Internationalizing Like China

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We empirically characterize how China is internationalizing the Renminbi by selectively opening up its domestic bond market to foreign investors and propose a dynamic reputation model to explain this internationalization strategy. The Chinese government deliberately controlled the entry of foreign investors into its market, first allowing in relatively stable long-term investors like central banks before allowing in flightier investors like mutual funds. Our framework explains these patterns as the result of a government strategy to build its reputation as an international currency issuer while attempting to reduce the cost of potential capital flight as it tries to gain credibility. The dynamics of reputation make Chinese debt a substitute for emerging market risky debt in the early stage of internationalization and more of a substitute for developed countries safe debt in the later stages. We extend our framework to explore how countries compete to become a reserve currency. Competition worsens the incentives to build up reputation by reducing the benefits of having a higher reputation. The framework is tractable and allows to make sense of both new entrants like China and established players like the United States.

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1 Introduction

With the third largest domestic bond market in the world behind the United States and the Euro Area, China is often described as a possible future international currency provider. However, unlike the US 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. 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 is in its relatively 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 international monetary system. This paper makes two contributions. First, it empirically characterizes the Renminbi's internationalization and the changing nature of foreign investment. Second, it provides a tractable framework to shed light on the gradual strategy that the Chinese government is pursuing in the internationalization of the Renminbi.

We begin our analysis by providing a comprehensive characterization of foreign investment in China's domestic bond market. We document three stylized facts. First, after being largely segmented from global capital markets, foreigners have now started investing in Renminbi-denominated bonds. The initial increase in foreign investment was driven by central banks while the more recent increase has been driven by private investors. Second, 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. Third, by the time the Chinese government allowed in flightier private capital, foreign investors were holding Renminbi-denominated bonds not merely as part of emerging market debt portfolios, but also in developed markets debt portfolios.

We begin by documenting that while the initial foreign flows into Renminbi (RMB) bonds were driven by central banks, a share of the growth over the last few years has been coming from private sector investors around the world. We then turn to documenting that the changing investor composition was a deliberate policy choice of the Chinese government. 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, and some hedge funds.

We provide evidence that by the time China allowed in relatively flighty foreign investors, RMB bonds were in many cases held in foreign private portfolios in conjunction with safer developed market debt rather than riskier emerging market debt. To demonstrate these substitutability patterns, we use micro data at the security level for private foreign investors like mutual funds, exchange traded funds (ETFs), and insurance companies to analyze the portfolios shifts corresponding to

increased holdings of RMB bonds. While there is substantial heterogeneity, funds do tend to specialize in the broad types of assets that they hold. For example, a fund that holds bonds in a given emerging (developed) market currency is substantially more likely to invest in other emerging (developed) currencies bonds. In our sample, RMB bonds occupy a middle position between developed and emerging market debt, with funds that hold them likely to have both types of debt in the rest of their portfolio. We also document which assets funds sold in order to purchase RMB bonds in recent years. We find that funds purchasing RMB bonds are generally substituting away from developed currency bonds, such as the U.S. Dollar, Euro and Japanese Yen, rather than emerging market currencies like the Brazilian Real or Mexican Peso.

The patterns documented above raise many interesting questions on how a large economy can or should internationalize its currency, what is the rationale for gradualism and selecting the investors base, and the effect of Chinese capital market liberalization on other bond markets around the world and interest rates. We develop a theoretical framework to make sense of the above facts and provide a way to think about these issues. The framework has three core ingredients: governments that are potentially opportunistic and may want to capture foreign capital in crises, heterogeneous foreign investors with varying degree of flightiness, and slow building of reputation of issuing governments in the eyes of foreign investors. The framework is tractable and allows a number of generalizations including competition among issuing countries and two-way capital flows.

We interpret the policy choices of China as trading off building reputation as a country capable of providing the global 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 causing crises as the investors pull out in times of stress. Crises are costly both directly because they lead to costly liquidations, and also indirectly because attempts to limit a flight of capital 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. In practice, 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 type 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 requiring less collateral in a crisis to roll over the debt. We view this class as capturing the behavior of central banks, sovereign wealth funds, but also some private investors that have particularly long-horizons and stable funding (e.g. endowments and other non-profit institutions). The other class, flighty private investors, captures the majority of private investors like mutual funds, ETFs, and hedge funds.

We develop a dynamic reputation model in the spirit of Phelan (2006) and Amador and Phelan

(2021) 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. Following negative aggregate shocks, foreign investors demand high collateral to roll over existing debt, forcing some assets to be liquidated to repay debt that cannot be rolled over due to insufficient collateral. 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 of the country: the more foreigners expect the country to impose the controls ex-post, the worse the terms of credit are ex-ante.

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 only borrow 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 following a bad shock, 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 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.

Our model provides a rationale for China's gradual approach to internationalization of its markets, a gradualism that fits with the philosophy "crossing the river by feeling the stones." This saying refers to crossing a river safely by touching each stone one steps on, and captures the idea of improving policy via experimentation and gradual reforms. Gradualism in the model occurs both within each class of investors, since foreign participation builds gradually as reputation improves, and across classes with reforms that let in new classes of investors.

Establishing the credibility of being an international currency issuer, like the strong reputation the US currently has in global markets, is a slow and arduous process. Throughout modern history, many would-be contenders, like Japan or the Eurozone, have failed to displace the dominance of the dollar. Whether or not the Renminbi will become a reserve currency is also uncertain. The model captures this dynamic in several ways. Reputation can only be built 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 tamper with foreign debt holdings. The 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 governments during crises is a salient moment for investors to update their beliefs on 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.

As reputation builds, and investors become more sure a government will not impose capital

controls, it becomes more difficult to build it further and many governments decide that further gains in reputation are too small to justify not imposing capital controls in the next crisis. Those governments that trigger the controls lose their reputation with investors, thus resetting their reputation cycle. The model points out that the evolution of the Renminbi as an international currency is unlikely to be a straight line; rather there will be crises and there may be set-backs in reputation, with foreign investors fleeing and China potentially introducing new restrictions on foreign investors. The stationary distribution of the model shows that countries endogenously spend most of the time at low levels of reputation and instituting policies in crisis that indeed confirm such low reputation is warranted.

The model is tractable and can help make sense not only of new situations, like China's internationalization, but also the behavior of established players like the US and their past trajectory. To do so we develop a model of competition among issuing countries and investors who specialize in holding assets issued by lower or higher reputation governments (i.e. developed or emerging market debt). Competition has a deep interaction with reputation building since countries' choices feature an interesting complementarity: if a country's competitors impose capital controls today and reset their reputation, then that country has higher incentives not to do so since tomorrow at a higher level of reputation it will capture a larger share of the market (face a better residual demand curve).

We show that competition lowers the incentives to build a higher reputation by limiting the future benefits of becoming a reserve currency. In the extreme, committed governments could provide such high levels of competition as to deter any attempt by opportunistic governments to build reputation. More generally, we show that competition induces countries like China, currently at low levels of reputation, to spend more time (in a stationary distribution sense) at low levels of reputation.

Finally, we extend the model to include two-way capital flows. Both gross foreign assets and liabilities grow in reputation, and crises with losses of reputation feature two-way retrenchment, a sharp contraction in both gross assets and liabilities. A country like China can start as a large net foreign creditor at low levels of reputation. Even if domestic savings are high, and so is the desire to invest these savings abroad, the governments wants to let foreigners into the domestic bond market to start building reputation in the eyes of global investors. Reputation is like a pledgable asset, it is valuable because one can borrow against it. The higher its value, the more the country wants to lever against it. As reputation builds, the net foreign assets position deteriorates and established reserve currency issuer tend to be net foreign debtors.

Related Literature. The internationalization of the Renminbi is an important global macroeconomic development that has attracted much policy attention but surprisingly little formal analysis, either empirically or theoretically. In a similar spirit to this paper, Song, Storesletten and Zilibotti (2011) documented a number of stylized facts about the nature of China's economic growth strategy and provide a theoretical framework consistent with the observed patterns. Our focus is more

directly related to the literature on China's bond and currency market reforms like Song and Xiong (2018), Cerutti and Obstfeld (2018), Prasad (2017), Mo and Subrahmanyam (2020), and Lai (2021) and papers included in the handbook by Amstad, Sun and Xiong (2020). Brunnermeier, Sockin and Xiong (2017) and Brunnermeier et al. (2022) focus on China's gradualistic approach to financial markets reforms.

There is a recent theoretical literature on the international monetary system, mostly focusing on established international currencies like the the US dollar and euro (Farhi and Maggiori (2018), He, Krishnamurthy and Milbradt (2019), 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 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), and in particular to papers that consider changes in the commitment types over time (Phelan (2006), Amador and Phelan (2021)).[1] 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.

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

2 Background on China's Bond Market

We begin by providing a brief overview of China's bond markets. 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.I shows the remarkable growth in China's bond market over the last 15 years, the value approaching nearly $20 trillion at the end of 2020. 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 Figure A.I are the closest to the textbook case of free capital movement, thus making China an interesting stand out 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, the bonds of the large Chinese state-affiliated policy banks (Agricultural Development Bank of China, China Development

[1] See also Cripps et al. (2004), Tadelis (1999), and Mailath and Samuelson (2001).

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 the categories were supplanted by local-government bonds. 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 regulating the type of investors that could enter via 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 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.[2] 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.[3] In these early stages, the quotas were small and only a narrow range of investors actually gained access to the market. Importantly, QFII investment was originally subject to a one-year lock up period. In 2009, this was lowered to three months for "pension funds, insurance funds, mutual funds, charitable funds, endowment funds, government and monetary authorities and open-ended funds." (ASIFMA (2021))

In the 2010s, China significantly broadened direct access to the domestic bond market, allowing foreign participation in the China Interbank Bond Market (CIBM). The primary participants were central banks and other official investors, like sovereign wealth funds, and they could directly access the interbank market. In 2013, QFII and RQFII participants were allowed access to the interbank market (Kai (2019)). In 2015, the People's Bank of China (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)).[4] These reforms helped meet the requirements for the Renminbi's

[2]The Renminbi Qualified Foreign Institutional Investor (RQFII) was introduced in 2011, allowing investors to use RMB to enter the market rather than foreign currency. The programs were merged in 2020.

[3]Amstad and He (2020) note that 90% of foreign investment through these programs went to the stock market, with the small remaining share going to bonds.

[4]The Chinese government was explicit that these relaxiation 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

inclusion in the SDR basket in 2016. Quota restrictions were removed for all investors with the launch of CIBM Direct in February 2016 (Kai (2019)), but this form of access still required direct access to China's bond markets with its accompanying regulatory and registration hurdles (Schipke et al. (2019)).

These hurdles were significantly lowered in 2017 with the introduction of Bond Connect. Unlike earlier programs, Bond Connect is based offshore in Hong Kong and can be accessed via standard trading platforms like Bloomberg without the registration requirements of QFII or CIBM Direct. The ease of access into the Chinese market via Bond Connect was seen as an important reform to facilitate China's inclusion in global bond indices such as the Bloomberg Global Aggregate Index and the JP Morgan Government Bond Index - Emerging Markets (GBI-EM). In order to be included in these indices, bonds must be freely tradable, there cannot be substantial capital controls, and in some cases hedging instruments need to be available. 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 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 incomplete for them to invest.[5]

While each step of these reforms has its own intricacies, one can understand China's bond market liberalization as beginning by allowing in a narrow 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.

3 The Renminbi 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 $100 billion to nearly $640 billion at the start of 2022. The largest increase came in 2020, where

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."

[5]See Sano and Galbraith (2019) for details. The President of the GPIF, Masataka Miyzono, explained "Chinese government bonds cannot be settled in an international settlement system that can be used for other major government bonds. The market's liquidity is still limited compared with the size of GPIF's investment scale. Trading of futures is not allowed for foreign investors."

foreign holdings increased by nearly $200 billion. Appendix Figure A.II plots the rise of foreign ownership of RMB-denominated bonds issued in onshore capital markets at a monthly frequency.

The process was gradual and features some setbacks. There were two significant instance of foreign capital outflows over the last decade. The first occurred during the financial market turbulence of 2015-2016: between July 2015 and February 2016 the value of foreign holdings declined from $128 to $101 billion dollars, a 21% decline. This was a period of Chinese stock market volatility and depreciation of the Renminbi, and China intervened heavily in its financial markets. In particular, regulators introduced suspensions of share-trading following market drops and restricted domestic firms and investors from moving capital abroad. Despite the market turmoil and the sizable outflows, China did not introduce restrictions on foreign investors, including those in the bond market, from exiting the country.[6] In fact, government officials at the time publicly reinforced China's commitment to the opening up process and explicitly characterized capital controls as an unwanted regression in that process.[7] Some market participants, however, still argued that the possibility of future restrictions acted as a deterrent to foreign investment in China.[8] Inflows resumed and accelerated after this outflows episode. 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.[9]

Figure 1 decomposes foreign ownership of Chinese Renminbi bonds issued by Chinese-resident entities into two components, central bank reserves and private investment. The initial rise in foreign investment is largely driven by central bank holdings.[10] It is only in 2019 and 2020 that we see a more substantial increase in private foreign investment in RMB bonds.

Figure 2 plots the estimated private ownership of RMB bonds by investor country (excluding

[6]See, for instance, Danese (2016), who writes of the differential restrictions on outflows: "This is important since, as a result of capital outflows, Chinese authorities have been clamping down on all existing channels for moving capital out of the country. This has included suspending issuance of new quotas for outbound programmes, such as the qualified domestic institutional investor (QDII) scheme, as well as 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."

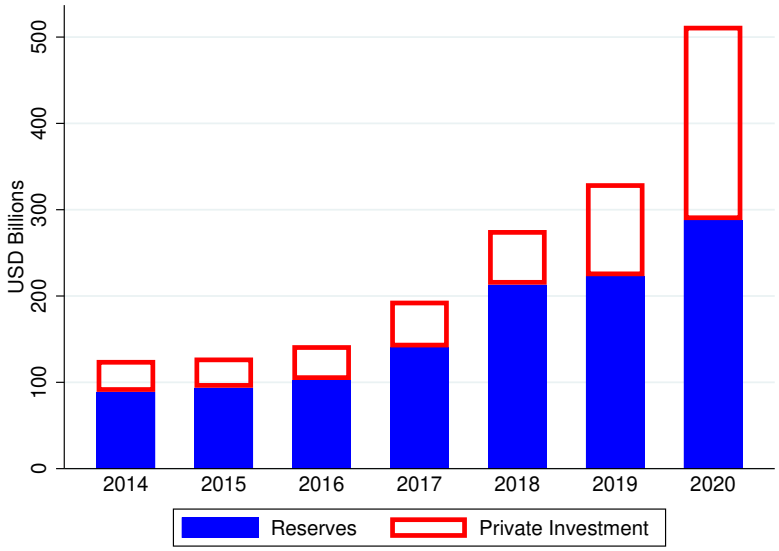
[7]See SAFE (2016) or SAFE (2015).

[8]See Weinland (2017), who writes in the Financial Times, "China's restraints on capital outflows have started to discourage inbound investment into the country, the opposite of the intended effect of the measures."

[9]Market commentary mentions fears, after Russia's invasion of Ukraine, of sanctions spillover to China, but also deterioration in China's fundamentals and raising rates in the United States and other advanced economies.

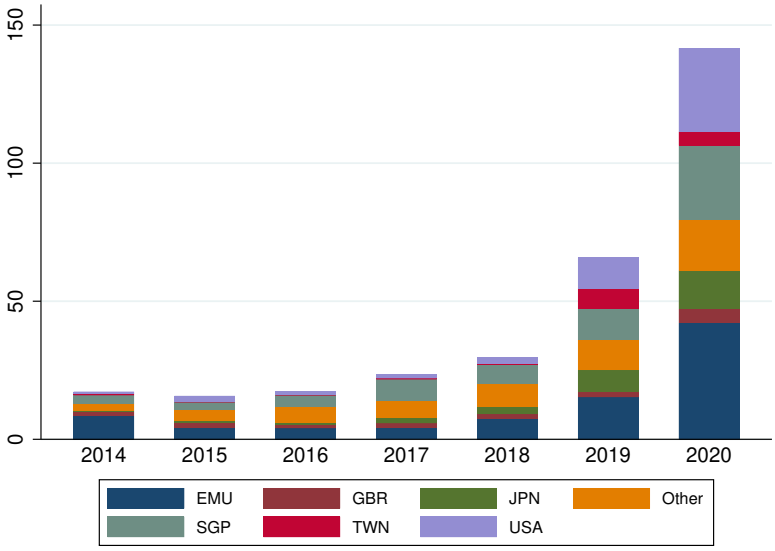
[10]By far, the largest disclosed holder is the Central Bank of Russia. In 2017 and 2018, Russia dramatically cut its holdings of USD reserves and moved into RMB and EUR, apparently in response to U.S. sanctions and general wariness of relying on the dollar-based financial system. In particular, Russia increased its holding of RMB 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. 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.

Figure 1: Composition of Foreign Ownership of Chinese-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. See Appendix A.I for details.

Figure 2: Geography of Private Holders of Renminbi Bonds



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

investment from Hong Kong and Macau).[11] We find that the largest private foreign holders of RMB are the Euro Area, United States, Singapore, Japan, and Taiwan.

These aggregate investment figures raise 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.III shows that China Government Bonds (CGBs) account for 67% of of foreign investment in China, with 30% of investment in Policy Bank Bonds (PBBs), even though these two classes only account for a combined 62% of the total bond market. Importantly, these are the two categories that are either direct liabilities (CGBs) or assumed to be implicitly guaranteed (PBBs) by the Central Government. By contrast, only 3% of foreign investment goes to the 38% of the market with significant private credit risk. These patterns highlight that conditional on investing in RMB, foreign investors mostly hold the safer assets denominated in that currency.

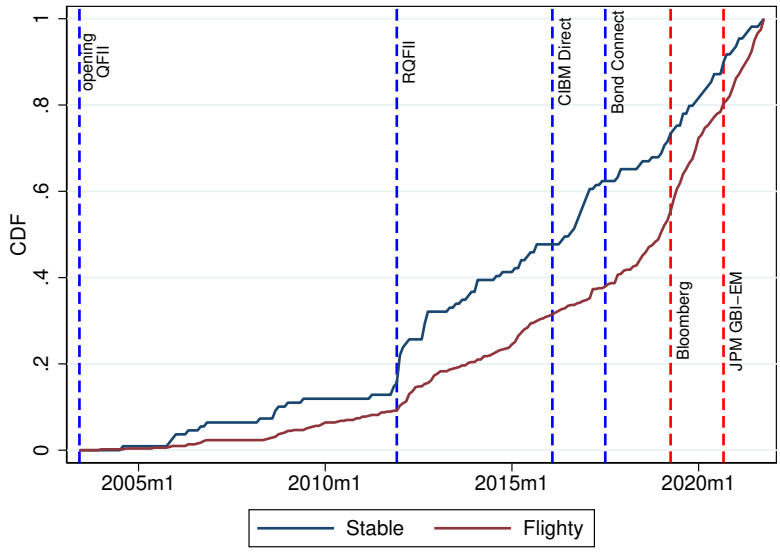
Foreign investment in RMB bonds is, of course, not the only way that foreign investors can lend to China. In Appendix A.II, we document the changing importance of offshore RMB bond issuance in Chinese borrowing, as well as the relative importance of direct onshore RMB finance and tax haven based dollar funding. In particular, we see that in mutual fund investment in China, the share of RMB investment in China that occurred offshore (the CNH market) relative to the onshore RMB market (the CNY market) fell from over 90% in 2013 to under 10% by 2020. Despite this rise in the relative importance of onshore relative to offshore RMB financing, Appendix Figure A.XVIII demonstrates that throughout the full sample period private foreign investors continued to invest more in China in foreign currency via its tax haven domiciled subsidiaries than it did in the onshore RMB market, even through 2020. See Coppola, Maggiori, Neiman and Schreger (2021) for a more detailed exploration of investment in China through tax haven domiciled subsidiaries.

3.1 Selecting the Foreign Investor Base

In the previous subsection, we documented the sources of the recent inflows into the Chinese bond market. 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 for the Chinese bond market discussed in Section 2: 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 funds as "Stable" investors,

[11] CPIS is not limited to private investment and includes public investment in the form of sovereign wealth funds, government pension funds, and state-owned enterprises (while excluding central banks' reserve holdings). In this sense it may be more accurately described as all non-central bank holdings.

Figure 3: 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.

"Flighty" investors, or "Banks."[12]

Figure 3 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.[13] 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.

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 4, both draws

[12]"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.

[13]Appendix Figure A.IV 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. In particular, the stable non-profit sector enters the market relatively early on in the liberalization process, whereas the relatively flightier portfolio management sector sees the overwhelming share of entry during the latest Bond Connect period.

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.

3.2 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, ETFs, and insurance companies domiciled in over 50 countries, excluding China.[14] These data include for each fund or insurance company their complete worldwide holdings at the security level. We further the data with information on the asset class, currency, market of issuance, nationality and residency of the issuer and its ultimate parent company, and other security characteristics.[15]

Portfolio Holdings. We start our analysis by examining what other type of foreign currency bonds funds holding bonds in a particular currency are 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 of 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" is likely to work better than looking at 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.[16] 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.[17] 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

[14] The country of origin of the investment is taken to be the country of domicile of the fund or insurance company making the investment.

[15] 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.

[16] DM currencies are the so-called G10 currencies, and EM currencies are the ones from countries in MSCI's list of Emerging Markets. See Appendix A.IV.

[17] We define domestic currency to be the currency of the country in which the fund is domiciled. In the Appendix we explore robustness of this choice by also excluding the currency in which the fund reports its returns.

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 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 $\rho_{c,DM}$ emphasizes that the correlation is cross-sectional over funds at a point in time.[18]

The top panel of Figure 4 reports these correlations using 2020 end-of-year holdings data. As one would expect, EM currencies have low and negative correlation with DM shares, as they are mainly held by EM focused funds. For instance, the fact that the share invested in Indonesian Rupiah (IDR) bonds has a correlation of approximately -70% with the DM currency share means that funds that invest more in IDR are overwhelmingly likely to have a low share of their portfolio allocated to bonds denominated in DM currencies. Similarly, it is not surprising that major DM currencies, like the Euro and the Dollar, have a positive and high correlation. These patterns reflect the specialization of investors in the data, with some funds more EM and some funds more DM focused.

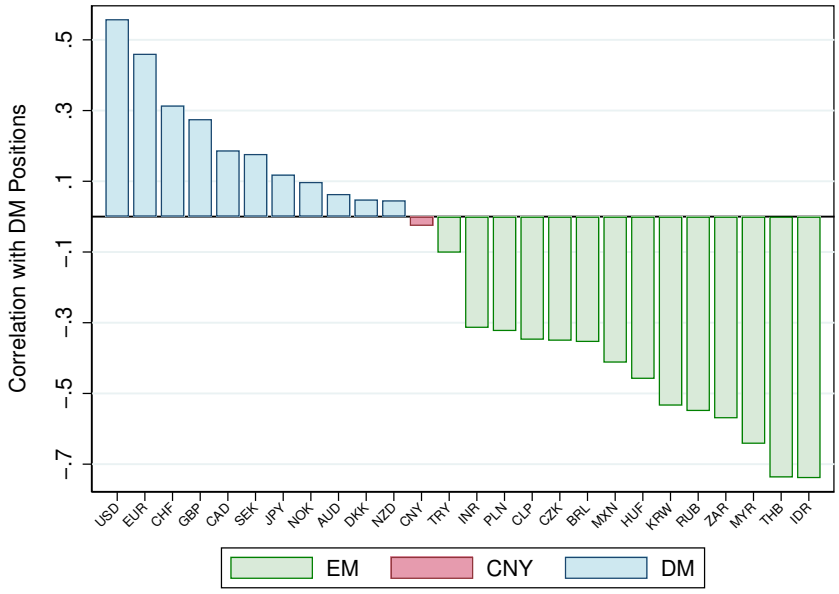
Given this specialization, it is interesting to ask what type of funds hold a relatively new asset like RMB bonds. Figure 4 shows that the Chinese RMB ranks in between emerging market and developed market currencies in terms of its correlation with DM bond portfolio shares. It will be instructive to see how this correlation measure evolves as China navigates the current episode of capital outflows, and in the longer-term as it potentially deepens its opening up strategy.

To explore these patters further, we restrict attention to local currency government bonds in

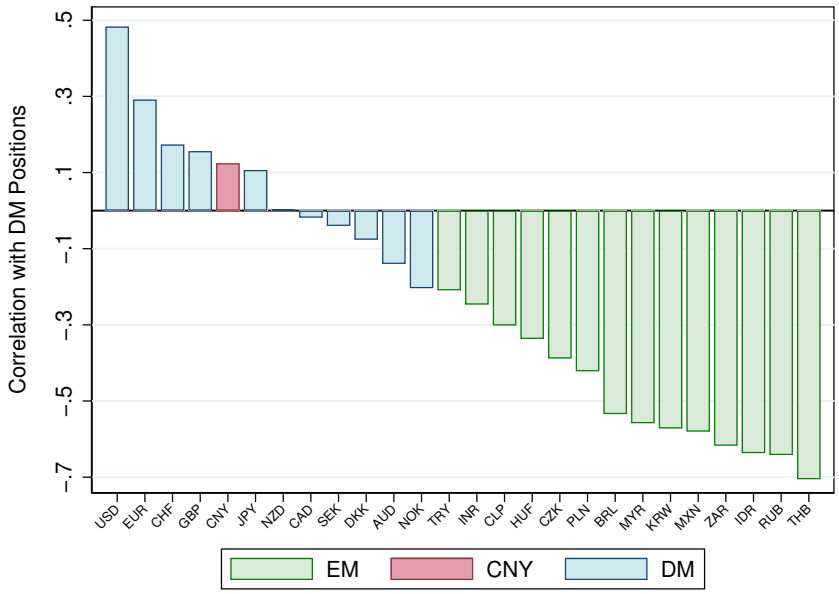
[18] We exclude from our analysis specialist funds in any particular currency, which we define as funds that have more than 50% of their foreign currency bond portfolio in a single currency. Appendix A.IV provides more details on the procedure.

Figure 4: Portfolio Similarity with Developed Market Currencies

(a) All Bonds

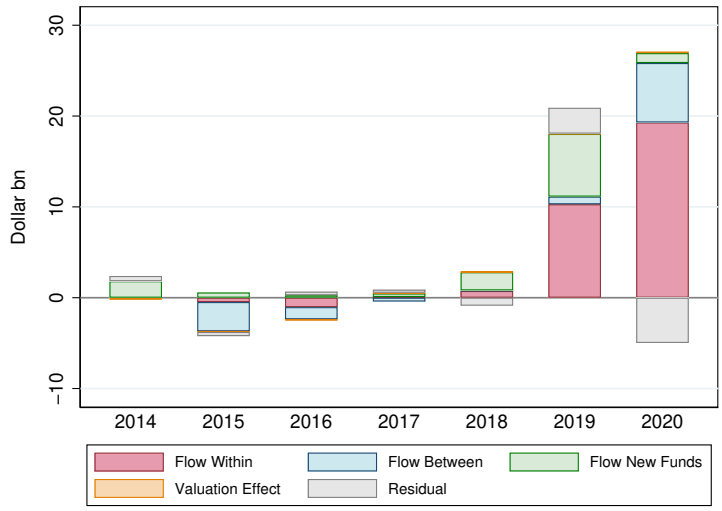


(b) Local Currency Government Bonds



Notes: Figures report the correlation between the holdings of bonds in each currency and holdings in Developed Markets (DM) currencies. The top panel includes all bonds and the bottom panel only local currency government bonds.

Figure 5: Decomposition of Change in Renminbi Holdings by Type of Flow



Notes: Figure implements the decomposition of flows into RMB bonds in equation 2. Flow Within refers to increases in holdings of RMB assets holding fixed the size of funds. Flow Between refers to increases in holdings of RMB assets generated by inflows into funds that own RMB, holding prices and portfolio shares fixed. Flow New Funds refers to RMB bonds purchased by funds that were created in that year. Valuation Effect refers to the change in the market value of holdings coming from bond price and exchange rate changes. Residual includes measurement error and approximation residuals.

the bottom panel of Figure 4, where again RMB bonds rank in between emerging and developed currencies bonds, this time more tilted towards DM currencies. In the Appendix A.IV we further explore the role of indexation, the time series variation, as well as repeat this exercise for equities.

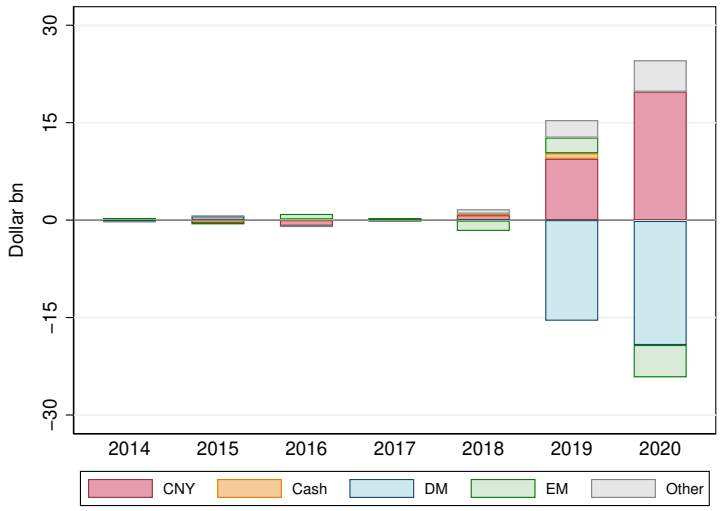
Portfolio Flows. We now turn to understanding what assets investors substituted away from as they moved into RMB starting in 2018. We focus on the active component of portfolio changes in this analysis holding prices and assets under management fixed. To do so, we decompose the change in investment positions into a number of economically interpretable components. The change in the dollar value of investment $\Delta MV_{t,i,b}$ of a particular asset b between time t and $t-1$ by fund i, can be split into the within-fund portfolio shift towards that asset $\left(F^{Within}_{t,i,b}\right)$, the increase or decrease in investment in that asset driven by fund-level inflows or outflows $\left(F^{Between}_{t,i,b}\right)$, valuation effects $(VE_{t,i,b})$, newly created funds purchasing that bond $(F^{NewFunds}_{t,i,b})$, and a residual $\left(F^{Residual}_{t,i,b}\right)$. We write this decomposition as:

$$\Delta MV_{t,i,b} = F^{Within}_{t,i,b} + F^{Between}_{t,i,b} + VE_{t,i,b} + F^{NewFunds}_{t,i,b} + F^{Residual}_{t,i,b}. \tag{2}$$

Figure 5 displays the decomposition of flows into RMB bonds into the five components as in equation (2).[19] Most of the increase in foreign holdings in 2019 and 2020 came from the Within-fund

[19]See Appendix Section A.V for further details on the decomposition.

Figure 6: Decomposition of Portfolio Shift by Currency Group



Notes: Figure implements the decomposition of the within component of flows. "CNY" refers to all assets denominated in Chinese Yuan. "DM" refers to cross-border holdings of developed market currencies. "EM" refers to cross-border holdings of emerging market currencies. "Other" refers to other currencies and equities. This figure only consider funds that own some RMB assets.

active reallocation component, which suggests that foreign investors' entry in the RMB bond market came at the expense of a reduction in the portfolio shares of other assets.[20] In 2020, more than two-thirds of the observed increase in RMB positions stemmed from these Within-fund reallocations, with most of the remaining share coming from the between-fund component, meaning that funds that already invested in RMB attracted more inflows during that year.

At the fund level the Within component sums to zero (as portfolio shares need to sum to 1), so we can write $F^{Within}_{t,i,CNY} + \sum_{b \neq CNY} F^{Within}_{t,i,b} = 0$. By zooming in the Within-fund flow, Figure 6 shows that in 2019 and 2020, funds that purchased RMB bonds tended to sell bonds issued in developed market currencies. In 2019, funds purchasing RMB slightly increase their holdings of emerging markets currencies, while in 2020 a small amount of the RMB purchases come from sales of emerging market currency bonds. Overall, the substitution towards RMB bonds in private foreign portfolios came from movements out of developed market debt.[21]

In Appendix Section A.XIX, we explore how much of the inflows to RMB bonds were driven by index inclusions. We use data on the index that funds report as their benchmark, and find that inclusion in the Bloomberg Global Aggregate led to more inflows than did the 2020 inclusion in the JP Morgan GBI Index. Because the Bloomberg Global Aggregate is more tilted towards developed country currencies that the EM-currency-focused GBI, the rebalancing of funds benchmarked to

[20] In 2019 the second largest component was the flow coming from new funds launched that year, predominately new Taiwanese ETFs that invest solely in Chinese RMB. Liu and Chan (2019) describe how reforms in the Taiwanese insurance industry drove inflows into RMB bond ETFs.

[21] Appendix Figure A.XIX further disaggregates the flows from Figure 6 into U.S. Treasuries and Agencies and Other DM currencies.

the Bloomberg index may help explain why the purchases of RMB were largely financed with sales of DM currencies, with sales of EM currencies to buy RMB only beginning in 2020. The inclusion of China in both a major global and EM-focused bond index may help explain why it occupies an intermediate position between DM and EM currencies in terms of the portfolio correlations.

Price Evidence. Evidence on bond returns is hard to provide given the short sample, the likelihood of peso problems (crisis our out of sample), and the possible endogeneity of return dynamics to the size of foreign holdings. We provide here a brief analysis focusing on government bonds, and relegate a fuller treatment to the appendix.[22]

We estimate bond return loadings on risk factors that are commonly used in the literature. We begin our sample in 2010, the year when China's peg against the US dollar was first relaxed.[23] We measure quarterly dollar returns of holding a three-month tenor bond in currency i as $R_{i,t+1} = i_t - i_t^* - \Delta e_{t+1}$. We then regress the returns $R_{i,t}$ on a risk factor f_t to estimate the currency-specific loading on the factor, β_i, from a linear regression $R_{i,t} = \alpha_i + \beta_i f_t + \epsilon_{i,t}$.

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

4 Reputation in the International Monetary System

We organize the empirical patterns documented above around three stylized facts that inform our theory. First, that the Chinese domestic bond market has progressively opened-up to foreign participation. Second, that this gradual opening up progress was shaped by government policies aimed

[22] For a comparison of the return and yield curve dynamics in the US and China, see Carpenter et al. (2022).

[23] Jermann et al. (2019) provide a detailed analysis of China's exchange rate regime.

at selecting an investor base: starting with stable long-term investors and progressively letting in flightier private investors. Third, that by the time private flightier 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.

In this section we explain these facts via a dynamic model of a country internationalizing its bond market. We think of a country like China that has the potential of becoming the provider of a reserve currency, e.g. economic size, geopolitical importance, etc., but that at an early stage does not have the reputation to provide 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. Through the lens of the model, we provide both a deeper view of the existing empirical patterns and frame our thinking about possible future evolution of the international monetary system.

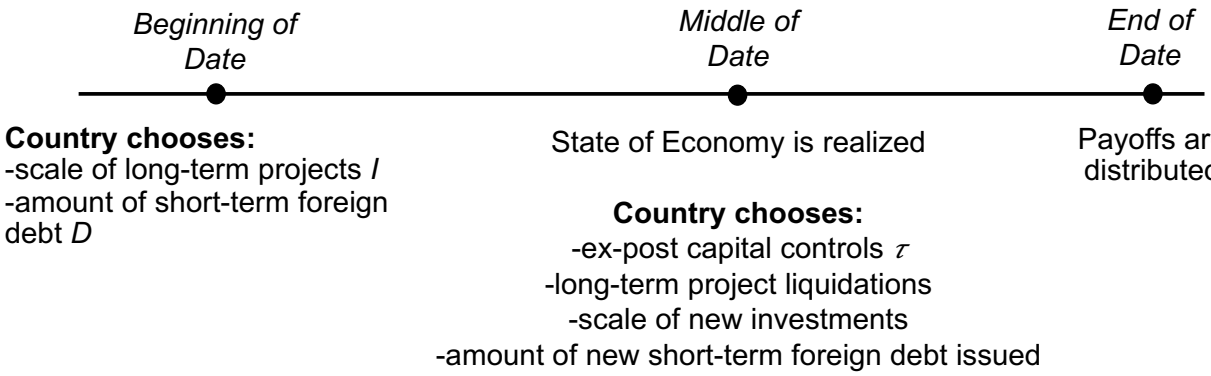
4.1 Model Setup

The model is infinite horizon and time is discrete $t = 0, 1, ...$ Within each date t, we embed a financial intermediation model with costly liquidations that generates both a benefit from letting in foreign investors and an ex-post cost in case of a capital flight from these investors. Across dates t, we develop a dynamic reputation model in which governments trade off the immediate benefit of imposing capital controls to combat a capital flight with the loss of reputation that this ensues in future periods.

Each date t is divided into a beginning, middle, and end of the period. At the beginning of t, long-term investments are undertaken. These long-term investments mature at the end of period t and are financed with short-term debt that has to be rolled over in the middle of period t. In the middle sub-period, a state $s \in \{H, L\}$ is realized, where H (high) corresponds to normal times and L (low) corresponds to a crisis. A crisis in this model is a flight of foreign investors who demand collateral (a haircut) to roll over the maturing short-term debt. Figure 7 provides a timeline of date t and the actions taken at each point in time are described in detail below.

The domestic economy has a government, household, and a financial intermediation sector. At each date t, a new generation of entrepreneurs are born. Entrepreneurs run the intermediation sector, which they finance using a fixed endowment of inside equity and by borrowing from foreign investors. Entrepreneurs die at the end of t and consume the payoff from their investment. Our focus is on raising financing from foreign investors, and we extend the framework to include domestic investors in the appendix. For expositional clarity, we refer to the intermediaries directly rather than the entrepreneurs who run them. For most of the paper we aggregate the intermediation sector, households, and the government and think of actions at the country level. Particularly in the context of China, the boundaries between government and private actors can be blurry in practice with the presence of policy banks, state-owned firms, and in general high degree of control of the government over private (credit-investment) decisions. As the empirical sections of the paper

Figure 7: Model Timeline Within Each Date



Notes: Figure displays the timing withing each date t of the financial intermediation model.

documented, at this stage of internationalization of China's bond market, foreigners are concentrated in government debt and the debt of the policy banks, with limited investment of foreign investors in onshore corporate debt. In the model, one can think the funds raised via debt finance as being allocated by the government and financial system directly or indirectly to production.

There are two types of foreign investors: stable investors and flighty investors. These two categories aim to capture in a simple way the economics highlighted in the previous section on different investor characteristics and strategic choices on the part of the country on which investors to let into its bond market at each point in time in the internationalization process. The key distinction between the two types of investors is the haircut they require to roll-over short-term debt, essentially capturing their flightiness during a crisis.

At the beginning of period t, the government chooses which types of investors are allowed to participate in the domestic bond market, that is whom the country borrows from. In the middle of period t, the government can impose ex-post capital controls on net outflows from foreigners, taxing them at rate $\bar{\tau}$. We consider two types of governments, committed or opportunistic, that differ by their willingness to impose these controls. The committed type never imposes a capital control on outflows by assumption, whereas the opportunistic type chooses strategically each period whether to do so. One can think of the two governments as differing by the direct utility loss they face when they impose capital controls, with the committed type facing a much higher loss than the opportunistic type. As in the literature, one can think of this as a stand in for institutional quality.

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 foreigners' fears about investing onshore in China: the ability to "get the money out" in a future crisis. As detailed in Appendix A.VII, foreign investors in the Chinese bond market emphasize uncertainty over "repatriation risk" and or whether China will "lock the gates" in bad times.[24] While of course there are the

[24]For instance, a number of funds discuss concerns over the custodian or beneficial ownership arrangement

standard currency and interest rate risks of investing in RMB, China is not necessarily an outlier on these dimensions. Instead, the dimension in which China appears to be perceived far differently than other countries is the possibility that investors will not be able to get their money out in bad times. We model this as the risk that China institutes an ex-post capital outflow tax, although it could easily be re-framed as a quantity restriction on outflows.[25]

The government currently in power gets dissolved and replaced with a new one in the next period at an exogenous and constant rate. The current government puts no weight on the welfare of future new governments, meaning that this is akin to governments dying with some probability. We assume that if the low state is realized and the government dies, the new government might be of a different type. This exogenous type-switching, introduced by Phelan (2006), plays an important role in the dynamics of reputation in our model even for small probabilities of type-switching. Formally, we assume that in both the high and low state, a fraction ϵ^O of opportunistic governments and a fraction ϵ^C of committed governments die. In the high state, governments are replaced by a new government of the same type. In the low state, governments that are replaced switch type, that is committed governments that die are replaced by opportunistic governments and vice versa. Deaths and replacements are not observable to investors. We assume $1 - \epsilon^C - \epsilon^O > 0$.

4.2 Foreign Investor Base and Capital Flight

At the beginning of period t, the representative intermediary finances investment using an endowment of inside equity $A > 0$ and short-term debt D_t, due in the middle of period of t, from foreign investors at an interest rate R_t.[26] The interest rate R_t depends on which investors the country borrows from and how much it borrows. We denote R_t to be the promised yield and $\tilde{R}_t$ to be the actual return, which differs from the promised yield when the government imposes capital controls in the middle of period t. A debt roll-over problem arises because the project is long-term, maturing at the end of period t, and the debt is short-term, maturing in the middle of period t.

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.

[25] Outright default, and inflation or exchange rate depreciation are other ways to alter repayments to foreign bondholders. They also carry reputational losses. Ex-ante capital controls, which are allowed in our model, do not carry the same reputational stigma because they are known at the time of investment. Our model captures this notion that ex-post controls are reputationally costly for governments to use.

[26] Appendix A.XVIII.1 considers an extension that also allows borrowing from domestic savers at the same interest rate. In that extension domestic borrowing is a wash with inside equity, and we therefore take the simpler approach here of only considering inside equity.

4.2.1 Foreign Investor Base

Both stable investors, indexed by $i = s$, and flighty investors, indexed by $i = f$, are risk neutral, valuing investment decisions for their expected returns. Investor types are assumed to be observable to the government, as they are driven by institutional features. For example, the Chinese government can observe which investors are official and likely to be stable, such as foreign central banks or sovereign wealth funds, and which are private and likely to be flighty, such as hedge funds or active mutual funds. Once access is granted to a class of investors, however, they all are able to participate in the same domestic bond market and face the same interest rate and collateral provisions. Formally, we assume that the government can choose which types of investors are allowed to participate in the bond market, but the government cannot offer different contracts to different investors nor price discriminate investors it allows to participate. This means that investors of both types receive the same yield, return, and collateral. This assumption is intended to capture the idea that in practice the way that a government lets in a new type of investor is to undertake the reforms necessary for that type of investor to be able to effectively bring in their capital. These reforms will then apply to the entire market, not just to the new investor type

We view this as capturing the spirit of the evidence in Section 2 and Section 3.1 documenting the gradual process by which China has progressively and selectively allowed different type 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.

The focus of this paper is on the internationalization of the Chinese domestic bond market. We highlighted in Section 3 that there is also an offshore (or international) market for Chinese bonds, some of which are denominated in the offshore Yuan, the CNH. One can think of the offshore market as an early experimentation with foreign investors, especially flighty ones. To maintain simplicity, the offshore market is not the focus of the theory because ultimately it is the size and depth of the domestic market that might lead China to become an important player in the international monetary system.

Both classes of investors also have a quadratic cost of lending, modeled in reduced form as a bond in utility function. The lending decision at the beginning of date t by investor type $i \in \{s, f\}$ is given by

$$\max_{D_t^i} E[\tilde{R}_t - \bar{R}]D_t^i - \frac{1}{4}bD_t^{i2}$$

where $\bar{R}$ is an outside option investment return and b a slope coefficient.[27] The first order condition that determines the interest rate schedule of type i is

$$E[\tilde{R}_t] = \bar{R} + \frac{1}{2}bD_t^i.$$

[27] In the Appendix, we allow both the outside option and slope to differ by class of investors, but many of the results are best understood in the simpler leading case of homogeneous coefficients considered here.

Investors of each class i are in an overlapping generation, whose second generation arrives in the middle of period t. For simplicity, the second generation of investors has a perfectly elastic supply of funds regardless of the state. Their outside option in the high state has return R^H, meaning that R^H is the required interest rate for debt rollover in the high state. In the low state, the outside option is $R^L < R^H$. We denote the amount of debt that the second generation provides as D_t^H and D_t^L in the high and low state, respectively.

To roll over debt, the two types of investors require a different haircut on the inside equity value of the projects in the middle of date t if the low state is realized. We describe the haircut in more detail in the next subsection, but here we note that stable investors require a lower haircut, $h^s \in (0,1)$, than flighty investors, that is $h^f > h^s$. This is the sense in which the two classes of investors are differentially flighty: flighty investors require higher collateral to be posted in a crisis to convince them to roll over debt. We assume that the country cannot discriminate between investors on collateral requirements: if the country lets in flighty investors, all investors must be offered the higher collateral rate.

We next turn to writing the ex-post return that investors realize as a function of the chosen ex-post capital outflow charge, τ.

$$\tilde{R}_t(\tau) = \frac{R_t D_t - \tau D_t^L - (R_t D_t - D_t^L)\tau}{D_t} = R_t(1-\tau).$$

Intuitively, there are two costs to the first generation of investors when the country imposes an ex-post capital control. The first is the direct fiscal cost of the outflow tax on any repatriated capital, $(R_t D_t - D_t^L)\tau$. The second is the indirect cost that arises from the lower interest rate on rollover and the bargaining between the two investor generations. Since the second generation has an outside option of R^L, but the domestic interest rate is $R^L - \tau$, the second generation would experience a loss τD_t^L from lending in the domestic economy. By contrast, the first generation loses an additional τD_t^L from the outflow tax applied if no foreign debt is rolled over. Our bargaining assumption therefore says the second generation agrees to roll over D_t^L of debt in exchange for a compensating transfer payment of τD_t^L from the first generation.[28]

We define M_t to be the probability that investors assign to the government not imposing capital controls, conditional on the low state being realized:

$$M_t = \Pr(\tau = 0 | s = L). \tag{3}$$

It is a combination of the probability that the government is committed and so never imposes the capital control, and the probability that the government is opportunistic but chooses not to impose the capital control. The probability M_t is a key endogenous object of the dynamic problem across dates t, but it is taken as given when solving the static date t problem. Conditional on this

[28]We assume that revenues from the capital controls are either thrown away or remitted lump sum to all foreigners, including non-participants. This eliminates the direct revenue motive from imposing capital controls and sharpens the focus on rollover incentives channel.

probability M_t, the expected return of the first generation of investors is given by

$$E[\tilde{R}_t] = \pi_H R_t + (1 - \pi_H)\Big(M_t R_t + (1 - M_t)R_t(1 - \bar{\tau})\Big) = \mathcal{M}_t R_t,$$

where we defined $\mathcal{M}_t = 1 - (1 - \pi_H)(1 - M_t)\bar{\tau}$ to be one minus the expected loss per unit of debt from the introduction of ex post capital controls. Notice that $\mathcal{M}_t$ increases in M_t and also accounts for the fact that the capital control is never imposed by any government in the high state. Given this characterization of expected returns, we can substitute back into the interest rate schedule of investor type i at the beginning of t to obtain the promised interest rate

$$R_t = \frac{\bar{R} + \frac{1}{2}bD_t^i}{\mathcal{M}_t}.$$

The interest rate schedule both has a lower intercept and also is more inelastic the lower is the probability that capital controls are imposed ex-post. These features will be important in the dynamic problem, as governments recognize that gaining a good reputation can lead to better borrowing terms.

4.2.2 Financial Intermediation and Collateral Constraints

We next turn to describing intermediation in our framework. Our modeling of intermediation aims to be streamlined so that it can capture crucial features of foreign capital flights and inefficient liquidation while remaining sufficiently tractable to be analyzed jointly with the dynamic reputation game. The model combines elements of the liquidity shocks literature (Holmstrom and Tirole 1997, Farhi and Tirole 2012) and of collateral constraints models (Kiyotaki and Moore 1997). At the beginning of date t, intermediaries invest their endowment of inside equity A and proceeds from debt financing D_t in an illiquid long-term project. The long-term project has a scale I_t and a unit cost, so that the financing constraint of the intermediary is $I_t \leq A + D_t$.

The project has a gross return per unit $Q \geq 1$ in the middle of the date, which does not depend on the state, transforming its scale to QI_t.[29] The project yields no payoff at the middle of t, but yields 1 unit of the consumption good per unit of remaining scale at the end of t, so that the final payoff is QI_t. We think of Q as the return on investment that is maintained to maturity. The intermediary can liquidate the project prior to maturity in the middle of t at a constant price of $\gamma \in (0, 1)$, which does not depend on the state. As a result, γQI_t is the maximum value of liquidation in the middle of the date. Although the payoff of the initial project does not depend on the state, the investment opportunities and credit conditions in the middle of t depend on the state.

In the high state, $s = H$, the economy is in a boom. The intermediary has valuable new

[29] Nothing is lost by normalizing Q to 1, but a value higher than one is more in line with observed positive rates of return and interest.

opportunities and credit markets are frictionless. The intermediary can roll over any debt at the interest rate R^H. The intermediary also gains access to a more valuable investment project, which converts 1 unit of the consumption good in the middle of t into R^H units of the consumption good at the end of t. We assume that $\gamma R^H > 1$, so that the intermediary optimally redeploys all of its existing assets to the new project in the high state. As a result, its payoff in the high state is given by

$$V_t^H = R^H \Big(\gamma Q I_t - R_t D_t \Big), \tag{4}$$

which does not depend on its debt rollover choice since the borrowing rate and return on the new project are both R^H. We assume that $R_t D_t$ is rolled over without loss of generality. In the high state, rollovers and liquidations are all voluntary and driven by the presence of attractive new projects. The model gets most of its action from the crisis state described below.

In the low state, $s = L$, the economy is in a bad state. The intermediary does not have a valuable new investment opportunity, and credit markets are constrained. Define L_t to be assets that are (forcibly) liquidated prior to maturity in the low state. Forced liquidations occur because a collateral constraint limits debt rollover, meaning that the intermediary has to repay part of its initial debt by liquidating assets in the middle of t. Formally, the intermediary faces a collateral constraint on debt rollover, given by

$$(R^L - \tau) D_t^L \leq (1 - h_t)(Q I_t - L_t),$$

where $h_t = h^s$ if the only investors present are stable ($D_t^f = 0$) and $h_t = h^f$ if both stable and flighty investors are present ($D_t^f > 0$). Recall that flighty investors require a higher haircut than do stable investors, $h^f > h^s$. A higher haircut means that less of the remaining value of the projects (i.e. the part that was not liquidated) can be used as collateral for new short-term debt. The way in which we formulated the constraint also implies that imposing ex-post capital controls slackens the constraint by depressing interest rates on new debt in the middle date. Intuitively, countries are tempted to impose capital controls ex-post in a roll-over crisis to capture existing foreign savings and alleviate the rollover problem. This formulation of the constraint is a tractable and convenient way to convey these economics. We solve the model assuming the constraint (in the low state) always binds, and then verify it does so.

In the middle of period t, the intermediary must repay debt either by rolling it over or liquidating assets, yielding a budget constraint $D_t^L + \gamma L_t = R_t D_t$. Combining the collateral constraint and budget constraint and substituting into the final payoff, $Q I_t - L_t - (R^L - \tau) D_t^L$, of the intermediary, we obtain the value in the low state as

$$V_t^L = \underbrace{\frac{h_t}{\gamma - \frac{1-h_t}{R^L - \tau}}}_{\text{Net Worth Multiplier}} \quad \underbrace{\Big(\gamma Q I_t - R_t D_t \Big)}_{\substack{\text{Liquidation Value of} \\ \text{Inside Equity}}}. \tag{5}$$

As in the high state, the value of intermediation in the low state depends on the inside equity of the intermediary evaluated at the liquidation value: $\gamma QI_t - R_t D_t$. Intuitively, these are the funds at the intermediary's disposal entering the middle period of the date. In the high state, equation (4) shows that the value of intermediation is a multiple R_H of inside equity because all long-term projects are (voluntarily) liquidated in favor of new investment opportunities that return R_H. In the low state, equation (5) shows that the multiple takes value $\frac{h_t}{\gamma - \frac{1-h_t}{R^L-\tau}}$. The numerator in this multiple, h_t, measures the collateral value of the inside equity of the intermediary if projects were all liquidated. The denominator, $\gamma - \frac{1-h_t}{R^L-\tau}$, grosses up this value for the effect of liquidations. On the one hand, liquidating one unit of the long-term project raises resources γ that can then be used to repay due debt. On the other hand, a liquidated investment lowers the collateral that can be used to raise new debt and tightens the debt roll over constraint by $\frac{1-h_t}{R^L-\tau}$. For (forced) liquidations to occur in equilibrium, we assume $\gamma - \frac{1-h^s}{R^L-\overline{\tau}} > 0$. Imposing the capital control, $\tau = \overline{\tau}$, reduces the denominator by reducing the interest rate $R^L - \tau$ and leads to a larger net worth multiplier.

Putting V_t^H and V_t^L together, we have the total expected value of intermediation given by:

$$E[\tilde{V}_t] = \pi_H V_t^H + \pi_L V_t^L = \left(\pi_H R^H + \pi_L \frac{h_t}{\gamma - \frac{1-h_t}{R^L-\tau}}\right)\left(\gamma QI_t - R_t D_t\right),$$

which depends on whether or not the government imposes the capital control in the low state, $\tau \in \{0, \overline{\tau}\}$. As will become clear below, the tractability of the model arises in good part from the above equation: the ability to summarize the subgame value of intermediation as a multiple of inside equity.

4.2.3 Optimal Policy of the Committed Type and Flow Indirect Utility

The solution of the model can be analyzed by first determining what the committed type optimally chooses to do in each date. Opportunistic types then decide to either mimic the committed type or deviate. Therefore, we start by analyzing the problem of debt issuance at the beginning of date t by the committed type. Recall that the type is not known to investors and consider the case of a belief $M_t \in [0, 1]$ that the government will not exercise the capital control in the low state in that date. The decision problem of the committed government is to choose a debt issuance D_t to maximize the expected value $E[\tilde{V}_t]$ with $\tau = 0$, subject to the interest rate schedules and collateral demands by investors.

While the committed type optimally chooses issuance given the beliefs of the investors, we do not allow the committed type to strategically use its choices to alter investor beliefs in either the current or future periods. In essence, the committed type does not choose actions under the knowledge that opportunistic types might endogenously react to those choices and thereby cause investors to update their beliefs about the government that they are facing. This simplification is common in the literature on dynamic reputation.

We characterize the optimal debt policy of the committed type in the Lemma below.

Lemma 1 *There exists a unique opening up threshold* $M^* \in [0,1]$ *such that optimal policies are*

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

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

$$R_t(M_t) = \frac{1}{2}\frac{\bar{R}}{\mathcal{M}_t} + \frac{1}{2}\gamma Q$$

See proof in Appendix A.IX. There is a single crossing point at M^* where the committed government shifts from borrowing from only stable investors to also borrowing from flighty investors. The intuition is that as the probability that investors assign to ex-post capital controls decreases (M increases), the interest rate schedule becomes more favorable, i.e. it shifts downwards and flattens, and the country's desired borrowing increases. At some point this shift is large enough that the benefit of letting in the flighty investors in terms of lower borrowing costs outweighs the cost of higher flightiness, a higher haircut, in a possible crisis. The heterogeneity in haircuts acts as a fixed cost and generates a threshold rule in the borrowing schedule.

The optimal policy rules are intuitive. Consider first the case of $M_t \leq M^*$, where the committed type only borrows from stable investors. If the committed type acted as a competitive borrower, taking the interest rate as given, then the interest rate would equal the liquidation value of the project $R_t = \gamma Q$. Instead, the committed type accounts for the impact of its borrowing on the interest rate: it equates marginal benefit and marginal cost of borrowing. As a result, it borrows less than in the competitive case and faces lower interest rates. As is common in monopolist problems of this (functional form) type, it borrows half as much as in the competitive case and the equilibrium interest rate is an arithmetic average of the competitive rate γQ and the rate that would have been paid on the first unit of debt $\frac{\bar{R}}{\mathcal{M}_t}$. Optimal debt issuance features an *upward* discontinuity at M^*. Once the flighty investors are let in, the committed type borrows equally from both classes of investors.[30]

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 et al. (2022)), something we return to in Section 6.[31] 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

[30] In the Appendix we derive these optimal policies allowing for heterogeneous demand curves from the two classes of investors.

[31] While we focus on monopoly rents as the economic benefit of being the international currency provider, there are, course, other potential reasons a country would want to provide an international currency. See Frieden (2016) and Broz and Frieden (2001) for discussions of the political economy of exchange rates and currencies.

capital controls. 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 (Guerrieri and Lorenzoni (2017); Farhi and Werning (2016); Bianchi and Lorenzoni (2021)).[32]

The government could also consider a number of other ex-post policies that would interact with ex-post capital controls. Bailout policy is a particularly relevant one since the government could prevent liquidations by bailing out the intermediation sector, formally bypassing the credit constraint. Such bailouts have fiscal costs (either via direct taxation, or via the accumulation of precautionary reserves) 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 it financial intermediaries during the 2008 financial crisis while not tampering at all, and in fact supporting, the payoff and market access to US Treasuries by foreigners. We keep these policy alternatives in the background of the formal model.

We define $V(M_t)$ to be the flow indirect utility of the committed type in the low state:

$$V(M_t) = \frac{h_t}{\gamma - \frac{1-h_t}{R^L}} \Big(\gamma Q I(M_t) - R(M_t) D(M_t) \Big),$$

where $I(M_t)$, $R(M_t)$, and $D(M_t)$ are the optimal policy rules described above. An opportunistic government chooses the same rules at the beginning of date t, since not doing so would reveal the government type before any debt is even raised in the date.[33] However, the opportunistic government might deviate ex-post in the middle sub-period by imposing capital controls. Since the value of exercising ex-post capital controls in the low state for the opportunistic government is

$$V^{\overline{\tau}}(M_t) = \frac{h_t}{\gamma - \frac{1-h_t}{R^L - \overline{\tau}}} \Big(\gamma Q I_t(M_t) - R_t(M_t) D_t(M_t) \Big),$$

we find that the gain induced by imposing the capital control is a proportional increase in indirect utility for the opportunistic type. In particular, we can define $V^{\overline{\tau}}(M_t) = g(h_t) V(M_t)$, where

$$g(h_t) = \frac{\gamma - \frac{1-h_t}{R^L}}{\gamma - \frac{1-h_t}{R^L - \overline{\tau}}}. \tag{6}$$

[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.

[33] For example, we can impose the off-path beliefs that investors ascribe the lowest possible reputation $M_t = 0$ to governments that do not mimic the committed type's debt issuance decision. If an opportunistic type reveals itself at the beginning of t by choosing a different issuance strategy, it can be assigned a reputation lower than ϵ^O because its type cannot switch to being committed until the end of t – that is, investors know for sure it is opportunistic. We could also impose further punishments, such as a sharp nonlinearity in the interest rate schedule at reputations below ϵ^O.

We have $h_t(M_t) = h^s$ when $M_t \leq M^*$ and the economy is only open to stable investors and $h_t(M_t) = h^f$ when $M_t > M^*$ and the economy is also open to flighty investors. We express g as a function of h_t, rather than M_t, to maintain exposition clarity.

In the main body of the paper, we make the following simplifying assumption: $R^H = \frac{h_t}{\gamma - \frac{1-h_t}{R^L - \overline{\tau}}}$. This means that the return on the new project in the high state depends on whether the government has opened up to flighty investors. This assumption allows the flow utility of the committed type in the high state to be written as a scaled version of its flow utility in the low state, $V_t^H = g(h_t)V(M_t)$. This simplification carries a lot of tractability at little economic cost and is relaxed in Appendix A.XVIII.2.

5 The Dynamics of Reputation Building

Section 4.2 solved the date t subgame of a committed type government that faces investor beliefs M_t that the government will impose the capital control. We now turn to the dynamic problem of the opportunistic government.

The opportunistic government discounts the future at the effective discount factor $\beta^*(1-\epsilon^O) = \beta$, which accounts for both its subjective discount factor and its probability of being replaced. We define π_t to be investors' prior belief entering date t that the government is the committed type, with $\pi_0 = \epsilon^O$ being the prior belief at date 0. This prior belief at date 0 means that investors enter into the game believing all governments start as opportunistic except for an initial fraction ϵ^O that switched to being committed.[34]

If an opportunistic government wants to avoid revealing its type before raising debt, it needs to mimic the debt issuance strategy of the committed government at the beginning of period t. However, it has a strategic choice of whether or not to impose capital controls on outflows if the economy enters the low state. If the low state is realized and the opportunistic government does not impose capital controls, investors' posterior belief that the government is committed rises. This occurs because, as we will show, only a fraction of opportunistic types forgo capital controls conditional on a low state occurring. No updating of beliefs occurs in the high state since there is no temptation for an opportunistic government to impose capital controls and governments that are replaced following the high state are known to be succeeded by governments of the same type. The model of dynamic reputation in the presence of exogenous type switching is in the spirit of Phelan (2006) and Amador and Phelan (2021).[35]

The model is designed to capture the idea that reputation as an international currency issuer can only be built in the "fire" of severe crises. In normal times, there is little (in fact nothing) that investors learn about the government type and how it would behave in a future crisis. One

[34] We can initialize the model from other prior beliefs π_0. In these cases, the model will feature one different transition path to an initial graduation step, at which point all opportunistic governments will have reverted to beliefs ϵ^O and will continue on the cycle described below.

[35] Lu (2013) extends Phelan (2006) to consider a committed type that optimally chooses tax policy.

can think of the low state as rare, thus emphasizing that building reputation as an international currency issuer is a slow process in calendar time, with long-spells of tranquil markets and no reputation building, and short but intense episodes of crisis when issuers are tested by the markets.

We denote by $m_t \in [0,1]$ the endogenous fraction of opportunistic governments that do not impose the capital control at date t if the low state is realized. Following the low state occurring, investors' beliefs evolve according to Bayes' rule. If a total fraction $M_t = \pi_t + (1-\pi_t)m_t$ of all governments do not exercise capital controls in the low state, then the posterior belief of investors that a government that did not impose the capital control in the low state is the committed type is given by

$$\pi_{t+1} = \epsilon^O + (1 - \epsilon^C - \epsilon^O)\frac{\pi_t}{M_t}. \tag{7}$$

This accounts for the fact that a fraction ϵ^O of remaining opportunistic types switch to being committed at the end of the period, while a fraction ϵ^C of committed types switch to being opportunistic. Because $0 \leq m_t \leq 1$, then $\pi_t \leq M_t$ and the highest possible posterior belief is $\pi_{t+1} = 1 - \epsilon^C$, which happens only when $m_t = 0$ and all opportunistic governments choose to impose capital controls. The posterior belief is bounded below one due to the fact that a committed government is replaced and is succeeded by an opportunistic government with probability ϵ^C.

If the government does impose the capital control, then its type is revealed to be opportunistic. The posterior belief reverts to $\pi_0 = \epsilon^O$, which is the probability that the opportunistic government is replaced by a committed government. If the government faced the high state, then priors and posteriors coincide, that is $\pi_{t+1} = \pi_t$.

In our model, the belief M_t that the government will impose the capital control turns out to be a natural variable in which to express solutions, rather than the belief π_t that the government is the committed type. This is because the interest rate schedule depends on M_t, rather than directly on π_t. We refer to M_t as the "reputation" of the government, and refer to π_t as "beliefs" about the government's type. Under this terminology, a government having a good reputation means investors think it is less likely that the government will impose capital controls on them.

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.[36] In practice, we believe China can observe the behavior of large investors, like foreign central banks or large investment management group, 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.

[36] Future work could allow for such uncertainty, for example, along the lines of higher order beliefs in which the country is uncertain about what its reputation is with the investors.

Dynamics of Reputation in Equilibrium. Since the model features reputation cycles with potentially long spells without reputation updating, it is useful to distinguish calendar time, indexed by t, and steps in the reputation cycle, indexed by $n = 0, 1, 2, ...$ Each step n might occur over multiple calendar dates t as the country cycles over the reputation, growing it and then resetting it. Similarly, the calendar length between two steps in the cycle, n and $n+1$, is stochastic and depends on the next arrival of a crisis. In what follows we keep track of cycle steps rather than calendar dates.

We conjecture and solve for a Markov equilibrium consisting of a cycle defined by two steps, N^* and N. Resetting the cycles corresponds to returning to step $n = 0$ and occurs when a government imposes capital controls and reveals itself to be opportunistic. The step N^* is the first step at which the government lets in flighty investors in addition to stable investors. As such, we refer to it as the "opening up step" of the domestic bond market. More formally, for steps $n < N^*$ we have $M_n < M^*$, meaning that the economy is closed to flighty investors. For steps $n \geq N^*$ we have $M_n > M^*$ and the economy is open to flighty investors.

At all steps $n < N$, a fraction $0 < m_n < 1$ of opportunistic governments choose not to impose the capital control and continue to the next step of the cycle. The remaining fraction $1 - m_n$ choose to impose capital controls and revert to the beginning of the cycle. At step N, all opportunistic governments impose the capital control, $m_N = 0$, and revert to the beginning of the cycle. 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 graduate, or remain committed and continue at the constant beliefs and reputation, $\pi_{N+1} = M_{N+1} = 1 - \epsilon^C$.

5.1 Strategic Choices of Opportunistic Governments

Given the conjectured equilibrium, we need to determine the policy rule of the opportunistic government. Define $W(M_n)$ to be the value function of the opportunistic government with reputation M_n. In our conjectured Markov equilibrium, an opportunistic government at step n of the cycle that does not impose the capital control in the low state achieves value

$$W^0(M_n) = \pi_H \Big(g(h_n) V(M_n) + \beta W(M_n) \Big) + (1 - \pi_H) \Big(V(M_n) + \beta W(M_{n+1}) \Big).$$

Recall that if the high state is realized, then no governments impose the capital control and there is no change in beliefs. In this case, the continuation value is just the (lifetime) value function at step n of the cycle. By contrast if the low state is realized, then a government that does not impose a capital control progresses to the next step of the cycle and receives the continuation value from reputation increasing to M_{n+1}.

If instead the government chooses to impose the capital control in the low state, then it achieves

value

$$W^{\overline{\tau}}(M_n) = \pi_H\Big(g(h_n)V(M_n) + \beta W(M_n)\Big) + (1-\pi_H)\Big(g(h_n)V(M_n) + \beta W(M_0)\Big).$$

In the high state, the government does not impose the capital control and receives exactly the same value as above. By contrast in the low state, by imposing the control the government achieves an increase in flow utility to $g(h_n)V(M_n)$, rather than only $V(M_n)$. However, this comes at the cost of loss of reputation: the government resets to the beginning of the cycle and achieves continuation value $W(M_0)$, rather than $W(M_{n+1})$.[37]

There is no dynamic inconsistency within a date between the beginning of the date issuance decisions and the middle of the date imposition of capital controls. Intuitively, this is because investors know the probability that a government will impose the capital control, but not whether a specific government will impose the capital control. This means that a government can be thought of as having made a decision regarding capital controls at the beginning of the date. The value function at step n is therefore given by

$$W(M_n) = \max_{\tau\in\{0,\overline{\tau}\}}\left\{W^0(M_n)\ ,\ W^{\overline{\tau}}(M_n)\right\}.$$

In our conjectured equilibrium, opportunistic governments play (identical) mixed strategies such that a fraction m_n of opportunistic governments do not impose the capital control at step $n < N$ while a fraction $1 - m_n$ impose the capital control. For this to occur, it must be the case that opportunistic governments are indifferent between imposing and not imposing the capital control, that is for $n < N$ we have

$$W(M_n) = W^0(M_n) = W^{\overline{\tau}}(M_n).$$

Using that $W(M_0) = W^{\overline{\tau}}(M_0)$, we obtain the expression for $W(M_0)$

$$W(M_0) = \frac{1}{1-\beta}g(h_0)V(M_0). \tag{8}$$

This condition says that the lifetime value of a (single) mixing opportunistic government at the beginning of the cycle is equal to the value it would achieve if it followed the strategy of imposing the capital control at every date forever. Although the value function of the opportunistic type grows in the cycle step as reputation builds, that is $W(M_1) > W(M_0)$, the indifference condition ensures that this growth is perfectly balanced by the excess value of imposing the capital control today.

Similarly, we can use the indifference condition $W(M_n) = W^0(M_n) = W^{\overline{\tau}}(M_n)$ and the Bellman

[37] In the model, the imposition of capital controls fully reveals the type of the government and resets the reputation to the beginning of the cycle. It is possible to weaken this feature by having the committed types also impose some baseline degree of capital controls.

equation at step $n < N$ to characterize the transition path.[38] Combining these, we obtain

$$V(M_{n+1}) = \frac{g(h_n)}{g(h_{n+1})}\rho(h_n)V(M_n) + \frac{g(h_0)}{g(h_{n+1})}V(M_0) \tag{9}$$

where we have defined $\rho(h_n) = \frac{1-\pi_H\beta}{\beta}\frac{g(h_n)-1}{g(h_n)}$. Equation (9) characterizes the indifference path of our conjectured equilibrium in terms of flow utility $V(M_n)$, rather than in terms of the value function W_n. It tells us – given an initial reputation M_0, opening up step N^*, and graduation step N – what the path of reputation $M_1, ..., M_N$ must be to maintain indifference up until the graduation step. This path is characterized by an AR(1) process in flow utility $V(M_n)$. However, as we describe in detail below, the coefficients of the AR(1) process change when the economy opens up due to the change in investor composition. We build more intuition for this equation as we decompose it into its dynamics in the different regions.

To simplify notation, we will denote $\rho^s = \rho(h^s)$ and $\rho^f = \rho(h^f)$. Notice that $\rho^f < \rho^s$ since $g(h^f) < g(h^s)$.

5.2 A First Pass At Solutions: Homogenous Investors

To build intuition for the model dynamics, we consider first the simpler case in which the foreign investors are homogeneous. Formally, we set $h^s = h^f$ so that the haircut is identical across the two investor groups. The transition dynamics of equation (9) simplify to:

$$V(M_{n+1}) = \rho^f V(M_n) + V(M_0). \tag{10}$$

The transition path of flow utility $V(M_n)$ follows an AR(1) with a constant coefficient, $\rho^f = \frac{1-\pi_H\beta}{\beta}\frac{g(h^f)-1}{g(h^f)}$. 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 $g(h^f)$ 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. Finally, the rate of convergence falls as the low state becomes less likely, since a higher probability of the high state means a government gets a higher expected value in continuation for a given reputation.

The opportunistic government in our conjectured equilibrium must be willing to graduate at step N. This requires that $W^{\overline{\tau}}(M_N) \geq W^0(M_N)$. We know that after graduation, $M_{N+1} = 1 - \epsilon^C$. Therefore, graduation requires that

$$V(1-\epsilon^C) \leq \rho^f V(M_N) + V(M_0). \tag{11}$$

[38] Note that for all steps $n+1 < N$, both $W(M_{n+1}) = W^{\overline{\tau}}(M_{n+1})$ and $W(M_{n+1}) = W^0(M_{n+1})$ are valid Bellman equations due to indifference. However, at step N graduation occurs, and hence $W^{\overline{\tau}}(M_N) \geq W^0(M_N)$ in our conjectured equilibrium. Therefore, $W(M_N) = W^{\overline{\tau}}(M_N)$ is the valid Bellman equation at N.

Intuitively, this equation states that graduation occurs because the flow utility that would be required to maintain indifference, $\rho^f V(M_N) + V(M_0)$, exceeds the maximum flow utility $V(1-\epsilon^C)$ that can be achieved at the highest possible beliefs and reputation. Once the transition path would exceed this threshold, indifference can no longer be maintained and graduation occurs. Graduation cannot occur at a prior point on the indifference path. If graduation occurred at a step with $V(1-\epsilon^C) > \rho^f V(M_N) + V(M_0)$, then an opportunistic government would be indifferent between imposing the capital control and continuing to a reputation $M_{N+1} < 1-\epsilon^C$. But this would mean the opportunistic government strictly preferred continuing to reputation $1-\epsilon^C$, rather than graduating at N. In our conjectured equilibrium, the graduation step N is determined, starting from the initial reputation M_0, as the first step N at which condition (11) is satisfied.

The conjectured equilibrium of this model consists of a graduation step N, a path of reputation $M_0, ..., M_N$, and a path of beliefs $\pi_0, ..., \pi_N$ such that: (i) reputation evolves by the indifference condition (10); (ii) beliefs evolve according to Bayes' rule in equation (7); (iii) all opportunistic governments are willing to graduate at N as in condition (11); (iv) $\pi_n \leq M_n$ for $n < N$; and (v) $M_N = \pi_N$, consistent with all types graduating at step N. We refer to this type of equilibrium as a graduation step Markov equilibrium.[39] The proposition below characterizes this equilibrium.

Proposition 1 *There exists a unique graduation step Markov equilibrium.*

Proposition 1 (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 (10) and the path of beliefs described by equation (7) have different responses to a change in the initial government reputation M_0. An increase in initial reputation M_0 means that all future reputations M_n must be higher to maintain the indifference condition. By contrast, a higher initial reputation means that posterior beliefs 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. The terminal condition of graduation, equation (11), 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.

Numerical Illustration. Figure 8 presents a numerical example illustrating the equilibrium. Since the investors are homogenous, the opening up date is $N^* = 0$ by definition. In this example,

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

graduation occurs at $N = 10$. The upper left panel plots the evolution of reputation M_n and beliefs π_n. Beliefs and reputation are close to each other at $n = 0$ because, at this point, investors' are almost certain the government is opportunistic; in this example, prior beliefs at $n = 0$ are $\pi_0 = \epsilon^O = 0.01$. Intuitively, most governments at $n = 0$ are those that exercised capital controls last period, thus revealing themselves to be opportunistic, and the only uncertainty about their type this period is due to the exogenous switching probability. At $n = 0$ there is no reputational cost to imposing the capital controls because the posterior belief would coincide with the prior, and a large increase in reputation is required for opportunistic governments to be willing to forgo imposing capital controls. Furthermore, since the belief that the government is the committed type is very low, a small fraction of opportunistic governments mimicking generates a large increase in posterior beliefs and future reputation. This can be seen in the top left panel of Figure 8 in which a large gain in reputation M_n occurs moving from $n = 0$ to $n = 1$. The top right quadrant shows that this is supported by a relatively low value of the mimicking probability m_0. As beliefs build, reputation exceeds beliefs as more opportunistic governments are willing to defer employing capital controls to capitalize on the higher reputation and higher future benefits of imposing capital controls. This willingness declines as graduation approaches, reflecting the exponential convergence of the reputation building process.

The bottom left panel of Figure 8 shows the decline in the equilibrium borrowing rate R_n as reputation of the government improves. The bottom right panel shows the corresponding increase in foreign debt as the reputation improves. At higher reputation the government contemporaneously sustains more foreign debt and lower interest rates which is intuitive since higher reputation is a shift downward in the interest rate schedule.

This homogeneous-investors version of the model already captures salient empirical features documented in Sections 2 and 3. 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 commitment during crises: they pull out their capital and pay attention to the reaction of the Chinese government and the well functioning of the bond market. If during these crises the Chinese government lets foreigners take their money out unimpaired, foreign investors positively update on the future prospects of investing in Chinese bonds. The model makes sense of the 2015-16 v-shape episode of capital outflows, again visible in Appendix Figure A.II. In the midst of economic and financial turmoil in China, foreigners liquidated more than 20% of their Chinese bond holdings without the Chinese government locking the gates to foreign capital.[40] As the crisis passed, foreign capital flows returned to China with the overall foreign bond holdings increasing well past their pre-2015 peak.[41] To further connect the model

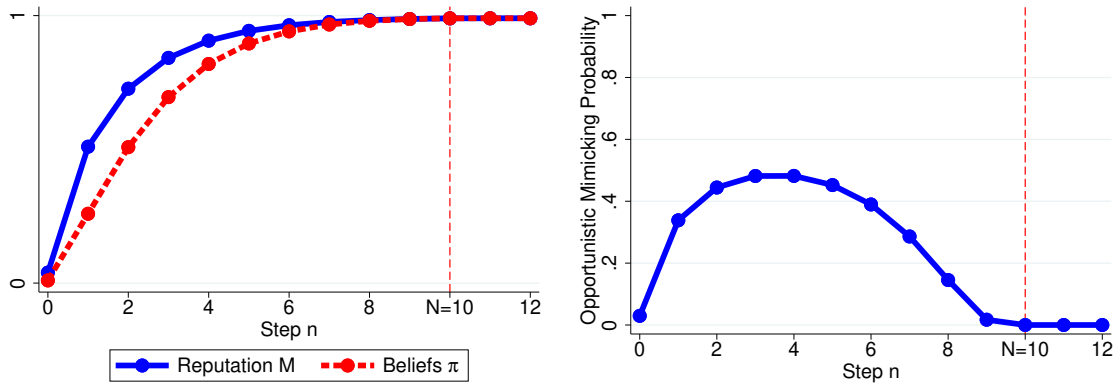
[40] In fact, the Chinese government decided to intervene by blocking domestic savers from exporting capital. A decision that we view, in part, as being motivated by fears that restrictions on foreigners would have damaged China reputation in global markets at a time when China was actively pushing for internationalization.

[41] The simplicity of the model implies that the level of holdings is purely a function of reputation. This can be relaxed by making the outside option $\bar{R}$ or the slope of the demand curve b time varying, thus allowing for changes in the demand for Chinese bonds that do not depend solely on reputation.

Figure 8: Equilibrium Reputation Cycle: Homogeneous Foreign Investors

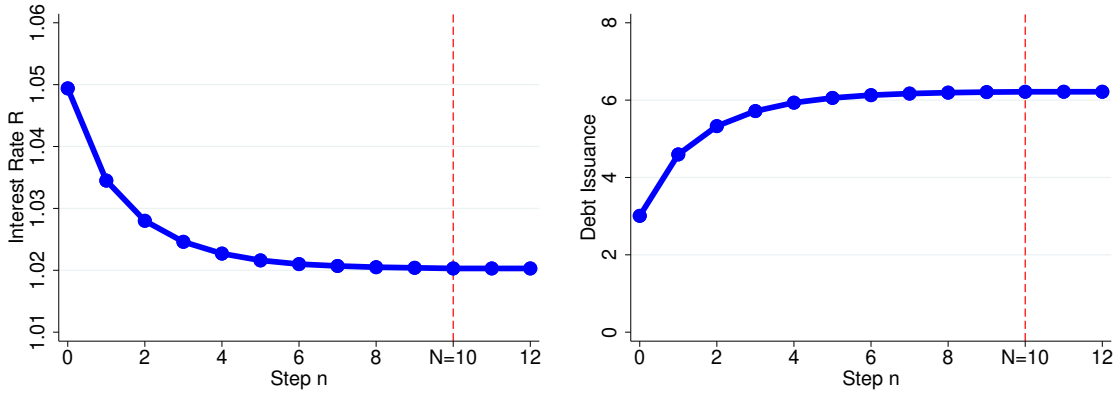
(a) Reputation and Beliefs M and π

(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 homogenous.

with the empirical patterns of reform and sequential investor entry of Section 3.1, we next turn to analyzing the equilibrium of the heterogeneous investor model.

5.3 Model Equilibrium with Stable and Flighty Investors

We now analyze the the model with heterogeneous investor types. 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. A number of different combinations are possible, with opening up preceding or following graduation, as well as different timing for both events. Formally, our conjectured equilibrium has an opening up step $0 \leq N^* \leq N+1$ and a graduation step N. If $N^* = 0$ then the economy opens up immediately, whereas if $N^* = N+1$ then the economy only opens after graduation.

If $N^* = 0$, then the transition dynamics are the same as in Section 5.2. If $N^* = N+1$, the economy follows the transition dynamics of Section 5.2 up to a change in the definition of the graduation condition in equation (11).[42] Therefore, we focus attention here on characterizing the transition dynamics when $0 < N^* \leq N$: the cycle starts with only stable investors, reputation builds up for some time, then the government opens up to flighty investors, reputation builds up for more time until eventually the government imposes capital controls and the cycle restarts.

When $0 < N^* \leq N$, the transition dynamics of the model from equation (9) can be divided into two regions: a region with only stable investors and one with both investors. At the boundary between these two regions, a jump occurs in the dynamics.

The first region covers the cycle steps before the economy opens up to flighty investors. When $n+1 < N^*$ (if nonempty), the economy has not yet opened up at either n or $n+1$. In this case, the haircut is that demanded by the stable investors, $h_0 = ... = h_n = h_{n+1} = h^s$, and the transition dynamics in equation (9) reduces to the transition dynamics governed by the stable investors:

$$V(M_{n+1}) = \rho^s V(M_n) + V(M_0). \tag{12}$$

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

At the point of opening up to flighty investors, the economy is not open to them at $n = N^* - 1$ but is open to them at $n+1 = N^*$. This means that $h_0 = ... = h_{N^*-1} = h^s$ but $h_{N^*} = h^f$. Therefore, the transition dynamics of equation (9) generate

$$V(M_{N^*}) = \frac{g(h^s)}{g(h^f)}\Big(\rho^s V(M_{N^*-1}) + V(M_0)\Big). \tag{13}$$

The opening up step N^* has the same transition dynamics as before opening up, but is scaled by

[42] Since the economy is closed to flighty investors at N but open at $N+1$, the graduation condition in this case is $V(1-\epsilon^C) \leq \frac{g^s}{g^f}(\rho^s V(M_N) + V(M_0))$, where the RHS is the required promised flow utility to maintain indifference at the opening up date (see equation (13)).

the relative value $g(h^s)/g(h^f)$ of imposing the capital control before and after opening up. We have that $g(h^s) > g(h^f)$: for a given inside equity, imposing capital controls before rather than after opening up increases the government utility more. Intuitively, this occurs because flighty investors are more inelastic (require a higher haircut) in their debt rollover decisions in the crisis state, 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 flow value $V(M_{N^*})$ relative to the dynamics before opening up. This is because the lower proportional value of exercising the capital control must be offset by a larger increase in the baseline value $V(M_{N^*})$ which that proportional increase is weighed against. Since the proportional value of imposing the capital control falls by $g(h^f)/g(h^s)$, flow utility must increase by the same proportion $g(h^s)/g(h^f)$ in order to maintain indifference. In other words, the transition dynamics of the value of the opportunistic government of imposing capital controls, $g(h_n)V(M_n)$, are the same at and before opening up.[43]

Our model captures the notion that investors welcome these "opening up" decisions from China, which in the data correspond to the reforms that increase market access to foreigners described in Section 3.1. The model provides a rationale for the pattern in Figure 3 where these reforms lead to more foreign participation in local bond markets by progressively flightier investors. The model captures both the gradualism of reforms, the sequencing (starting with stable and then going to flightier investors), and the bunched entry (the jump up at opening up). The gradualism occurs because at low levels of reputation it is too expensive to open up to flighty investors. China first "experiments" with only stable investors and waits for investors to form a higher opinion, a higher reputation, of the functioning of its domestic bond market. When reputation is sufficiently high, China pursues reforms that broaden market access to flightier foreign investors. These reforms are viewed positively by investors in the sense that they lead to higher reputation for the country. The higher reputation is associated with more participation even at low interest rates, a shift downward and flattening of the investors demand curve. The bunched entry at the point of reform, like the entry observed after the introduction of Bond connect in 2017, occurs because of the fixed cost nature of reforms in our model.

The second region is the cycle steps after opening up but before the graduation step, $N^* < n+1 \leq N$ (if nonempty). In this region, the economy is open at both n and $n+1$, so that $h_0 = h^s$ and $h_n = h_{n+1} = h^f$. As a result, the transition dynamics of equation (9) are

$$V(M_{n+1}) = \rho^f V(M_n) + \frac{g^s}{g^f} V(M_0). \tag{14}$$

Intuitively, a government that imposes the capital control at n also benefits from the higher pro-

[43] We can alternatively express the transition dynamics of the problem as $g(h_n)V(M_n) = \rho^s g(h_n)V(M_n) + g(h_0)V(M_0)$, which expresses them in terms of the value $g(h_n)V(M_n)$ to the opportunistic government of imposing the capital control.

portional value of imposing the capital control when it resets to reputation M_0. This leads to the scaling of $V(M_0)$ by $g(h^s)/g(h^f)$. 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. This captures the notion that building reputation as a reserve currency issuer gets progressively more difficult later in the game, once reputation is already high, since the large stock of reputation acts as a commitment device. The presence of the flightier class of investors accentuates this dynamic by decreasing the gains further from imposing capital controls.

The model offers an explanation for the seemingly puzzling observation that despite the Chinese Bond Connect platform having no limits on northbound flows (foreign capital inflows into China), foreign investors after a period of bunched entry did not immediately go "all in" into Chinese bonds. As we documented in Section 2, some prominent investors kept being underweight China compared to the size of its bond market (or the weight in benchmark bond indices). In the model, very much like in the homogeneous investor case, away from reform dates (the open up step) reputation evolves slowly and even in the best case scenario of no major crises and capital controls not being instituted, it takes time for investors to choose to increase their positions.

Finally, opportunistic governments must be willing to graduate at N, that is they must find imposing the capital control to be preferable. The required condition for graduation at N is given by[44]

$$V(1-\epsilon^C) \leq \rho^f V(M_N) + \frac{g(h^s)}{g(h^f)} V(M_0). \tag{15}$$

The intuition is analogous to the one investor model (equation (11)). Maintaining indifference requires an increasing path of reputation M_n. Graduation occurs at the step N where the reputation implied by the indifference path (14) exceeds the highest possible reputation $1-\epsilon^C$.

The conjectured equilibrium of this model consists of a graduation step N, an opening up step N^*, a path of reputation $M_0, ..., M_N$, and a path of beliefs $\pi_0, ..., \pi_N$ such that: (i) reputation evolves by the transition dynamics in equations (12, 13, and 14); (ii) beliefs evolve according to Bayes' rule in equation (7); (iii) all opportunistic governments are willing to graduate at N as in condition (15); (iv) $\pi_n \leq M_n$ for $n < N$ (that is, $0 \leq m_n \leq 1$); and (v) $M_N = \pi_N$. As before, we refer to this as a graduation step Markov equilibrium. The proposition below characterizes this equilibrium.

Proposition 2 *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

[44]Note that equation (15) is correct even if $N^* = N$, that is opening up and graduation coincide and the transition dynamics of equation (14) never apply on the equilibrium path. This is because graduation is governed by the evolution of reputation that would be required to maintain indifference, and hence by equation (14).

with that step. In some sense, the logic of uniqueness of the equilibrium in the special case of homogenous investors carries over to this set-up 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 date there might be two possible outcomes. The first is that the economy opens up and reputation experiences a larger jump according to equation (13), 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 (12) governed the dynamics, we would have $M_{N^*} < M^*$. This in turn rationalizes the decision of committed governments not to open up.

Additional Heterogeneity in Investor Demand Curves. To focus on our core point on differences in investor flightiness, our baseline model assumes the only difference between investors is their required haircut. However, in reality, there may be other dimensions along which investors differ. In Appendix Section A.XIX, we allow for further heterogeneity in terms of parameters of the demand curve, like slope and intercept, as well as capping the total amount of financing that can be obtained by some investors. This allows for a richer characterization of heterogeneity and highlights the fixed-cost component of reforms that open up to further types of investors.

This extension of the model highlights the importance of building the investor base, starting with stable investors, in the early phases of internationalizing the bond market of what could become an international currency. We think of the demand for the country's bonds by stable investors even at low levels of reputation as a special characteristic of countries that could become a reserve currency, like China. Most other countries, like many emerging markets, do not have this option and instead open up directly facing flighty investors. Some developed countries, like Australia, only attract reserve managers when they already have a very high reputation. At each point in history only a handful of countries are possible contenders for a reserve currency role and researchers have long debated these countries necessary characteristics such as size, importance in trade, military power, institutional quality, and fiscal capacity (Eichengreen et al. (2017)). This extension captures this idea as the presence of these characteristics for China (e.g. size, and military power) is why the stable investors are demanding the bonds even at low levels of reputation, and instead focus on the endogenous build up of reputation.

Numerical Illustration. Figure 9 provides a numerical example illustrating the equilibrium. In this case, the economy opens up at $N^* = 2$ and graduates at $N = 5$. The dynamics before opening up are similar to those in the one investor class case. At low levels of reputation letting in the flighty investors is sub-optimal since total desired borrowing is small.[45] While beginning

[45]This numerical example assumes there is a limit on the amount stable investors can invest ($\bar{D}_s$.) discussed in Section A.XIX.

with low reputation and borrowing only from stable investors, as reputation builds further and consequently the interest rate schedule shifts downwards, 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 build-up slows down substantially after opening up as seen is the top left panel of Figure 9. The bottom right panel of Figure 9 confirms the intuition that the government upon opening up to flighty investors wants to borrow a lot more. The bottom left panel shows that the equilibrium interest rate falls together with this debt increase.

After opening up, foreign debt continues to increase and interest rates continue to fall, but the movements are much less pronounced since further build up of reputation occurs slowly. Eventually, much like in the one investor case, 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 model shows how hard it is to build a reputation toward being a reserve currency. 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 currency 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, but also currency depreciation and/or inflation, can impair such a promise without constituting a deviation from the rule of law per se. Investors buying an international currency 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 drove the focus of the paper on foreign investment in domestic currency bonds, rather than equity of foreign direct investment where there is no expectation of stable returns regardless of the level of financial development or reputation.

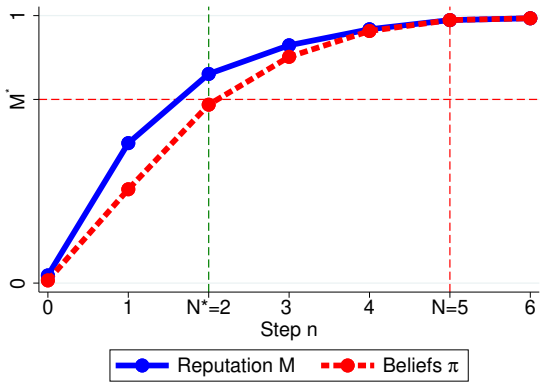
It is also interesting to reflect on how the model speaks to earlier episodes of countries building reputation toward becoming a global reserve currency. In this respect, we think of the first U.S. Secretary of the Treasury, Alexander Hamilton, policy of having the newly created federal government assume the debt of the states. The policy aimed at building a solid reputation as a borrower for the newly created United States (Sargent (2012)).[46] Similarly, we think of the later efforts by New York Federal Reserve Governor Benjamin Strong to build an investor base for the trade-bills (bankers acceptances) market in dollar in New York to rival the liquid and safe markets for these bills in sterling in London. Such efforts were instrumental into making the dollar a reserve currency (Eichengreen (2011); Broz (2018)). The need to maintain reputation was also a motivation behind England's misguided return to the gold standard at the pre-war exchange rate level in the 1920s.[47]

[46] Hamilton (1790) extols the virtues of governments that maintain their promises to creditors: "States, like individuals, who observe their engagements, are respected and trusted: while the reverse is the fate of those, who pursue an opposite conduct. [...] The credit of the United States will quickly be established on the firm foundation of an effectual provision for the existing debt." Chernow (2004)[pg 298] remarks: "With this huge gamble, Hamilton laid the foundations for America's future financial preeminence".

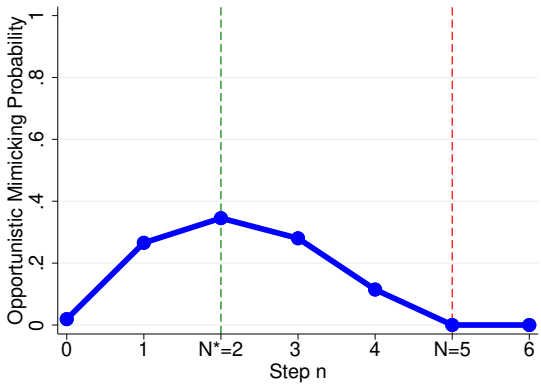
[47] The Cunliffe Committee, charged in 1918 with studying the possible international monetary arrange-

Figure 9: Equilibrium Reputation Cycle: Heterogeneous Foreign Investors

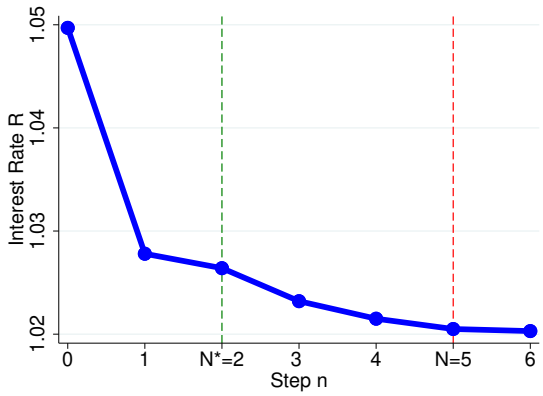
(a) Reputation and Beliefs M and π



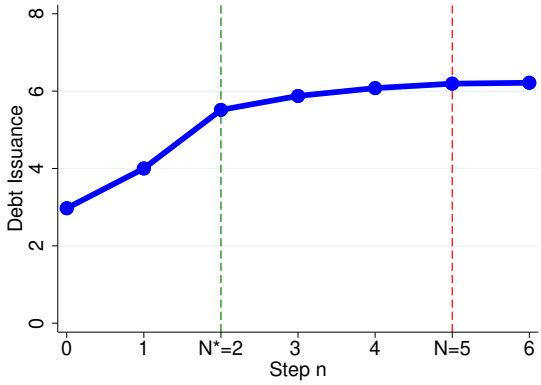
(b) Mimicking Probability m



(c) Interest Rate R



(d) Debt Issuance D



Numerical illustration of the equilibrium of the model when foreign investors are heterogeneous.

Countries have, at various times, suffered losses of reputation as a provider of reserve currencies. England suffered a blow to its reputation with the sudden devaluation of the pound in 1931 and never recovered its role as a reserve currency provider. The US went off gold in 1933 and then again in 1972. In particular, the Nixon administration in 1971 reneged on a promise of free convertibility of the dollar into gold, restricting this ability only to official ("stable") investors and excluding the private ("flighty") investors. Immediately after 1973 there was an attempt by foreign investors to diversify away from the dollar, but, perhaps due to the lack of viable alternatives, the dollar quickly regained and maintained its status.[48]

To further connect the model with the empirical patterns of investor specialization in different assets in Section 3.2 and to analyze the competition between a new entrant like China and an established player like the US, we next turn to developing a version of the reputation model in which multiple countries compete in issuing debt in world markets.

6 Reserve Currency Competition

The model considered so far featured a single country facing a set of investors. An important feature of becoming an international currency is that a country at the beginning of the cycle faces competition from both other "aspirants", those at the same low level of reputation, and from countries that are already established, those at high levels of reputation. For example, China is entering now, but faces competition from the US as an established reserve currency issuer. Theoretically, the interaction between reputation building and competition is an interesting area due to complementarities. For example, the value to a country of future higher reputation increases if current competitors lose reputation but decreases if entrenched players issue more. Both occur because the actions of others affect the residual demand curve that the country faces for its debt at future levels of reputation.

We now extend our baseline model to study competition between countries and multiple investors with different portfolio preferences. For example, some investors might be developed market specialists while others might be emerging market specialists as we documented in Section 3.2. In this section, we assume that all investors demand the same haircut h.

There is a measure one of countries, indexed by $j \in [0, 1]$. Countries are identical in the sense that they have the same fundamentals, but may be at different reputation levels M. We denote μ

ments after WWI, stated in in its interim report: "The uncertainty of the monetary situation will handicap our industry, our position as an international financial centre will suffer and our general commercial status in the eyes of the world will be lowered." A strong dissenting voice was John Maynard Keynes (Keynes (1923)) who argued that these concerns were overblown compared to the economic cost of return to gold at a deflationary peg.

[48]The model could be extended to include behavioral biases in the updating of reputation in the form of wedges in equation (7). In particular, it would be interesting to consider a set-up in which investors, conditional on not observing ex-post capital controls in a crisis, become overly optimistic about the government being the committed type. Once they observe a country being a safe investment for a while, they think it will always be safe.

to be the distribution (measure) over reputation levels among countries. The distribution μ is an endogenous object, but is taken as given by individual countries and by investors.

We restrict attention to symmetric equilibria in which $R_j(M) = R(M)$ for all j at reputation M, that is all countries at the same reputation post the same interest rate, and investors choose $D_{ij}(M) = D_i(M)$ for all j. In this sense, we are treating the problem as if there is a representative committed government of reputation M that is choosing an issuance decision. Similarly, we define the decision problems of opportunistic governments as functions of their reputation M but not of their identity j. For brevity, we henceforth suppress the j notation.

In addition to the debt issuances of the set of countries, we introduce an asset S that is in fixed supply $\overline{S}$ and that is sold competitively. Its endogenously determined return is R^S. This asset serves as a common factor across investors.

6.1 Specialist Investors: Asset Demand and Aggregation

A model with multiple assets of varying reputation, that is the debts issued by each of the countries, also allows use to study heterogeneity in investors portfolio holdings. Consistent with Section 3.2, we allow investors to specialize in assets of varying levels of reputation. In the data, some funds specialize in emerging markets risky debt and others in safe debt issued by developed countries. Formally, we assume that there is a set of investors, $i \in \{1, ..., I\}$, each of equal size $\frac{1}{I}$. Investor i takes the distribution μ of countries, the posted interest rates R, and the return R^S as given. She chooses her debt portfolio, D_i, and asset holdings, S_i, in order to maximize her utility,

$$(R^S - \bar{R})S_i + \int E[\tilde{R}(M) - \bar{R}]D_i(M)d\mu(M) - \frac{1}{8}b\left(\lambda S_i + \int \omega_i(M)D_i(M)^2 d\mu(M)\right)^2 \tag{16}$$

where $\omega_i : [0,1] \to [0,\infty)$ is a weighting function that depends on i, and where λ is a weight on the holding cost of S_i. The weights ω_i are investor specific and akin to taste (higher or lower holding cost) for particular assets.[49]

Demand Curves for Assets. Given the preferences of investor i, we can write the demand curve of investor i for S_i from her first order conditions as

$$R^S - \bar{R} = \frac{1}{4}b\lambda\left(\lambda S_i + \int \omega_i(M)D_i(M)^2 d\mu(M)\right).$$

[49] Equation (16) is the analog of investor preferences in the previous section, with the exception that i's portfolio holding costs are no longer separable across countries and reputation levels. The Lebesgue integrals in the equation are defined over the distribution $\mu(M)$. The baseline model with a single investor is a special case of this model in which we assumed that holding costs were separable across countries, that $\omega_i(M) = 1$, and that $I = 1$.

We sum this equation over all investors to obtain

$$R^S - \bar{R} = \frac{1}{I}\frac{1}{4}b\lambda\left(\lambda\overline{S} + \sum_i \int \omega_i(M)D_i(M)^2 d\mu(M)\right).$$

The above two equations tell us that the marginal portfolio holding cost of investor i is equal to the return on asset S relative to the outside option, $R^S - \bar{R}$. Likewise, the average portfolio holding costs across investors is also equal to $R^S - \bar{R}$. This common factor across investors induces much tractability, as it will become clear below.[50] For simplicity, we set $\overline{S} = 0$, so that asset S is in zero net supply, and normalize the holding cost $\lambda = 1$. Under these assumptions, we define the average portfolio holding cost from above:

$$b^* = 2(R^S - \bar{R}) = \frac{1}{2}b\int\left[\frac{1}{I}\sum_i \omega_i(M)D_i(M)^2\right]d\mu(M), \tag{17}$$

where we multiply by two without loss for convenience in the derivations that follow.

The first order condition for investor i for debt purchase from a country of reputation M with a promised interest rate $R(M)$ is

$$E[\tilde{R}(M)] = \bar{R} + \frac{1}{2}b^*\omega_i(M)D_i(M) \tag{18}$$

This demand curve has the same form as in the baseline model, except that $b^*\omega_i(M)$ replaces b as the slope of the demand curve. The demand curve is affected not only by overall debt issuance, b^*, but also by the reputation-specific holding costs $\omega_i(M)$ of investor i. For example, an investor i that specializes in reputation M might have a low holding cost $\omega_i(M)$, and hence have a relatively flat interest rate schedule for debt of that reputation level.

The model features a very tractable aggregation to a representative investor. Consider the problem of a committed government that currently has reputation M. As in the baseline model, this committed government internalizes the effect of the promised interest rate $R(M)$ on the demand schedules (18) of all investors. Given nondiscrimination in interest rates between investors, equating the demand schedules of two investors gives us $\omega_i(M)D_i(M) = \omega_1(M)D_1(M)$ for all i. A country of reputation M raises different debt amounts from different investors only to the extent that their holding costs $\omega_i(M)$ differ. The term b^* drops out since it is common across investors. The total amount borrowed by a country of reputation M is given by $D(M) = \frac{1}{I}\sum_i D_i(M)$. Substituting in, we obtain

$$D(M) = \omega_i(M)D_i(M)\frac{1}{I}\sum_j \frac{1}{\omega_j(M)}. \tag{19}$$

[50] An analogy might be drawn with money in the utility function frameworks and the cashless limit; a modeling tool that has proved very tractable in macro theory.

From here, it is useful to define

$$\frac{1}{\omega(M)} = \frac{1}{I}\sum_i \frac{1}{\omega_i(M)}. \tag{20}$$

Equation (20) defines $\omega(M)$ as a measure of the average holding cost $\omega_i(M)$ across investors. It defines the average taste, $\frac{1}{\omega(M)}$, of investors for debt of that level of reputation. Substituting equations (19) and (20) into equation (17), we obtain: $b^* = \frac{1}{2}b\int \omega(M)D(M)^2 d\mu(M)$.

An optimizing country of reputation M chooses total issuance as if it was facing a representative investor with demand schedule:

$$E[\tilde{R}(M)] = R + \frac{1}{2}b^*\omega(M)D(M). \tag{21}$$

The aggregate demand schedule depends on average holding costs b^* and reputation specific taste $\omega(M)$. When other countries increase issuance to the investors, the residual demand curve faced by a specific country for its debt worsens. The effect occurs through a common component, b^*, to which countries of varying reputation M are heterogeneously exposed via the taste $\omega(M)$. Countries at levels of reputation that investors find less attractive, a high $\omega(M)$, are more exposed to increases in b^*.

6.2 Countries Issuance Decisions

We define $D^{NC}(M)$ to be the optimal debt issuance of a committed government with reputation M in the baseline model (i.e. no competition and homogeneous investors), as defined under Lemma 1, when that government faces slope b. Equation (21) then tells us that the solution here is simply

$$D(M) = \frac{b}{b^*\omega(M)}D^{NC}(M), \tag{22}$$

and moreover we know that the equilibrium promised interest rate is $R(M) = \frac{1}{2}\frac{R}{\mathcal{M}} + \frac{1}{2}\gamma Q$, as in the baseline model. The proof follows exactly as in Lemma 1, except that we no longer have to account for M^* since investors here are assumed to be homogeneous in terms of haircuts. Intuitively, optimal debt issuance here is scaled up or down relative to the model without competition by the relative slopes of the demand curves in the two cases. As the slope steepens due to competition (b^*), equilibrium issuance falls. Substituting equation (22) into the expression for b^*, we write

$$b^* = b\left(\frac{1}{2}\int \frac{1}{\omega(M)}D^{NC}(M)^2 d\mu(M)\right)^{1/3}. \tag{23}$$

This expresses b^* as a function of the equilibrium stationary distribution μ over reputations.

6.3 Equilibrium and Stationary Distribution

We have so far mapped the decision problem of committed governments in the model with competition into the same decision problem in the model without competition. We now show that this mapping of the model can be tractably extended to solve for the problem of opportunistic governments in the dynamic reputation model. Mapping into the dynamic reputation model involves solving for both the reputational dynamics and also the distribution μ over reputations. In particular, the distribution will be atomic with atoms at $\mathbf{M} = \{M_0, ..., M_N, 1 - \epsilon^C\}$, and with no mass at any point in $[0, 1]$ that is disjoint with $\mathbf{M}$. $\mathbf{M}$ is the reputation cycle.

As in the baseline model we conjecture a graduation step Markov equilibrium. The transition dynamics in this model have the form

$$V(M_n, b^*) = \rho V(M_{n-1}, b^*) + V(M_0, b^*),$$

capturing the fact that the transition dynamics now depend on the distribution μ through b^*. A key point of tractability of this competition model is that b^* is a sufficient statistic for the distribution μ when solving the dynamic reputation model. For a given b^*, there exists a unique graduation step Markov equilibrium. We obtain this result as a corollary of Proposition 1.[51]

The conjectured equilibrium of this model consists of a slope b^*, a discrete set of reputations $\mathbf{M}$, and a distribution μ over that set such that: (i) the set $\mathbf{M}$ is the cycle of the unique graduation step Markov equilibrium associated with b^*; (ii) the distribution μ is the stationary distribution from that graduation step Markov equilibrium; (iii) b^* is equal to the marginal portfolio holding cost of investors, that is equation (23) holds.[52]

A remarkable point of tractability of this model is that b^* is a sufficient statistic for determining the equilibrium reputation cycle and stationary distribution, leaving only the consistency condition (23) to verify. In Appendix A.XVI, we leverage this insight to show that holding all parameters fixed except for b, every b^* can be obtained as a solution of a model with competition for some unique value of b.

Competition affects the dynamics of the model both by affecting the optimal debt policy for a given reputation path and by affecting the path of reputation itself. Intuitively, competition lowers the value of becoming a reserve currency because, in the presence of competitors, the residual demand curve for debt is not as attractive (steeper) for the issuer. Most potential candidate countries stay at low levels of reputation, that is they do not become reserve currencies, and even those that emerge as reserve currencies find being one less valuable than in the absence of competition. To unpack these effects it is useful to consider some special cases before turning to the full effect of

[51] The only material difference to the form of V is that the model with competition involves the weights ω, and otherwise replaces b with b^*. The proof of Proposition 1 only made use of V being increasing and continuous. Once we assume that $V(M_n, b^*)$ is increasing and continuous, the proof of Proposition 1 therefore extends immediately this setting. We have already assumed continuity. A (stronger than necessary) sufficient condition for $V(M, b^*)$ to be increasing in M is that ω is nonincreasing in M.

[52] Appendix A.XVII characterizes the stationary distribution μ.

competition on the stationary distribution.

We consider first the special case of no inside equity, so that all projects are fully debt financed.

Proposition 3 *Assume that inside equity is zero, $A = 0$. Then, there exists a unique graduation step Markov equilibrium of the model with competition. The reputation vector $\boldsymbol{M}$ and distribution μ are the same as those in the unique graduation step Markov equilibrium in the model without competition but with holding costs ω. Competition lowers the optimal debt issuance but does not affect the evolution of reputation.*

In this limiting case, competition lowers equilibrium debt issuance but has no direct impact on the reputational dynamics. The reason is that absent inside equity, the entire value of the government comes from debt issuance. Because b^* has the same proportional impact on the demand curves of all reputation levels, it drops out of the transition dynamics absent inside equity, leading to the limiting result.

In the general case with $A \geq 0$, the transition dynamics are

$$V^{\omega}(M_n) = \rho v A \frac{b^* - b}{b} + \rho V^{\omega}(M_{n-1}) + V^{\omega}(M_0),$$

where V^{ω} is the indirect utility function when there is no competition and there are weights ω, and where $v = \frac{h}{\gamma - \frac{1-h}{R^L}}\gamma Q$ is the marginal value of inside equity in the low state.[53] In the limiting case of $A = 0$, these transition dynamics collapse to those of the model without competition, as highlighted by Proposition 3. When $A > 0$, the above equation shows that reputation builds more quickly when competition is higher, that is b^* increases relative to b. Intuitively, the government's value can be thought of as a combination of value from inside equity and value from external debt. As competition becomes more fierce, the value of external debt declines relative to the value of inside equity, making it less costly for a government to forego its current reputation level (all else equal). This means that a larger reputational gain is required to induce the opportunistic government to be willing to forgo capital controls today.

This observation gives rise to our second interesting limiting case: that committed governments can provide sufficiently fierce competition to force immediate graduation by opportunistic governments.

Proposition 4 *There exists a threshold $\overline{b}^*$ such that if and only if $b^* > \overline{b}^*$, there is a crowd out equilibrium of the competition model in which $\boldsymbol{M} = \{\epsilon^W, 1 - \epsilon^C\}$ and all opportunistic governments immediately graduate.*

Intuitively, competition in this case is sufficiently fierce that opportunistic governments cannot build sufficient value from reputation. As a result, they immediately impose capital controls and

[53] See the proof of Proposition 3 in the Appendix.

graduate. Proposition 4 expresses the result in terms of a threshold on the sufficient statistic b^*. The proof of Proposition 4, see Appendix A.XIII, shows that this threshold is given by

$$\overline{b}^* = \left(1 + \frac{V^\omega(1-\epsilon^C) - (1+\rho)V^\omega(\epsilon^O)}{\rho v A}\right) b.$$

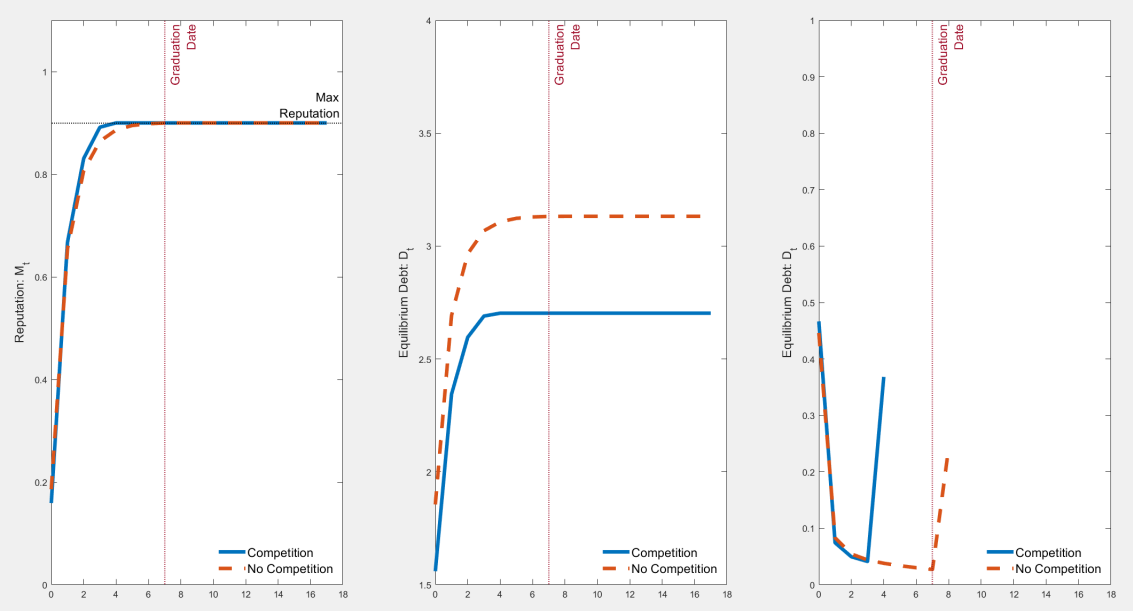
A similar expression holds in the model without competition and provides a restriction on a set of parameters, including the slope of the demand curve b, to avoid immediate graduation ($N = 0$). In particular, the model without competition requires that $(1+\rho)V^\omega(\epsilon^O) \geq V^\omega(1-\epsilon^C)$ for immediate graduation to occur. If the model without competition features immediate graduation, then the model with competition also features immediate graduation. The threshold above shows that even if the model without competition has a nonzero graduation step, sufficiently strong competition can force immediate graduation.

We now turn a numerical illustration of the general case. Figure 10 plots the stationary distribution of reputation for a country in the model under two configurations. In the first configuration, there is a single issuing country cycling over its reputation. The distribution μ is degenerate at each point in time and for simplicity we assume $\omega(M) = 1$. This configuration is equivalent to the baseline model of Section 5.2 with homogeneous haircuts. For this configuration, Figure 10 plots the stationary frequency that the country spends at each level of reputation. The country spends most of the time at low levels of reputation highlighting how difficult it is to emerge as a reserve currency in the model.

In the second configuration, there is a unit mass of issuing countries. All parameters are otherwise identical to the first configuration, including b and $\omega(M) = 1$. For this configuration, Figure 10 plots the stationary frequency that a country, drawn at random ex-ante, spends at each level of reputation. Given the law of large numbers, this frequency also coincides with the stationary cross-sectional distribution μ. Compared to the first configuration, the country now spends more time at low levels of reputation and graduates sooner. These features highlight that competition deters a country currently at a low level of reputation, like China, from building reputation up into being a reserve currency.

How Can the U.S. Deter China From Becoming a Reserve Currency? In the model of competition we studied above, countries take the reputation cycle $\mathbf{M}$ and distribution μ as given, in the spirit of monopolistic competition models. It is useful to consider here the incentives of a country to manipulate the cycle. We consider the following leading example. Suppose there was a country known to be committed forever, so that it's reputation is $M = 1$ and constant. Assume that this country chooses issuance taking into consideration its effect on b^*. What would be its optimal debt issuance? It faces two opposing forces. For a given b^*, an increase in issuance pushes up the interest rate the country pays. However, an increase in issuance can decrease b^* if other countries respond in equilibrium by lowering their issuance sufficiently due to their worse residual demand curve.

Figure 10: Stationary Distribution and Competition



Notes: Numerical illustration of the stationary distribution of the model with or without competition.

6.4 Investor Portfolios and an Empirical Proxy for Reputation

The presence of multiple investors and assets allows us to characterize what types of investors hold a country at a given point in its reputation cycle. From the demand curves derived above, we have $D_i(M) = \frac{1}{\omega_i(M)}\omega(M)D(M)$. Consider a single country with reputation M. The (infinitesimal) portfolio share of investor i in that single country is given by

$$\alpha_i(M) = \frac{\frac{1}{\omega_i(M)}\omega(M)D(M)}{AUM_i}.$$

It is useful to consider the correlation of portfolio shares across funds, and we consider the simplest case of assuming funds are equally sized (AUM_i constant for all i). We consider fixing a reference set of assets, say those with high reputation, denoted M^r. Then we can derive the following proposition.

Proposition 5 *The portfolio share correlation across investors i for assets of reputation M with a reference set of reputation M^r is*

$$corr(\alpha_i(M), \alpha_i(M^r)) = corr\left(\frac{1}{\omega_i(M)}, \frac{1}{\omega_i(M^r)}\right)$$

Proposition 5 provides the theoretical counterpart to equation (1) and the empirical evidence on

portfolio shares in Figure 4. It tells us that the correlation between portfolio shares in two different reputation levels is exactly the correlation of the inverse holding cost weights of investors. In a model in which investors tend to specialize in certain reputation levels, this correlation tends to be high when M and M^r are close. Proposition 5 provides a simple and empirically implementable way to track the reputation rank of a country by estimating the correlation of portfolio shares.[54]

Mapping Proposition 5 into Figure 4 requires taking the set of developed-currencies government bonds (DM) to be the reference set. We think of the reference set as having a high reputation M. Then the figure shows that indeed the correlation is positive and high for government bonds denominated in currencies of some notoriously high reputation countries such as the US, Switzerland, and Great Britain. Similarly, the correlation is negative for emerging markets like Brazil, Mexico and South Africa. At present, China is in the middle, with a reputation rank estimated in between emerging markets and developed countries. This provides a simple statistic to track over time the evolution of reputation, assuming fund specialization will stay similar. While the time series for China is relative short, from 2014-2020, we find that China's portfolio correlation with developed markets has increased, consistent with an improving reputation (see Appendix A.IV). Interestingly, we see a slight dip in the correlation in 2016 in the wake of the financial market turbulence and investor fears of capital controls. However, after the episode ended without China imposing restrictions on foreign bond repatriation, we see the correlation increase sharply approaching, but not reaching, DM levels.

7 Two-Way Capital Flows

The Chinese government is one of the largest holders of U.S. Treasuries and a major foreign investor in everything from direct financing of infrastructure projects to loans to emerging market economies.[55] At the same time, it is letting foreigners participate in its domestic bond markets. In the model considered so far, we have focused on the decision to borrow from foreigners. We now focus on the interrelated decision of letting domestic savers invest abroad. These two-way capital flows are important in understanding China's motivation for internationalizing its currency because they distinguish the current account and net foreign asset position (net borrowing at the country level) from the gross assets and liabilities positions and changes in gross positions.

We show that, as reputation builds, increased investment by foreigners in the domestic bond market coincides with increased foreign investment by domestic households (savers). In net, as reputation builds, the country becomes more of a borrower (or at least less of a creditor) from the rest of the world. For example, starting from a large creditor position at low levels of reputation, like China's present situation, there is a tendency toward becoming a debtor as reputation increases.

[54] This connects to the demand system asset pricing framework of Koijen and Yogo (2019), where one can potentially think of reputation as a characteristic that various types of investors value differently.

[55] See Horn et al. (2021) and Gelpern, Horn, Morris, Parks and Trebesch (2021) for studies on the nature of China's foreign investment.

Intuitively, reputation is like a pledgable asset, it is valuable because one can borrow against it. The more it becomes valuable, the more the country wants to use it to lever up.

We return to the baseline model of Section 5.3 with heterogeneous investors. We generalize that model by assuming that domestic households have an endowment W of liquid wealth at each date t. Households also own the intermediation sector, where $E_t = E[\tilde{V}_t]$ is the total value of the intermediation sector. Thus, their total wealth position is $W + E_t$. At the beginning of each date, households can invest an amount K_t in illiquid foreign assets, which pay out R^K at the end of the date. Households invest the remainder $W - K_t$ in illiquid non-intermediary investments, and we normalize the return of these assets to 1 for simplicity.[56] In the main text we assume that shares in the intermediaries cannot be traded, since inside capital A is fixed and domestically held. In Appendix A.XX, we relax this assumption and show that it generates a jump in both gross assets and liabilities that occurs at the open-up step.

Households have an adjustment cost for sending capital abroad based on their total wealth, given by $\Psi(k_t)(W + E_t)$, where $k_t = \frac{K_t}{W+E_t}$ is the fraction of their total wealth that they send abroad and where Ψ is increasing and convex. Given that households send a fraction k_t of their wealth abroad, their total welfare, including the value E_t of their intermediary equity, is given by: $\Big(R^K k_t - \Psi(k_t) + (1 - k_t)\Big)(W + E_t)$. The optimal private allocation of domestic savings to foreign investment k_t is constant, that is households always allocate a constant fraction of their total wealth to international investment. This optimal household allocation is given by $\Psi'(k) = R^K - 1$.

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

To capture the wedge between private and government incentives, we assume that the government obtains a proportional benefit B from all savings kept at home, which yields a total benefit to the government of $B(1 - k_t)(W + E_t)$. A value of $B > 0$, can stand in for government corruption, or more benignly benefits from keeping the savings domestic that are not internalized by households. A value of $B < 0$, help us capture the extra value attributed by the government compared

[56] We assume that there is a very large penalty associated with $K_t > W$ and focus for simplicity on solutions in which this constraint does not bind.

to households to investments abroad that help build the currency globally. Given the government's objective, its optimal allocation is $\Psi'(k_t) = R^K - (1 + B)$. If $B > 0$, then the government chooses to send less capital abroad than households would have privately chosen, and it imposes limits on domestic capital flowing abroad concurrently with the limits on inflows by foreigners (this latter part has been the focus of our model so far).[57]

Solving the model with two-way asset holdings follows the same steps as the model solution in Section 5.3. Since k_t is constant over time, the government's objective function is an affine transformation of $E[\tilde{V}_t]$ generating similar dynamics. We further impose a realistic restriction that the marginal value of an additional unit of inside equity is less than two, so that the marginal return on an additional unit of inside equity is less than one hundred percent.[58] We summarize the dynamics in the proposition below

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

Figure 11 provides a numerical illustration of two-way capital flows using the heterogenous investor calibration from Figure 9. We set Ψ, R^K, and B so that 10% of domestic wealth is invested abroad ($k_t = 0.1$). Figure 11 shows that as reputation builds, gross flows happen simultaneously: foreigners hold more of the domestic bond market and domestic capital flows abroad.

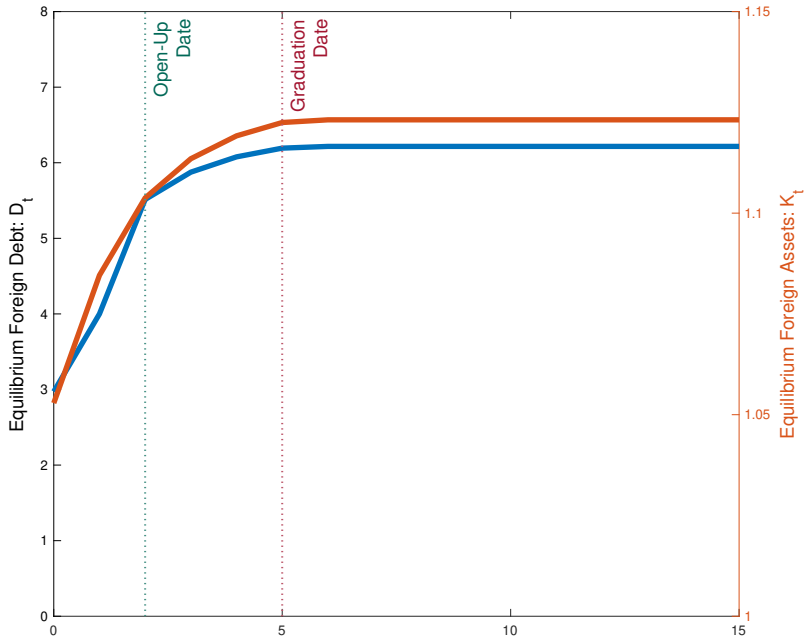
Foreign assets, $K_t = k(W+E_t)$, increases in constant proportion ($\kappa<1$) to the equity value of the intermediation sector. Intuitively, as reputation builds, the equity value of the intermediation sector also builds, and so does household net worth, making it more attractive to send more wealth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

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

[57] In practice the government might simultaneously limit some forms of domestic capital outflows and incentivize others. For example, it might limit private holdings of foreign assets and, at the same time, invest abroad via a state owned entity projects that the government selects. In the case of China, for example, there are tight controls on private holdings of foreign securities, but at the same time entities like SAFE and AIIB make large investments abroad using domestic savings. This could be accommodated in our framework by introducing two types of foreign investments, one over which B is positive and one over which it is negative.

[58] For example, this is true if $R^H \gamma Q < 2$. See the proof of Proposition 11 in the Appendix for discussion of where this condition applies.

Figure 11: Two-Way Capital Flows



Notes: Numerical illustration of the equilibrium of the model with both capital inflows and outflows.

This model also rationalizes capital retrenchments (Forbes and Warnock (2012)), the idea that in a crisis both gross assets and liabilities shrink. Consider a country that somewhere along its reputation cycle (i.e. not at the start point of the cycle) is hit by a crisis and imposes ex-post capital controls. Its reputation is reset to the beginning of the cycle. Over the episode, the country would experience a contraction in foreign borrowing, a reduction of its foreign assets, a movement of its current account toward surplus, and a spike in its bond yields.

8 Conclusion

This paper characterizes China's strategy for internationalizing its currency through controlling the set of investors that can access its bond market. While the Renminbi has a long way to go to rival the dollar as an international currency, with China's economy approaching the size of that of the United States and its bond market undergoing rapid growth, the integration of its capital market into global financial markets could become a major shift in the international monetary system. We explain China's gradual approach to liberalizing capital inflows as balancing the desire to gain international currency status against the risks of sudden capital outflows that comes with foreign 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 an international currency 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. We introduce a model of reserve currency competition in which a number of countries compete to build a reputation as a reserve currency provider. Competition makes it harder for countries to build reputation since it lowers the benefits of a high reputation. Incumbents like the U.S. can discourage new challengers by expanding the amount of safe debt they provide to the rest of the world.

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