether the intercept is amplified or muted relative to before. The first effect is that the value of imposing the capital control falls after opening up, which lowers not only net worth but also the gains from sending capital abroad. This pushes the constant further towards zero and inserts a negative wedge in the transition dynamics at and after opening up. This reflects the intuition that a country that resets its reputation also benefits from a higher proportional value of inside equity in the good state. The second effect arises from the increase in capital sent abroad, \( k^f > k^s \), after opening up. This effect is ambiguous on the constant. On the one hand, it dampens the constant because the average return on foreign capital, \( R^K - \frac{1}{k_n} \Psi(k_n) \), falls as capital is sent abroad. On the other hand, it amplifies the constant because as more capital is sent abroad, less is retained at home, and so larger reputation changes are required to maintain indifference.

\[ A.32 \]

A.32A Proof of Proposition 6

The increases in both gross assets and liabilities follow immediately from the fact that \( E_t \) and \( D_t \) both increase in reputation. For the latter part of the proposition, we have

\[ NFA_t = k(W + E_t) - D_t. \]

Adopting notation \( E_t = n_t \left[ \gamma Q I - R_tD_t \right] \), where \( n_t = \frac{h_t}{\gamma_t (1 - n_t)} \) is the net worth multiplier, we can define \( v_t = n_t \gamma Q \) as the marginal value of an additional unit of inside equity. Using the Envelope Theorem, we have

\[ \frac{\partial E_t}{\partial M_t} = -n_t \frac{\partial R_t}{\partial M_t} D_t = \frac{v_t}{\gamma Q} R_tD_t \frac{1}{1 - (1 - M_t)^\tau}. \]

Now, we split the proof into the regions \( M_t < M^* \) and \( M_t \geq M^* \).

For \( M_t < M^* \), the economy has not yet opened up, and we have

\[ \frac{\partial NFA_t}{\partial M_t} = \left[ k \left( \frac{v_t}{\gamma Q} \frac{R_tD_t}{1 - (1 - M_t)^\tau} - \frac{1}{b} \frac{\gamma Q}{1 - (1 - M_t)^\tau} \right) \right]. \]

\[ ^{29} \text{Notice that the component } \frac{g(h_n)\rho(h_n)}{\gamma(h_n)} \text{ in the slope of the AR(1) is correct as before, because it comes from the indifference condition which depends on } g. \text{ By contrast, the other terms come from the Bellman equation, which depends on } g^*. \]
From here, we note that
\[
\frac{\partial^2 NFA_t}{\partial M_t^2} = k \frac{v_t}{\gamma Q} \frac{\partial}{\partial M_t} \left[ \left( \frac{1}{2} \gamma Q + \frac{1}{2} \frac{\bar{R}}{1 - (1 - M_t)\tau} \right) \frac{1}{b} \left( \gamma Q - \frac{\bar{R}}{1 - (1 - M_t)\tau} \right) \right] \tau = \frac{1}{b} k \frac{v_t}{\gamma Q} \frac{\bar{R}^2}{(1 - (1 - M_t)\tau)^3} \tau^2 > 0
\]

so that if \( \frac{\partial NFA_t}{\partial M_t} \bigg|_{M_t=1} < 0 \), then NFA is everywhere deteriorating as reputation builds. NFA is deteriorating at \( M_t = 1 \) if \( k \frac{v_t}{\gamma Q} b R_t D_t - \gamma Q < 0 \). Substituting in for \( R_t \) and \( D_t \) and rearranging, we have the sufficient condition
\[
k < \frac{2}{v_t} \frac{(\gamma Q)^2}{(\gamma Q)^2 - \bar{R}^2}
\]

Finally, note that \( \frac{(\gamma Q)^2}{(\gamma Q)^2 - \bar{R}^2} > 1 \), so the result holds provided that \( v_t < 2 \).

Next, note that at \( M = M^* \), we have continuity in \( E_t \) but an upward discontinuity in \( D_t \). Therefore, NFA discretely deteriorates at \( M^* \).

Finally for \( M_t > M^* \), we can repeat the same steps to get
\[
\frac{\partial NFA_t}{\partial M_t} = \left[ k \frac{v_t}{\gamma Q} \frac{R_t D_t}{1 - (1 - M_t)\tau} - \frac{2}{b} \gamma Q \right] \tau.
\]

From here, note that we have \( k \frac{v_t}{\gamma Q} \frac{R_t D_t}{1 - (1 - M_t)\tau} - \frac{2}{b} \gamma Q < k \frac{v_t}{\gamma Q} \frac{R_t D_t}{1 - (1 - M_t)\tau} - \frac{1}{b} \gamma Q \), and so the same argument as before applies, completing the proof.
Appendix Figures and Tables

Table A.I: Fund Sample Summary Statistics: 2020

<table>
<thead>
<tr>
<th></th>
<th>Total AUM (USD mi)</th>
<th>Total FC AUM (USD mi)</th>
<th>Average Share of Total AUM in FC Assets</th>
<th>Average Share of FC Assets in LC Government Bonds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>Mean</td>
<td>Median</td>
</tr>
<tr>
<td>Funds</td>
<td>828</td>
<td>1,970</td>
<td>532</td>
<td>132</td>
</tr>
<tr>
<td>of which Domiciled in</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMU</td>
<td>429</td>
<td>1,170</td>
<td>462</td>
<td>132</td>
</tr>
<tr>
<td>USA</td>
<td>181</td>
<td>5,035</td>
<td>1,159</td>
<td>1,170</td>
</tr>
<tr>
<td>CAN</td>
<td>65</td>
<td>977</td>
<td>509</td>
<td>237</td>
</tr>
</tbody>
</table>

Notes: This table reports summary statistics of the funds included in the baseline analysis in 2020. We report the mean and median total AUM of these funds, the AUM in assets denominated in currencies that are not the currency of the country the fund is domiciled (FC), the average share of total AUM in these FC assets and the share of these FC assets that is allocated in government bonds in the local currency of the issuing country.

Table A.II: Summary of Rankings for Alternative Estimations

<table>
<thead>
<tr>
<th></th>
<th>CNY Rank</th>
<th>Average DM Rank</th>
<th>Average EM Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>13</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>(a) UST as Reference</td>
<td>12</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>(b) Weighted by FC AUM</td>
<td>15</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>(c) Excluding Index Funds</td>
<td>13</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>(d) Intensive Margin</td>
<td>5</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>(e) Alternative Specialist Threshold</td>
<td>14</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>(f) Alternative Minimum FC AUM</td>
<td>14</td>
<td>6</td>
<td>22</td>
</tr>
<tr>
<td>(g) Alternative FC Definition</td>
<td>14</td>
<td>6</td>
<td>22</td>
</tr>
</tbody>
</table>

Notes: This table compares the ranking of CNY to the DM and EM averages for each alternative subset of the data. To compute rankings we sort the estimated correlations in each case in descending order.
<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha_{c,i}$</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>$\beta_{BRL}$</td>
<td>$-0.088^{***}$</td>
<td>$-0.088^{***}$</td>
<td>$-0.088^{***}$</td>
<td>$-0.088^{***}$</td>
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<td></td>
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<tr>
<td></td>
<td>$(0.005)$</td>
<td>$(0.005)$</td>
<td>$(0.005)$</td>
<td>$(0.005)$</td>
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<tr>
<td>$\beta_{CNY}$</td>
<td>$-0.003$</td>
<td>$-0.003$</td>
<td>$-0.002$</td>
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<tr>
<td></td>
<td>$(0.007)$</td>
<td>$(0.007)$</td>
<td>$(0.007)$</td>
<td>$(0.007)$</td>
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<tr>
<td>$\beta_{JPY}$</td>
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<td>$0.184^{***}$</td>
<td>$0.182^{***}$</td>
<td>$0.184^{***}$</td>
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<td>$-0.004^{***}$</td>
<td>$-0.006^{***}$</td>
<td>$-0.004^{***}$</td>
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<td>$-0.001$</td>
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<tr>
<td></td>
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<td>$(0.001)$</td>
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<td>R-squared</td>
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<td>0.446</td>
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<td>No</td>
<td>No</td>
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<td>Yes</td>
<td>Yes</td>
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<tr>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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</tr>
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Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. This table reports the coefficient estimates of the gravity regressions. To simplify exposition instead of reporting all the $\beta_{DM}$ (one for each currency) we only report estimates for the BRL, CNY and JPY estimates. All specifications include currency and fund domicile fixed effects. DM Share indicates whether the specification includes the variables $\alpha_{DM,c,i}$. 
Figure A.I: Geography of Private Holders of Renminbi Bonds

Notes: Figure reports identified private holdings of RMB bonds by investor country. When available, data from CPIS and TIC are used. When countries do not report the currency composition of their bond investment, data on fund holdings from Morningstar are used.

Figure A.II: The World’s Largest Bond Markets

Source: BIS Total Debt Securities by Resident Issuer
Figure A.III: Foreign Ownership of China’s Domestic Bonds

(a) in RMB

(b) in USD

Source: Data from Bond Connect, CCDC, and SHCH.
Figure A.IV: The Composition of Foreign Ownership of RMB Bonds

(a) Share of Foreign-Owned and Total Debt, 2021Q4

(b) Share of Outstanding Bonds Owned by Foreign Investors

Notes: Data from China Central Depository & Clearing (CCDC). Top panel calculates the share of the foreign and total investment portfolio in each of the various categories of bonds. The bottom panel reports what share of each bond type is owned by foreign investors.
Figure A.V: Mutual Fund and ETF Investment in RMB

(a) Share of Foreign Investment in Offshore RMB

(b) Forms of Bond Investment in China and RMB

Notes: The top panel plots the share of foreign-owned RMB denominated bonds that were issued in onshore and offshore markets in global mutual fund and ETF portfolios. Offshore markets are defined as bonds classified as Eurobonds or Global by FIGI or bonds listed as being denominated in CNH. The bottom panel plots foreign ownership level of various types of Chinese bonds. China Residency FC refers to all bonds issued by a Chinese resident entity in a currency other than the RMB, and China Nationality FC refers to any foreign-owned foreign currency bonds issued by an entity that is Chinese on a nationality basis but not resident in China. Ownership data from Morningstar.
Figure A.VI: Foreign Investors’ Entry in China’s Domestic Bond Market

(a) All investor types

(b) Mutual and Hedge Funds

Notes: Panel (a) plots the share of each investor type that had entered the market by 2021 at a given date at a more refined investor category. Panel (b) plots the share of each investor type that had entered the market by 2021 at a given date breaking down Flithy investors into Mutual and Hedge Funds. We reclassified investors categorized as “portfolio managers” or “investment advice” companies according to the most frequent category among the subsidiaries.
Notes: In each figure, an observation is the portfolio holdings of a particular fund in the 4th quarter of 2020. The y-axis corresponds to the share of foreign currency portfolio holdings in a particular currency, and the x-axis to the share of the remaining (once we exclude this currency) foreign currency portfolio in DM currencies. In each panel, the blue dot represents the holdings of the PIMCO Emerging Markets Local Currency and Bond Fund and the red dot represents the holdings of the T. Rowe Price International Bond Fund. Notice the two funds are domiciled in the U.S. and, as explained in the text, their portfolio shares in USD are not considered for the analysis.
Figure A.VIII: Cross-Section of Estimates in 2020: Alternative Specifications

Notes: Figures report the correlation between the holdings of bonds in each currency and holdings in Developed Markets (DM) currencies for alternative specifications.
Figure A.IX: Cross-Section of Beta Estimates in 2020

Notes: These figures plot the estimate $\beta_{DM}$ in the gravity regressions including distance, trade flow and the common legal system dummy, as well as currency and fund domicile fixed effects. Gray lines correspond to 95% confidence intervals computed via bootstrapping.
Figure A.X: Portfolio Similarity with Developed Countries’ Local-Currency Government Bonds: 2010 to 2020

Notes: Figure plots the evolution of the portfolio share correlation with DM Local-Currency Government Bonds. Gray lines correspond to the other currencies. We plot currencies that accounted for at least 0.3% of the total foreign currency investment in government bonds on average between 2014 and 2020.
Figure A.XI: Cross-Section of Correlation Estimates in 2020

(a) USD Corporate Bonds

(b) Equities

Notes: These figures report the correlation measure by nationality of the issuer for different types of assets. Gray lines correspond to 95% confidence intervals computed via bootstrapping.
Figure A.XII: Returns on RMB relative to EM and DM Currencies

(a) HML

(b) VIX

Notes: 2010-2021. Quarterly returns based on 3m Government bond yields. $\beta_i$ estimated via univariate country-specific regressions of quarterly bond returns on the factor (HML in the top panel, and the log change in the VIX in the bottom panel). Data from Du et al. (2018).
Figure A.XIII: Understanding the Opening Up Decision

Panel (a) plots the case of $M < M^*$, Panel (b) plots the case $M = M^*$, and Panel (c) plots $M > M^*$. In each plot the schedule $R_0$ is the interest rate schedule available to the government if it borrows only from stable investors, and $R$ the interest rate schedule if it borrows from both stable and flighty investors. Point A denotes the optimal debt issuance of the government conditional on only borrowing from stable investors, while Point B denotes the optimal debt issuance conditional on borrowing from both. The global optimal decision is given by the highest of the profits in point A and B. Indifference curve $h^s$ denotes pairs of debt and interest rate that yield the same payoff to the committed government when the haircut is $h^s$. Indifference curve $h^f$ denotes pairs of debt and interest rate that yield the same payoff as points on indifference curve $h^s$, but when the haircut rises to $h^f$.

Notes: These figures provide a graphical representation of the opening up decision.
Figure A.XIV: Equilibrium Reputation Cycle: Homogeneous Foreign Investors

Notes: Numerical illustration of the equilibrium of the model when foreign investors are homogeneous. The $N$ dashed-red line is the graduation step.
Figure A.XV: Equilibrium Reputation Cycle: Heterogeneous Foreign Investors Demand Curves

Notes: Numerical illustration of the equilibrium of the model when foreign investors are heterogeneous. The $N^*$ dashed-green and $N$ dashed-red lines are the opening up and graduation steps, respectively.