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INTERNATIONALIZING LIKE CHINA

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ABSTRACT

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.

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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

[1] See also Prasad (2017), Mo and Subrahmanyam (2020), and Lai (2021).
[2] See 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

[3]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.

[4]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)).[5] 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.[6] 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

[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".

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.

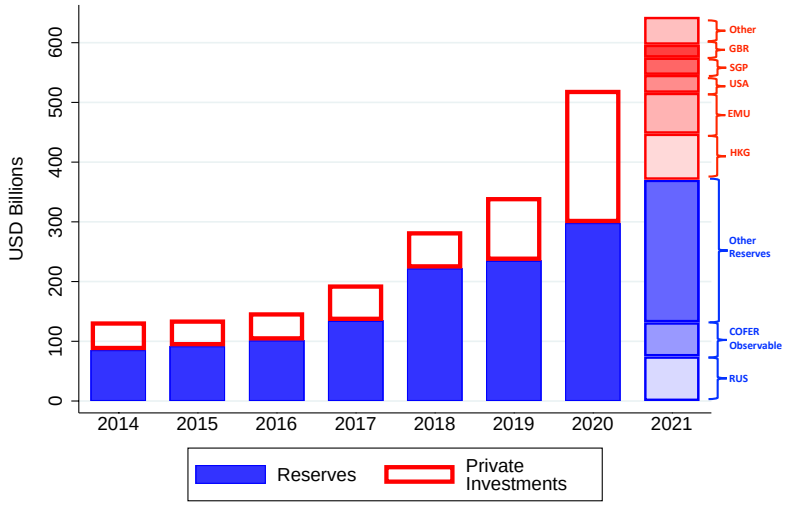
The process was gradual and featured some setbacks. There were two significant instances of foreign capital outflows over the last decade. The first occurred during the financial market turbulence of 2015-2016: between June 2015 and March 2016 the value of foreign holdings declined from $108 to $92 billion dollars, a 15% decline.[7] 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.[8] 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

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

[8] See Arslanalp, Eichengreen and Simpson-Bell (2022) for an analysis of the changing composition of global foreign exchange reserves.

Figure 1: Composition of Foreign Ownership of China-Issued RMB Bonds



Notes: Figure plots our estimated breakdown of foreign ownership of RMB denominated bonds into central bank reserves and private holdings. Data on reserves are from IMF COFER and private holdings are from IMF CPIS or from commercial data. See Appendix A.I.A for details.

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.[9]

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.[10]

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

[9] As discussed in Bahaj and Reis (2020) and 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.

[10] 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.

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

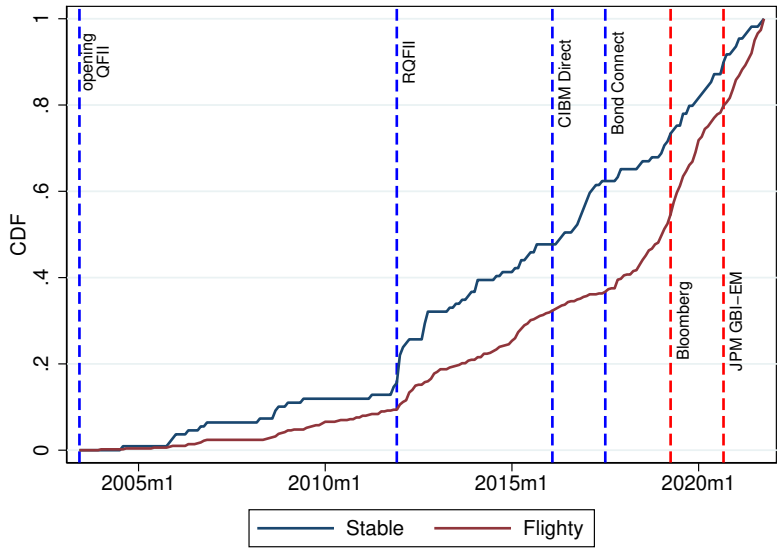
In the previous subsection, we documented the holdings of RMB bonds in China by reserve managers and foreign private investors. Here, we turn to understanding how China selected which type of investors would be able to invest in its bond market over time. To do so, we create a new monthly dataset of 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."[11]

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.[12] 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.

[12] Appendix 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.

Figure 2: Entry into Domestic Markets



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.[13] These 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.[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.[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.[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:

$$\alpha_{c,i} = \frac{\sum_{b \in B_c} \text{MV}_{b,i}}{\sum_{c \in FC_i} \sum_{b \in B_c} \text{MV}_{b,i}}$$

where $\text{MV}_{b,i}$ 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

[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.

[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.

[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

$$\rho_{c,DM} = corr_i \left(\alpha_{c,i}\ , \alpha_{DM,c,i}\right), \tag{1}$$

where the notation $corr_i$ 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.

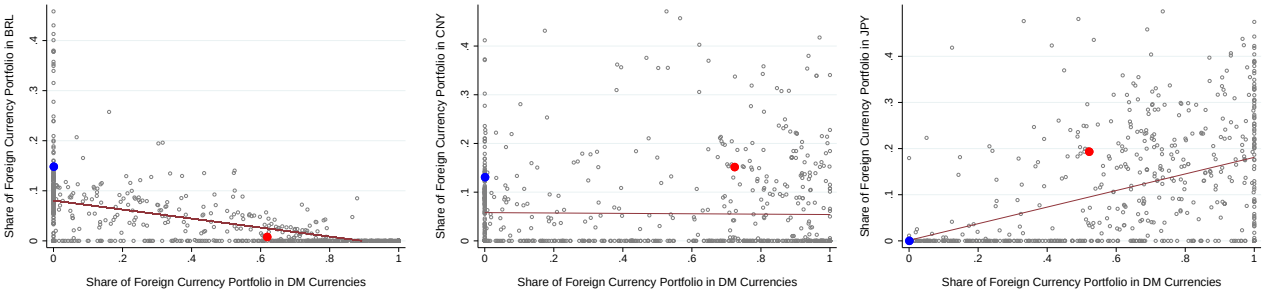
Second, we exclude from our analysis funds that specialize in any particular currency, which we define as funds that have more than 50% of their foreign currency bond portfolio in a single currency. We do so because these funds are most likely to have too specific a mandate to reliably contribute to 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.

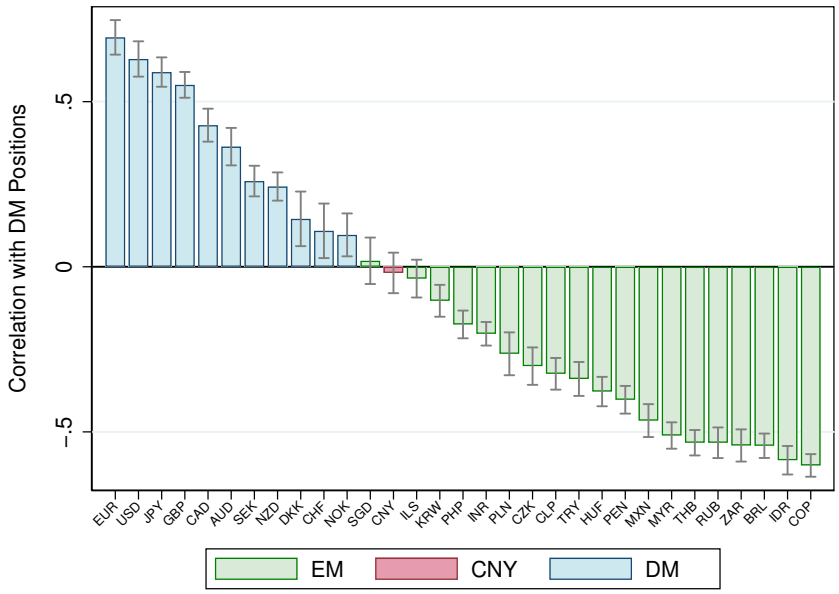
Figure 3: Portfolio Shares by Currency



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

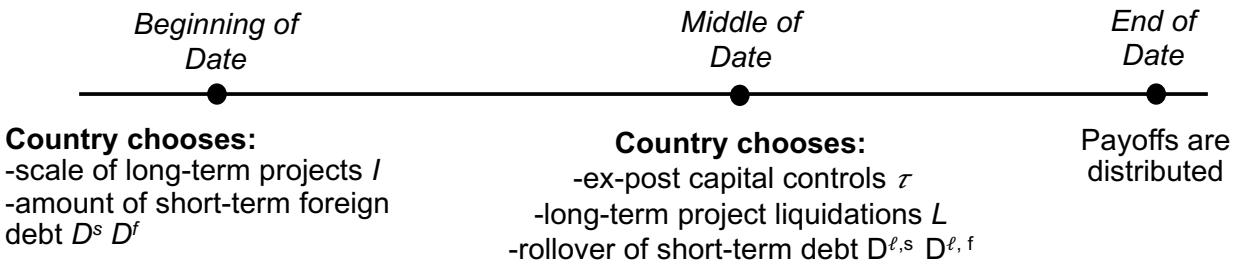
Notes: In each panel, observations are the portfolio holding shares of a particular fund in December 2020. The vertical axis is the portfolio share in BRL in the left panel, CNY in the middle panel, and JPY in the right panel. The horizontal axis in all panels is the portfolio share in developed markets 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.

Figure 5: Model Timeline Within Each Date



Notes: Figure displays the timing of the stage game within each date t.

DM focused funds.[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.

[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 $t = 0, 1, ...$ 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 $\tau \in \{0, \overline{\tau}\}$. 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.

Government 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

[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.

in the middle 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 t denoted by amount $D_t^i \geq 0$, $i \in \{s, f\}$, from the two types of investors at endogenous interest rates R_t^i. Denote $D_t = D_t^s + D_t^f$ to be total foreign debt borrowed at the beginning of date t and $R_t = \frac{R_t^s D_t^s + R_t^f D_t^f}{D_t^s + D_t^f}$ 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 γL_t the liquidation value that accrues to the intermediary.

The intermediary can roll over or repay the intermediary foreign debt in the middle of t. Denoting $D_t^\ell = D_t^{\ell,s} + D_t^{\ell,f}$ to be total debt that is rolled over, it must satisfy the budget constraint $D_t^\ell = R_t D_t - \gamma L_t$. 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_t^ℓ the common endogenous interest rate for debt rollover. We assume that debt rollover is subject to a pledgeability constraint,

$$R_t^\ell D_t^\ell \leq (1 - h_t)(QI_t - L_t), \tag{2}$$

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 $c_t = QI_t - L_t - R_t^\ell D_t^\ell$. We assume that the pledgeability constraint binds in the middle of t.[20] Substituting the rollover budget constraint $D_t^\ell = R_t D_t - \gamma L_t$ and the pledgeability constraint (equation 2) into the final payoff yields

$$c_t = \frac{h_t}{\gamma - \frac{1-h_t}{R_t^\ell}} \Big(\gamma QI_t - R_t D_t \Big). \tag{3}$$

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 the rollover interest rate R_t^ℓ is higher, because both tighten the pledgeability constraint and force more liquidations.

Investor Payoff and Demand Schedule. 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_t^i, at promised interest rate R_t^i, 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

[20] Appendix A.II.A derives equation 3 and provides a sufficient condition for the pledgeability constraint to bind.

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, we assume that

$$h_t = \begin{cases} h^s, & D_t^f = 0 \\ h^f, & D_t^f > 0 \end{cases} \tag{4}$$

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. As equation 4 makes clear, we have assumed that 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.[21]

Having discussed above the preferences and technology that characterize the stage game, we are now ready to define the equilirbium and solve the stage game. We solve by backward induction, starting in the middle of t with the demand for rollover debt.

Investor Payoff and Equilibrium in the Middle of t. An investor of type i with a debt repayment due of $R_t^i D_t^i$ pays a tax τ on net outflows, $\max(R_t^i D_t^i - D_t^{\ell,i}, 0)$, where $D_t^{\ell,i}$ is the new debt and $\tau \in \{0, \overline{\tau}\}$ 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_t^ℓ per unit rolled over in the middle of t. Investors solve the following problem:

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

Intuitively, investors are indifferent to any debt rollover if the interest rate is $R_t^\ell = 1 - \tau$.

We are now ready to define an equilibrium of the debt market in the middle of t. Given the capital control τ, an equilibrium is intermediary debt rollover D_t^ℓ, investor lending $D_t^{\ell,i}$, and an interest rate R_t^ℓ such that: (i) intermediaries and investors optimize, given the interest rate; (ii) the debt market clears, that is $D_t^\ell = D_t^{\ell,s} + D_t^{\ell,f}$. Lemma 1 shows that the equilibrium features an interest rate $R_t^\ell = 1 - \tau$.

Investor Payoff and Demand at the Beginning of t. Having solved the equilibrium in the middle of t, we can now move one more step backward. At the beginning of t, investors take as

[21] 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.

given the promised interest rate R_t^i 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:

$$\max_{D_t^i \geq 0} \quad \overline{R}w + (R_t^i E[1-\tau] - \overline{R})D_t^i - \frac{1}{4}\frac{b}{\omega(M_t)}D_t^{i2}, \tag{5}$$

where the first two terms are the expected monetary payoff at the end of the date, $E[c_t^{*,i}]$, 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). The solution to the maximization problem (equation 5) provides the investor demand curve for debt at the beginning of t, D_t^i.

The Lemma below collects the equilibrium interest rate in the middle of t and the demand curves in the beginning of t, D_t^i.

Lemma 1 *The equilibrium in the middle of t and foreign investors' optimization problems in the beginning of t lead to the following interest rate schedules:*

$$R_t^i = \frac{\bar{R} + \frac{1}{2}\frac{b}{\omega(M_t)}D_t^i}{1-(1-M_t)\overline{\tau}} \tag{6}$$

$$R_t^\ell = 1-\tau \tag{7}$$

Intuitively, the middle date interest rate (equation 7) is depressed whenever capital controls are imposed, $\tau = \overline{\tau}$, since controls worsen the investor outside option. The beginning of date interest rate schedule (equation 6) 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.

Equilibrium of the Debt Market at the Beginning of t. Equation 6 provides the demand curve for debt at the beginning of t. Since the government is a monopolist in this debt market, the equilibrium of the debt market at t is determined by the optimal choice of issuance of the government, which we turn to below. The equilibrium solution can be analyzed by first determining what the committed type of government optimally chooses to do in each date. 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 (see below). Hence, the equilibrium of the debt market at the beginning of t is identical irrespective of whether the government is committed or opportunistic.

Optimal Debt Policy of the Committed Type. 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_t^s, D_t^f) in order to maximize its date t objective (equation 3 with $R_t^\ell = 1$, that is $\tau = 0$), subject to the interest rate schedules of stable and flighty investors (equation 6) 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*

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

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

and the resulting interest rate is $R(M_t) = \frac{1}{2}\frac{\bar{R}}{1-(1-M_t)\overline{\tau}} + \frac{1}{2}\gamma Q$, 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. There are two key characteristics of the model that lead to this result: (i) market power of the government in the debt market; and, (ii) opening up treats all investors pari passu. We highlight the role of these assumptions below.

The intuition follows a typical fixed cost problem, which can be best visualized by taking the log of the government's date t payoff,

$$\log c_t = \underbrace{\log \frac{h_t}{\gamma - (1-h_t)}}_{\text{Net worth multiplier}} + \log\Big(\gamma Q I_t - R_t D_t\Big).$$

After taking the log, the net worth multiplier enters the government's objective separably from debt. This means that an increase in the haircut from $h_t = h^s$ to $h_t = h^f$ is a fixed cost to the committed government from the reduction in its net worth multiplier. The cost of admitting the flighty investors is that the necessary reforms make it easier for all investors to fly capital out of the country. Formally, the haircut increases from h^s to h^f for all investors, thus negatively affecting the value to the government of the inframarginal holders (i.e., the stable investors present before the reform). The committed government is only willing to pay this fixed cost if the benefit from doing so is sufficiently high. In particular, the benefit the committed government receives is the ability to borrow from a second class of investors without increasing the marginal interest rate.

As reputation M_t increases, the interest rate schedules R_t^i shift downwards and flatten. Since the government is a monopolist, when the price becomes less sensitive to the quantity issued, it is able to extract more surplus. This means that at higher reputation, the government can raise more debt at lower interest rates. This makes the benefit of borrowing from a second class of investors increase in the government reputation. The threshold is the point M^* at which the benefit of increasing the debt by letting in the flighty investors exactly equals the fixed cost of the higher haircut. Appendix A.II.D provides a graphical illustration of this tradeoff.

Our pari passu assumption (equation 4) is supported by the nature of the reforms that China instituted in practice as detailed in Section 2. For example, the Chinese government made a major market reform, the introduction of the Bond Connect in 2017, to allow in a new class of "flightier" private investors. The new market platform, however, is accessible and used by all investors, including those that had invested in China before 2017 under programs that made taking the capital out at short notice much harder. In this sense, opening up to flightier investors makes ex-post deleveraging in a crisis more acute as all investors now require better terms in order to roll over the debt.

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

$$V(M_t) = \frac{h(M_t)}{\gamma - (1 - h(M_t))} \quad \Big(\gamma Q I(M_t) - R(M_t) D(M_t)\Big) \tag{8}$$

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 chooses the same debt issuance as the committed government at the beginning of t to avoid immediately revealing its type.[22] 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 8. 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:

$$V^{Opp}(M_t, \tau) = \begin{cases} V(M_t), & \tau = 0 \\ g(M_t)V(M_t), & \tau = \overline{\tau} \end{cases} \tag{9}$$

[22] 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.

where

$$g(M_t) = \frac{\gamma - (1 - h(M_t))}{\gamma - \frac{1-h(M_t)}{1-\overline{\tau}}}. \tag{10}$$

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 π_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 π_t is not necessary for clarity.

We define a strategy of the opportunistic government to be a probability $m^o(\pi_t) \in [0,1]$ that it will not impose capital controls in the middle of the date when investors hold beliefs π_t at the beginning of that date.[23]

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 π_t. Consider strategies that are Markov in π_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 $D_t^i = D^i(M(\pi_t))$, $i \in \{s, f\}$, 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 $D_t^f = 0$ and $n_t = n^f$ (where $0 < n^f \leq n^s$) if $D_t^f > 0$. γQ 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 $\tau = \overline{\tau}$, where $g_t = g^s$ if $D_t^f = 0$ and $g_t = g^f$ if $D_t^f > 0$, with $g^s \geq g^f \geq 1$. Investor i receives payoff from lending equal to $R_t^i D_t^i$ if $\tau = 0$ and $(1-\overline{\tau})R_t^i D_t^i$ if $\tau = \overline{\tau}$, and her beginning of period expected utility is $\bar{R}w + (R_t^i E[1-\tau] - \bar{R})D_t^i - \frac{1}{4}\frac{b}{\omega(M_t(\pi_t))}D_t^{i2}$. 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

[23] 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.

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

$$\pi_{t+1} = \epsilon^O + (1-\epsilon^C-\epsilon^O)\frac{\pi_t}{M(\pi_t)}. \tag{11}$$

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,

$$W(\pi_n) = \max_{m_n^o \in [0,1]} m_n^o \Big(V^{Opp}(M(\pi_n),0) + \beta W(\pi_{n+1}) \Big) + (1-m_n^o)\Big(V^{Opp}(M(\pi_n),\bar{\tau}) + \beta W(\pi_0) \Big). \tag{12}$$

A mixed strategy $m_n^o \in (0,1)$ 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, $m_n^o = 0$, requires a weak preference for the capital control, whereas a pure strategy of not exercising the capital control, $m_n^o = 1$, 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 $\{D_n^s, D_n^f\}$, 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. *π_n is consistent with Bayes' rule in equation 11 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 $n < N^*$.[24] 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

$$W(\pi_n) = g(M_n)V(M_n) + \beta W(\pi_0), \tag{13}$$

[24] 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.

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

$$W(\pi_0) = \frac{1}{1-\beta} g(M_0) V(M_0). \tag{14}$$

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 13 and 14 into this indifference condition to obtain the representation

$$V(M_{n+1}) = \frac{g(M_n)}{g(M_{n+1})} \rho(M_n) V(M_n) + \frac{g(M_0)}{g(M_{n+1})} V(M_0) \tag{15}$$

where we have defined $\rho(M_n) = \frac{1}{\beta}\frac{g(M_n)-1}{g(M_n)}$. Equation 15 characterizes the indifference path of 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 opportunistic 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 15 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 opportunistic government also plays a pure strategy at $n > N$, meaning that $W(1-\epsilon^C) = g(1-\epsilon^C)V(1-\epsilon^C) + \beta W(\pi_0)$.[25] Combining these conditions with equation 13 yields

$$V(1-\epsilon^C) \leq \frac{g(M_N)}{g(1-\epsilon^C)} \rho(M_N) V(M_N) + \frac{g(M_0)}{g(1-\epsilon^C)} V(M_0). \tag{16}$$

Equation 16 parallels equation 15. Intuitively, it states that graduation occurs once the required indirect utility V to sustain a mixed strategy exceeds the upper bound on indirect utility $V(1-$

[25] If $N^* < N+1$, then equation 16 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 $\Big(1-(1-\beta)g(1-\epsilon^C)\Big)V(1-\epsilon^C) \leq \beta g(M_0)V(M_0)$, 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 $n > N$.

ϵ^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 15 implies there is an indirect utility $V \leq V(1-\epsilon^C)$ that makes an opportunistic government indifferent between imposing and not imposing the capital control. But this means the opportunistic 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.

Homogeneous Investors. We set $h^s = h^f$ so that all investors are equally flighty. The transition dynamics of equation 15 simplify to:

$$V(M_{n+1}) = \rho^f V(M_n) + V(M_0). \tag{17}$$

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 β, 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 16 is[26]

$$V(1-\epsilon^C) \leq \rho^f V(M_N) + V(M_0). \tag{18}$$

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 18 is satisfied.[27] 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 17 and the path of beliefs described by equation 11 have different responses to a change in the initial government reputation M_0. An increase in initial

[26] As noted above, equation 18 also guarantees that $m_n = 0$ is optimal for $n > N$.

[27] If $\rho^f > 1 - \frac{V(\epsilon^O)}{V(1-\epsilon^C)}$, the proof of Proposition 2 additionally shows that it must be the case that $N < \infty$.

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 π_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 π_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 18, 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.

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 ϵ^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 17 and 18. We now characterize the case $0 < N^* \leq N+1$. The transition dynamics of equation 15 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 $\mathcal{N}_1 \equiv \{n | n+1 < N^*\}$. For any $n \in \mathcal{N}_1$, 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 15 reduce to

$$V(M_{n+1}) = \rho^s V(M_n) + V(M_0). \tag{19}$$

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 15 reduce to:

$$V(M_{N^*}) = \frac{g^s}{g^f}\Big(\rho^s V(M_{N^*-1}) + V(M_0)\Big). \tag{20}$$

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, $\mathcal{N}_2 \equiv \{n | N^* \leq n < N\}$. 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 15 reduce to

$$V(M_{n+1}) = \rho^f V(M_n) + \frac{g^s}{g^f} V(M_0). \tag{21}$$

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 ρ^s to ρ^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 16 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

$$V(1-\epsilon^C) \leq \frac{g^s}{g^f}\Big(\rho^s V(M_{N^*-1}) + V(M_0)\Big).$$

Relating back to the intuition behind equation 20, 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.

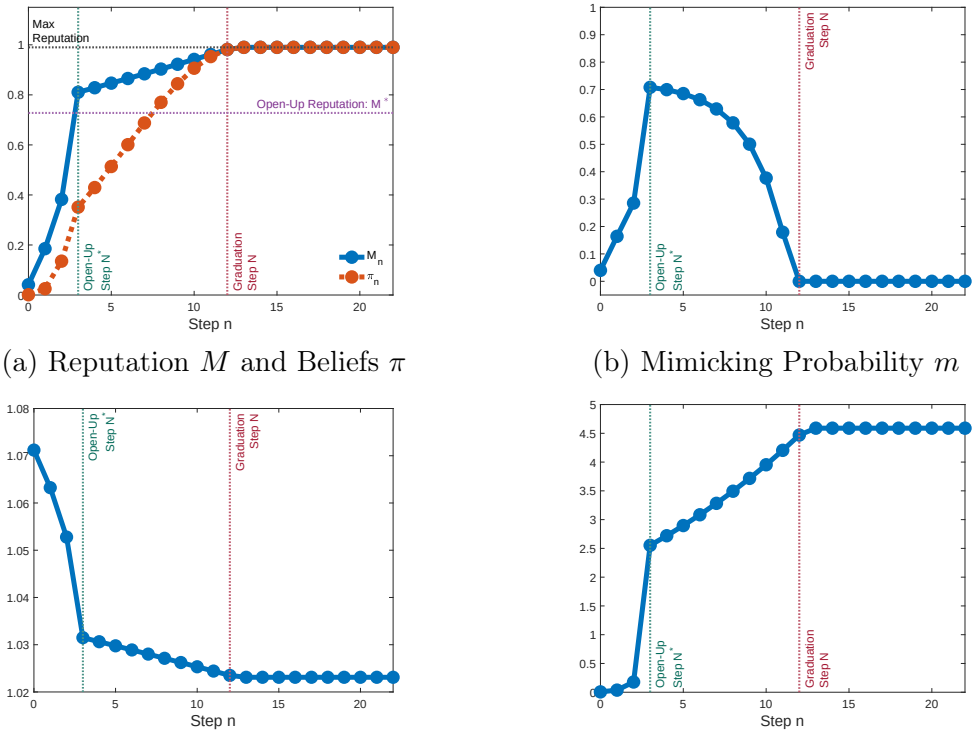
Proposition 3 *There is at most one graduation step Markov equilibrium associated with an opening up step N^*.*

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 20, 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 19 governed the dynamics, we would have $M_{N^*} < M^*$. This in turn rationalizes the decision of committed governments not to open up.[28]

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 π_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.

[28] This further clarifies uniqueness in the homogeneous case, $h^s = h^f$, where there is no shift in transition dynamics.

Figure 6: Equilibrium Reputation Cycle: Heterogeneous Foreign Investors



(a) Reputation M and Beliefs π

(b) Mimicking Probability m

(c) Interest Rate R

(d) Debt Issuance D

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.

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, 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.[29]

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

[29] 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.

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.[30] 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

[30]For 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.

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.[31] 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)).[32]

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

[31] In 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."

[32] In the model, liquidations happen at an exogenous price γ. 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.

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.

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 $c_t = E[n_t](\gamma QA + (\gamma Q - R_t)D_t)$, 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

$$R_t = \frac{\overline{R} + \frac{1}{2}bD_t^i}{1 - (1 - \mathcal{M}_t)\overline{\tau}}$$

where $\mathcal{M}_t = p + (1-p)M_t$ 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 6. $\mathcal{M}_t$ 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 $D_t^\ell = R_t D_t$.*
2. *If the Low state is realized and $\tau = 0$, then $D_t < D_{t+1}$ and $D_t^\ell|_{\tau=0} < R_t D_t$.*
3. *If the Low state is realized and $\tau = \overline{\tau}$, then $D_t > D_{t+1}$ and $D_t^\ell|_{\tau=\overline{\tau}} > D_t^\ell|_{\tau=0}$.*

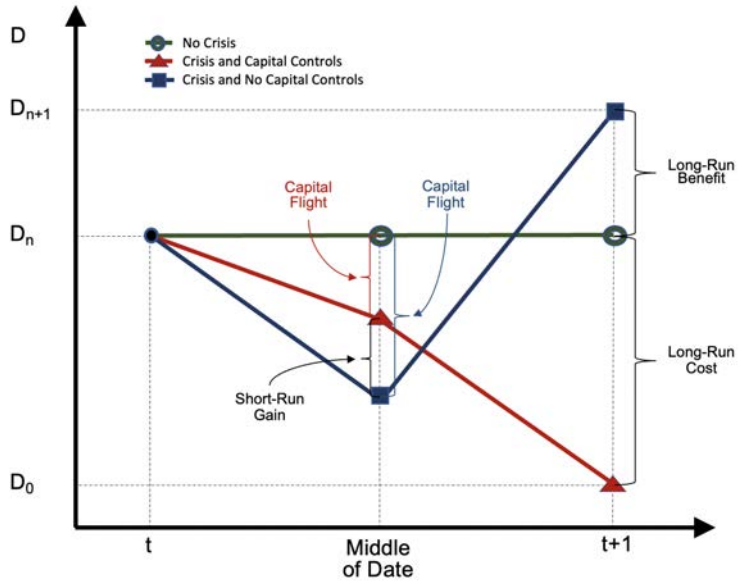
Figure 7 illustrates the debt dynamics of the model from Proposition 4. Consider an opportunistic government that at date t is at step $0 < n < N$ of its reputation cycle and denote its foreign debt D_n. Over date t there are three possible scenarios: no crisis, a crisis without the imposition of ex-post 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 ($D_{t+1} = D_t = D_n$).[33] 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 debt. The foreign debt levels fall due to the capital flight.[34] In this scenario, the government suffers through the crisis and does not impose ex-post capital controls. This builds higher reputation into

[33] Formally, in the middle of the date we have $D_t^\ell = R_t D_t$, and the picture is drawn for $R_t = 1$ to stress that debt levels remain constant.

[34] 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.

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.

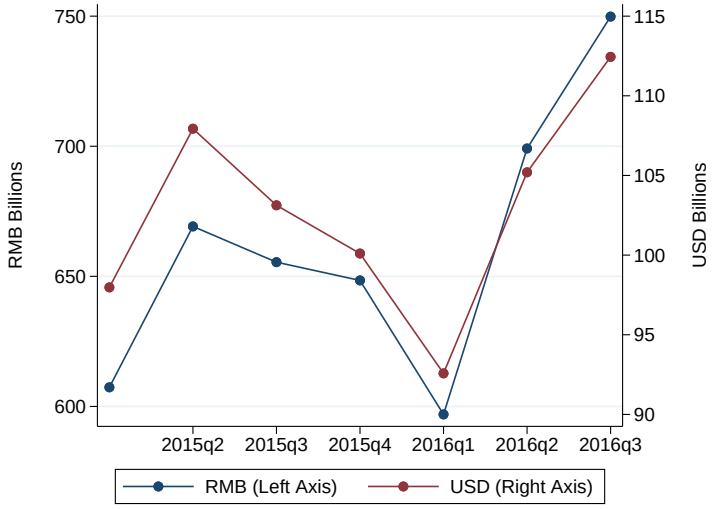
the next period. Once the crisis has passed at $t+1$, reputation is now higher and foreign capital not only comes back but is even higher than before, so that $D_{t+1} = D_{n+1} > D_n = D_t$. This scenario presents a typical V-shaped pattern in capital flows: foreigners panic and pull out during a crisis, 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

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).

denominated bonds, foreigners sold 11% of their holdings between 2015Q2 and 2016Q1.[35] 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."[36] The possibility of China imposing outflow controls was also openly discussed by policymakers. For instance, the Governor of the Bank of Japan Haruhiko Kuroda suggested that China enact capital controls to stop outflows, saying "Capital controls could be useful."[37] The Financial Times Editorial Board supported this position, writing that "Capital controls may be China's only real option."[38]

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.[39] While China never had a particularly strong reputation for allowing

[35] The dollar value of holdings (including valuation effects) declined by 15%.

[36] See: RMB Internationalization in 2017: Change, alignment and maturity.

[37] See: Financial Times Article.

[38] See: Financial Times Article.

[39] 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,

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.[40]

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 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."[41] 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.

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as well as issuing 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."

[40] 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).

[41] IMF Communique.

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

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