Online Appendix for
"Internationalizing Like China"

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A.I Further Details on Data and Estimates

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

A.I.A Aggregate and Bilateral Bond Holdings

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

One of our main data sources is the IMF's Coordinated Portfolio Investment Survey (CPIS). These data include the bond portfolio holdings of each foreign country in China. More precisely, the issuers are domiciled in China (resident in China irrespective of nationality); the bonds can be issued in any market and denominated in any currency; the bonds include all bond types by sector (government, corporate, etc...); and the holder in each country excludes the central bank. CPIS data is a proxy for private holdings. It does, however, include the holdings of some state entities, for example the sovereign "oil fund" of Norway. Non-private investors are, in this section, mainly central banks. In the specific case of China, these portfolio holdings are most likely to be concentrated in bonds denominated in RMB, issued onshore by Chinese resident entities (also by nationality). We maintain this assumption throughout and provide some supporting evidence in the next subsection.

CPIS also contains additional information on the Currency Breakdown of Investment by asset class (CPIS Table 2). These data are at the same investor and asset class level as the data above, but the issuers are now the universe of all issuers. For example, RMB denominated bond holdings of the U.S. include: bonds denominated in RMB issued by any entity (Chinese resident or otherwise) and held by investors domiciled in the U.S. This is a superset of the RMB denominated bonds held by each investor country onshore in China.

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

While most countries only report their holdings to COFER on a confidential basis such that the underlying bilateral data is not disclosed, some countries are also Special Data Dissemination Standard (SDDS) Plus adherents and disclose their positions denominated in RMB. In addition, and in order to obtain the most detailed breakdown by country of official holdings in RMB, we separately collected the currency breakdown directly from central banks' documents for non-SDDS reporters.[1] Using these combined data sources, we were able to observe the country breakdown for almost 40% of the total RMB official holdings in 2020.

There is a subset of countries that report their total reserve holdings in the International Financial Statistics (IFS), but do not report the currency breakdown to COFER. These countries are classified as "Unallocated Reserves" in COFER. By the end of 2020, about 6.6% of total reserves reported to IFS were from non-COFER reporters and therefore "Unallocated

[1]The non-SDDS countries for which documentation was manually collected are: Czech Republic, Italy, Kazakhstan, Romania, South Africa, Spain, Tanzania and United Kingdom.

Reserves." We estimate the RMB holdings for these countries by multiplying their total reserves by the share of RMB in total "Allocated Reserves" excluding China. China became a COFER reporter between 2015 and 2018 (Arslanalp et al. (2022)) but does not disclose what share of its reserves it reported to COFER at any point in time during the transition. We assume that it increased its disclosure share at a constant rate between 2015 and 2018 (25% at end of 2015, 50% at end of 2016, 75% at end of 2017, and 100% at end of 2018). Since we assume the PBoC does not hold any RMB denominated assets as reserves, we then remove China's reserves from the IMF's Allocated and Unallocated reserve totals to calculate the share of RMB in Allocated reserves excluding China. We estimate this share to be 3.1% in 2020. We then use this share of RMB to estimate the level of RMB holdings in Unallocated reserves to be $26 billion. Figure 1 labels as "Other Reserves" the sum of: "Allocated Reserves" for which the country of holder cannot be inferred, and our estimate of the RMB portion of "Unallocated Reserves."

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

For countries in the first group we obtain the CPIS Currency Breakdown of Investment by asset class (CPIS Table 2), which allows us to directly identify bond holdings in RMB by investor country.[2] As explained above, these data include all bonds denominated in RMB irrespective of the issuer. In this case, we assume that all RMB holdings are onshore. The next subsection provides some supporting evidence for this assumption.

For countries in the second group, we build an estimate by multiplying the level of bond holdings in China from CPIS (which includes bonds denominated in all currencies) with the percentage that we estimate to be RMB-denominated using micro data. We estimate this percentage using commercial security-level data on the positions of mutual funds and ETFs from Morningstar. We merge these data with CUSIP Global Services and Bloomberg FIGI security-level master files that include the currency of denomination as well as the residency of the immediate issuer. The combined dataset was previously used and is described in detail in Maggiori et al. (2020) and Coppola et al. (2021). In order to use the commercial data when the CPIS data on currency breakdown is unavailable, we require that we observe in the micro data at least 20% of the country's bond investment in China (residency) as reported

[2]For the U.S. in 2020, we use Treasury International Capital (TIC) data instead of IMF CPIS data.

in CPIS. In sum, for these countries we measure in each year the fraction of bond investment in China on a residency basis that is denominated in RMB and apply this fraction to the total bond holdings in CPIS. The countries with largest holdings in this second group are Luxembourg and Ireland.[3] We estimate that these two alone held about $35 billion in RMB bonds in 2020. Because the Morningstar data ends in 2020, we estimate the 2021 values for Luxembourg and Ireland based on their 2020 shares. Because Taiwan is not a CPIS reporter, we carry forward Taiwan's 2020 holding levels to 2021.

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

Finally, we impose the restriction that the sum of central bank and private holdings (which we call the disaggregated total) has to sum to total foreign holdings. For total foreign holdings, we combine data from a Chinese official source (Bond Connect) on onshore holdings with data from the BIS Debt Securities Statistics to obtain the internationally issued RMB debt outstanding from Chinese issuers in a given year. Bond Connect foreign holdings refer to the total onshore foreign holdings, including but not limited to holdings through Bond Connect.[4] From the BIS, we collect the total amount of international debt securities (IDS) issued by Chinese residents outside the local market of the country where the borrower resides (China) in RMB (about $16 billion by the end of 2020). This assumes that internationally issued RMB bonds that are classified as China by residency are entirely owned by foreign investors. In matching total foreign holdings in RMB from Bond Connect plus BIS IDS with the holdings we have obtained above from COFER, CPIS, and IFS (the disaggregated total), there is an approximation error due to mismatches in the concepts of residency of the issuer, currency, and market of issuance, in each of the datasets used.[5] For

[3]The set of countries in the second group changed over time depending on data availability. In 2020, the countries in this group were Switzerland, Denmark, Ireland, Lichtenstein, Luxembourg, Mauritius, New Zealand and Taiwan.

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

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

most of the years in our analysis, the disaggregated total is greater than the sum of Bond Connect and BIS IDS Chinese international issuance in RMB. We then compute the share of each country-investor type as a percent of a given year's disaggregated total and apply those percentages to total foreign holdings obtained as the sum of the Bond Connect and BIS IDS series. By doing so, we obtain an estimate for the breakdown between central bank reserves and private holdings of RMB bonds, and their split by country of holder as shown in Figure 1.

Figure 8 and Figure A.III plot the Bond Connect data (post-June 2017) and the sum of CCDC and SHCH prior to June 2017 without combining it with IDS or performing any scaling.[6] These data are an approximation to total foreign holdings of onshore RMB bonds issued by Chinese entities. They have the advantage of being available at a higher frequency, with new releases available almost immediately. We therefore use it whenever higher frequency or the availability of the most recent data are desirable.

A.I.B Offshore Issuance

In this subsection, we explore foreign investor holdings of Chinese bonds along several dimensions discussed in the previous subsection. We begin by classifying every bond issued in RMB into whether it was issued in onshore Chinese markets or offshore in international capital markets. To do so, we classify any security denominated in CNH (offshore Chinese Yuan) as being issued offshore. However, in order to avoid relying entirely on the reported currency, we combine open-source data from FIGI and additionally classify bonds with a security type of Eurobond or Global from FIGI as being issued offshore. We then merge this mapping of all RMB securities into onshore/offshore with the Morningstar data on bond holdings by mutual funds and ETFs. We measure the dollar value of end-of-year holdings of foreign funds[7] in onshore and offshore bonds, and calculate the share issued offshore in foreign holdings. Appendix Figure A.Va documents a substantial decrease in the share of foreign-owned RMB denominated bonds that were issued offshore: from more than 80% in 2014 to less than 10% in 2020. Recall that the level of overall RMB (onshore or offshore) holdings was minimal in 2014 and much larger in 2020. This result provides support for the (imperfect) assumption in the previous subsection that all bonds in RMB held by foreign investors are assumed to be onshore.

Additionally, we classify all bonds issued by a Chinese entity on a nationality basis by the source of issuance on a residency basis according to whether it was issued by a

[6] As described above, Bond Connect data corresponds to the sum of CCDC and SHCH. We complement with CCDC and SHCH data to obtain a longer time series.

[7] We consider foreign all funds excluding those domiciled in China or Hong Kong.

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

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

A.I.C Investor Entry Database

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

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

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

A.I.D Empirical Implementation: Portfolio Correlation Measure

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

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

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

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

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

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

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

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

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

(g). **Alternative Foreign Currency Definition:** excluding the currency in which the fund reports its returns (as opposed to excluding the currency of the country in which the fund is domiciled).

We summarize the results of these alternative specifications in Appendix Table A.II. For each alternative specification, we sort the estimated correlations in descending order and compute the average rank of DM and EM currencies, as well as the ranking of the CNY. Appendix Table A.II shows that, while there is clearly substantial variation in the estimates,

[8] DM currencies are AUD, CAD, CHF, DKK, EUR, JPY, NZD, NOK, GBP, SEK, USD. EM currencies are BRL, CLP, COP, CZK, HUF, IDR, ILS, INR, KRW, MXN, MYR, PEN, PHP, PLN, RUB, SGD, THB, TRY, ZAR.

the baseline result extends to these specifications in the sense that the Chinese RMB ranks between EM and DM currencies. The number of funds in subsets (c), (e), (f) and (g) changes due to the different selection criteria for the sample. Excluding index funds (e) reduces the sample size in about 8%, to 762 funds, while the alternative foreign currency definition (g) increases it in about 9% to 901 funds. Cases (e) and (f) impose less restrictive criteria than the baseline resulting in larger sample sizes: 1407 and 954 funds, respectively. In Appendix Figure A.VIII we report the cross-sectional estimates of these alternative specifications.

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

- $DIST_{Dom_i,c}$: Log Distance between the domicile country of fund i and the country issuing currency c.
- $TRADE_{Dom_i,c}$: Absolute value of the sum of imports and exports between country of domicile of fund i and the country issuing currency c as a share of the investor country GDP.
- $LEGAL_{Dom_i,c}$: Dummy that is 1 if the country of domicile of fund i and the country issuing currency c have same legal system origin.

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

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

$$\begin{aligned}\alpha_{c,i} =& \beta_{DM}^{AUD}\,\text{DMShare}_{AUD,i} + \beta_{DM}^{BRL}\,\text{DMShare}_{BRL,i} + \ldots + \beta_{DM}^{ZAR}\,\text{DMShare}_{ZAR,i} + \\ &+ \beta_{DIST} DIST_{Dom_i,c} + \beta_{LEGAL} LEGAL_{Dom_i,c} + \beta_{TRADE} TRADE_{Dom_i,c} + \epsilon_{c,i}\end{aligned}$$

where

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

Recall that, as defined in Section 2.2

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

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

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

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

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

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

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

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

A.I.E Price Evidence

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

We estimate bond return loadings on risk factors that are commonly used in the literature. We begin our sample in 2010, the year when China's peg against the U.S. dollar was first relaxed. We measure quarterly dollar returns of holding a three-month tenor bond in currency i as $R_{i,t+1} = i_t - i_t^* - \Delta e_{t+1}$. We then regress the returns $R_{i,t}$ on a risk factor f_t to estimate the currency-specific loading on the factor, 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 comes from the fact that the exchange rate was managed against the U.S. Dollar (and a basket of other currencies) throughout the sample period, making it among the least volatile currencies in the world. In addition, our sample ends in 2021, and we would expect the Renminbi to register as a riskier currency during recent years. It is important to emphasize that both the portfolio quantity and price evidence are statements about the market behavior over a short sample in which internationalization was starting to occur. As the model in the next section emphasizes, market beliefs about the safety of these assets might turn out to be quite wrong ex-post when crises occur, and China could decide to either directly or indirectly penalize foreign investors. Obviously, should those events materialize the return dynamics of the bonds would look dramatically different.

A.I.F Index Inclusion and Shifting Portfolio Investment

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

Prior to 2019Q1, funds that benchmark to the Bloomberg Global Aggregate Index owned very few Chinese RMB bonds. There is a steady rise in holdings of RMB by funds that benchmark to this index over the subsequent years, consistent with Bloomberg's announcement of a 20-month phase-in period, with portfolio weights scheduled to increase 0.30% per month.[9] By contrast, the FTSE World Government Bond Index (WGBI), a major competitor for the Bloomberg index, did not include Chinese RMB bonds in the index until October 2021.

[9] Pensions & Investments.

Indeed, in Morningstar data, we see that funds benchmarked to Bloomberg Global Aggregate held more than $10 billion of RMB-denominated bonds by the end of 2020 while funds benchmarked to the FTSE WGBI held only trivial amounts.

Aside from the benchmark driven rebalancing, the inclusion of China in benchmark indices appears to also account for a large extent of the other inflows. The largest single holder of RMB in the global mutual fund and ETF data is the $6.32bn held by the iShares China Bond ETF. While this fund does not benchmark against the Bloomberg Global Aggregate, it instead tracks the Bloomberg China Treasury and Policy Bank Index. This index was introduced in November 2016, and the fund itself was launched in July 2019, shortly after the inclusion of China in the Bloomberg Global Aggregate. As of December 2021, it had nearly doubled its AUM to $12.1bn, making it the second-largest European exchange-traded fund.[10] Because the creation of ETFs and other country-specific tracking indices followed the Renminbi's inclusion in world indices, index inclusion appears to have an important effect on channeling foreign capital to China above and beyond the direct index inclusion effect.

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

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

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

[10] The Financial Times, "Bond ETF inflows slump to lowest level since start of pandemic," December 17, 2021.

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

- "In the event that the relevant authorities suspend account opening or trading on the China Interbank Bond Market, a Fund's ability to invest in the China Interbank Bond Market will be adversely affected and limited. In such event, the Fund's ability to achieve its investment objective will be negatively affected and, after exhausting other trading alternatives, the Fund may suffer substantial losses as a result. Further, if Bond Connect is not operating, a Fund may not be able to acquire or dispose of bonds through Bond Connect in a timely manner, which could adversely affect the Fund's performance." (II-44)

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

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

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

- "Currency repatriation restrictions may have the effect of making securities and instruments tied to the PRC relatively illiquid, particularly in connection with redemption requests." (Page 53)
- Under the heading of "Investing through CIBM Direct," Pimco warns "The CIBM Direct Rules are relatively new and are still subject to continuous evolvement, which may adversely affect the Fund's capability to invest in the CIBM." (Page 53)
- Under the heading of "Investing Through Bond Connect," Pimco warns "In addition to the risks described under "Foreign Securities" and "Investments in the People's Republic of China," there are risks associated with a Fund's investment in Chinese government bonds and other PRC-based debt instruments traded on the CIBM through the Bond Connect program... Trading through Bond Connect is subject to a number of restrictions that may affect a Fund's investments and returns...While the ultimate investors hold a beneficial interest in Bond Connect securities, the mechanisms that beneficial owners may use to enforce their rights are untested and courts in the PRC have limited experience in applying the concept of beneficial ownership. As such, a Fund may not be able to participate in corporate actions affecting its rights as a bondholder, such as timely payment of distributions, due to time constraints or for other operational reasons." (Page 54)

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

- "The Chinese legal system constitutes a significant risk factor for investors. The interpretation and enforcement of Chinese laws and regulations are uncertain, and investments in China may not be subject to the same degree of legal protection as in other developed countries. In the event account opening or trading is suspended on the CIBM, a fund's ability to invest in securities traded on the CIBM will be adversely affected and may negatively affect the fund. Furthermore, if Bond Connect is not operating, a fund may not be able to acquire or dispose of bonds through Bond Connect in a timely manner, which could adversely affect the fund's performance.' (Page B-12)
- "Bond Connect trades are settled in RMB, which is currently restricted and not freely convertible. As a result, a fund's investments through Bond Connect will be exposed to currency risk and incur currency conversion costs, and it cannot be guaranteed that investors will have timely access to a reliable supply of RMB." (Page B-13)

A.II Proofs and Further Details on the Theory

A.II.A Derivation of c_t

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

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

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

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

The intermediary pledgeability constraint binds and liquidations are positive when

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

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

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

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

Under the conjecture that the pledgeability constraint binds, we have

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

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

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

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

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

Substituting in, we have

$$\begin{aligned} c_t &= QI_t - L_t - R_t^\ell \frac{(1-h_t)}{R_t^\ell}\Big(QI_t - L_t\Big) \\ &= h_t\Big(QI_t - L_t\Big) \\ &= \frac{h_t}{\gamma - \frac{1-h_t}{R_t^\ell}}\Big(\gamma QI_t - R_t D_t\Big) \end{aligned}$$

which gives the result for c_t.

A.II.B Proof of Lemma 1

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

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

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

$$R_t^\ell = 1 - \tau.$$

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

Each investor's total monetary payoff at the end of date t can therefore be written as

$$c_t^{*,i} = \overline{R}w + (R_t^i(1-\tau) - \overline{R})D_t^i,$$

which, all else equal, is lower when the capital control is imposed, $\tau = \overline{\tau}$.

At the beginning of t, investors solve:

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

The first order condition for type i yields

$$0 = (R_t^i E[1-\tau] - \overline{R}) - \frac{1}{2}\frac{b}{\omega(M_t)}D_t^i$$

which rearranges to the result.

A.II.C Proof of Proposition 1

Take as given a reputation level M_t. The objective of the committed government is:

$$\max_{D_t^s, D_t^f} \quad c_t = \frac{h_t}{\gamma - (1-h_t)}\bigg(\gamma Q I_t - R_t D_t\bigg)$$

subject to the pledgeability determination

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

and subject to the interest rate schedules (when borrowing from investors of type i)

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

Where the project funding constraint is $I_t = A + D_t$, the total debt definition is $D_t = D_t^s + D_t^f$, and the average interest rate is $R_t = \frac{R_t^s D_t^s + R_t^f D_t^f}{D_t^s + D_t^f}$. Note that the objective reflects that the committed government sets $\tau = 0$ and so $R_t^\ell = 1$.

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

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

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

The proof strategy proceeds as follows. We first find the optimal strategy if borrowing only from stable investors and the optimal strategy if borrowing from both investor types. We then find the maximum between the two to complete the characterization.[12]

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

$$\gamma Q = R_t + \frac{\partial R_t}{\partial D_t^s} D_t^s$$

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

$$D^s(M_t) = \frac{\omega(M_t)}{b}\bigg(\gamma Q(1-(1-M_t)\overline{\tau}) - \bar{R}\bigg).$$

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

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

Finally, we can substitute into the objective function to obtain

$$V^s(M_t) = n(h^s)\bigg(\gamma Q A + \Big(\gamma Q - R(M_t)\Big) D^s(M_t)\bigg)$$

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

$$\gamma Q I_t - R_t D_t = \gamma Q A + \sum_{i \in \{s,f\}} (\gamma Q - R_t^i) D_t^i$$

then we have that the committed type optimally borrows the same amount from each investor type, $D_t^s = D_t^f = \frac{1}{2} D_t$ and $R_t^s = R_t^f = R_t$. Thus the objective function is equivalent to $2(\gamma Q - R_t^s) D_t^s$, and so optimal policy sets $D^s(M_t)$ and $R^s(M_t)$ as before, and moreover sets $D^f(M_t) = D^s(M_t)$ and $R^f(M_t) = R^s(M_t)$. Therefore, $D(M_t) = 2D^s(M_t)$, and so indirect

[12]Note that it is never optimal to borrow only from flighty investors and not from stable investors.

utility is

$$V^f(M_t) = n(h^f)\Big(\gamma QA + 2\Big(\gamma Q - R(M_t)\Big)D^s(M_t)\Big).$$

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

$$\Delta'(M_t) = -n(h^s)\frac{\partial R_t^s}{\partial M_t}D_t^s + n(h^f)\sum_{i\in s,f}\frac{\partial R_t^i}{\partial M_t}D_t^i$$

where $\frac{\partial R_t^i}{\partial M_t}$ is the partial derivative at fixed debt. Given identical policy functions at the same reputation, then debt D_t^s and the interest rate derivative $\frac{\partial R_t^s}{\partial M_t}$ factor out, and hence

$$\Delta'(M_t) = \Big[-n(h^s) + 2n(h^f)\Big]\frac{\partial R_t^s}{\partial M_t}D_t^s(M_t).$$

Lastly, note that $\frac{\partial R_t^s}{\partial M_t} < 0$ as $\omega(M_t)$ is nondecreasing. Therefore, Δ' is monotone.

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

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

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

$$\Delta(M_t) = \Big(n(h^s) - n(h^f)\Big)\gamma QA + \Big[n(h^s) - 2n(h^f)\Big]\Big(\gamma Q - R(M_t)\Big)D^s(M_t) \leq 0,$$

and hence we can define $M^* = 1$ (the economy never opens up).

In sum, there exists a unique crossing point M^* such that optimal policies are

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

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

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

This proves the result.

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

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

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

To visualize the opening up decision, we ask whether the government can achieve higher utility by borrowing from flighty investors and incurring the lower pledgeability. The black dashed line is the indifference curve of pairs (D, R) that deliver the same payoff to the committed government when the pledgeability is h^f, as pairs on the solid black indifference curve did at the higher pledgeability h^s.[13] The h^f indifference curve lies everywhere below and to the right of the h^s indifference curve, reflecting that either a higher debt level or lower interest rate is required to compensate for the lower pledgeability.

The final part of the graph is the solid blue line, which is the interest rate schedule available to the government it if borrows from both stable and flighty investors.[14] This line has a flatter slope than the red line, reflecting the additional borrowing from flighty investors.

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

[14]Here, we already imposed the optimality condition that, if it borrows from both investors, the government borrows the same amount from both investors, equalizing the interest rate it pays across the two investor types.

At low reputation M, the blue line lies above the h^f indifference curve: that is, no points on the h^f indifference curve are attainable to the government even when borrowing from both investor types. This tells us that the government obtains lower payoff by opening up, reflected in that the optimal borrowing decision from both types, point B, lies above and to the left of the h^f indifference curve. This rationalizes the government's decision to only borrow from stable investors.

Panel (b) displays the same exercise, but conducted at a threshold M^*. As reputation increases, the interest rate schedule of borrowing from both types (solid blue line) flattens, and eventually becomes tangent to the h^f indifference curve.[15] At this reputation M^*, both the red and blue lines are, respectively, tangent to the h^s and h^f indifference curves. This reflects that at M^*, the government achieves the same optimal payoff regardless of whether or not it opens up. The government is indifferent to opening up or not at M^*.

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

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

[15]Note that because the red line also flattens, the h^s indifference curve that the red line is tangent to shifts downwards and to the right, so the h^f indifference curve also shifts downward and to the right.

A.II.E Verifying Opportunistic Government Mimics Issuance

We now show that the off-path beliefs $\pi = M = 0$ under our conjectured equilibrium induce the opportunistic government to mimic issuance. Suppose that at step n, the opportunistic government deviated to an optimal issuance. Facing beliefs $\pi = M = 0$, the optimal issuance policy of an opportunistic government is actually the same as Proposition 1 with $M = 0$. It therefore receives indirect utility $V(0)$ if not imposing capital controls and $g(0)V(0)$ if imposing capital controls. Investors' posterior beliefs are $\pi = \epsilon^O$ regardless of its capital control strategy, so that the continuation value to the opportunistic government is $W(\epsilon^C)$. Therefore, the opportunistic government sets $m = 0$. Thus, the value from the deviation to the committed government is

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

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

A.II.F Proof of Proposition 2

We begin by making two observations about the behavior of a feasible candidate path $\pi_0, ..., \pi_N$ and $M_0, ..., M_N$. The first is that the transition dynamics (17) imply that every point $M_n, \ldots, M_N$ of the path of reputation increases in the initial reputation $M_0(\pi_0)$ (henceforth M_0). The second is that Bayes' rule (11) implies that the evolution of beliefs $\pi_1, ..., \pi_N$ decreases in M_0, because π_{n+1} increases in π_n and decreases in M_n.[16]

It is convenient to define a candidate equilibrium in terms of the initial reputation M_0, with the path of reputation M_n defined from the transition dynamics and the path of beliefs π_n defined from Bayes' rule. Moreover, given a candidate initial reputation M_0, we can also pin down the graduation step N as follows.[17]

[16] To see this, note that Bayes' rule is $\pi_{n+1} = \epsilon^O + (1 - \epsilon^C - \epsilon^O)\frac{\pi_n}{M_n}$. Thus if M_0 increases, given $\pi_0 = \epsilon^O$ is fixed we have that π_1 decreases. Then consider the inductive step. Since M_0 increases, M_n increases for all n (equation 17). Thus if π_n decreases, then π_{n+1} also unambiguously decreases, completing the induction.

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

Lemma 1 *The graduation step N associated with an initial reputation M_0 is given by*[18]

$$N = \sup\left\{n \left| \frac{1-(\rho^f)^{n+1}}{1-\rho^f} V(M_0) < V(1-\epsilon^C)\right.\right\}$$

Proof of Lemma 1. *Suppose that we conjectured a graduation step $N' < N$. Then, at the conjectured graduation step N', the value of waiting one step and then imposing the capital control, rather than imposing it at the current step, is*

$$\begin{aligned}\frac{W^0_{N'} - W^{\overline{\tau}}_{N'}}{\pi_L} &= V(M_{N'}) - g^f V(M_{N'}) + \beta\Big[W_{N'+1} - W_0\Big] \\ &= \Big(1-g^f\Big)V(M_{N'}) + \frac{\beta g^f}{1-\pi_H\beta}\Big[V(1-\epsilon^C) - V(M_0)\Big] \\ &= \frac{\beta}{1-\pi_H\beta} g^f \Big[V(1-\epsilon^C) - \rho^f V(M_{N'}) - V(M_0)\Big] \\ &> 0\end{aligned}$$

so that the opportunistic type prefers not to graduate. The form of $V(M_n) = \sum_{x=0}^{n}(\rho^f)^x V(M_0) = \frac{1-(\rho^f)^{n+1}}{1-\rho^f}V(M_0)$ used in the supremum is obtained in a standard manner by iterating the AR(1) process forward.[19] *QED*

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

Lemma 2 *If $M_N = \pi_N$ for $N < \infty$, then $\pi_n < M_n < 1-\epsilon^C$ for all $n < N$.*

Proof of Lemma 2. *The proof proceeds by induction. By Lemma 1, we have $\pi_N = M_N < 1-\epsilon^C$. Suppose that at date $n+1$, $\pi_{n+1} \leq M_{n+1}$. Then by Bayes' rule $\pi_{n+1} = \epsilon^O + \frac{1-\epsilon^O-\epsilon^C}{M_n}\pi_n$,*

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

[19] Conjecturing that $V(M_n) = \sum_{x=0}^{n}(\rho^f)^x V(M_0) = \frac{1-(\rho^f)^{n+1}}{1-\rho^f}V(M_0)$, we have $V(M_0) = \sum_{x=0}^{0}(\rho^f)^x V(M_0) = V(M_0)$ and, by induction,

$$V(M_{n+1}) = \rho^f V(M_n) + V(M_0) = \sum_{x=0}^{n+1}(\rho^f)^x V(M_0) = \frac{1-(\rho^f)^{n+2}}{1-\rho^f}V(M_0),$$

giving the form of $V(M_n)$ used in the supremum definition.

we have

$$\frac{M_n}{\pi_n} = \frac{1-\epsilon^O-\epsilon^C}{\pi_{n+1}-\epsilon^O} \geq \frac{1-\epsilon^O-\epsilon^C}{M_{n+1}-\epsilon^O} \geq \frac{1-\epsilon^O-\epsilon^C}{M_N-\epsilon^O} > \frac{1-\epsilon^O-\epsilon^C}{1-\epsilon^C-\epsilon^O} = 1.$$

The induction is then completed by the terminal condition $M_N/\pi_N = 1$, completing the proof. QED

Given these preliminary results, we can form a candidate equilibrium from an initial reputation M_0, which then has a graduation step, path of reputation, and path of beliefs as outlined. For our candidate to constitute an equilibrium of the model, it must be the case that it also satisfies the terminal condition $\pi_N = M_N$ for graduation, in which case it also satisfies all intermediate conditions (Lemma 2) and so constitutes an equilibrium of the model. We are now ready to prove uniqueness and existence. We begin with uniqueness, and then prove existence.

Given we are defining candidate equilibrium from M_0 (implicitly, $M_0(\pi_0)$, that is the step 0 strategy $m_0(\pi_0)$), we will abuse notation and write $M_n(M_0)$ and $\pi_n(M_0)$ to make clear how a change in the initial conjectured reputation (implicitly, initial strategy/beliefs m_0) affects later parts of the path. One can equivalently think of this exercise as defining π_1 from $(\pi_0, M_0(\pi_0))$ using Bayes' rule and $M_1(\pi_1)$ from the transition equation, and so on. Doing so implicitly defines the strategies $m_n(\pi_n)$.

A.II.F1 Uniqueness

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

Suppose that there were another equilibrium with a higher graduation step. At the candidate equilibrium M_0^{**} with graduation step $N^{**} > N$, note that we must have $M_0^{**} < M_0^*$ from Lemma 1. We also recall that π_n is a decreasing function of M_0 from Bayes' rule. Thus, we have for $M_0^{**} < M_0^*$

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

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

A.II.F2 Existence

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

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

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

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

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

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

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

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

The first case is the case where $\rho^f > \overline{\rho}^f$, that is $V(\epsilon^O) > (1-\rho^f)V(1-\epsilon^C)$. In this case, we know there is a graduation step $\overline{N} < \infty$ associated with ϵ^O.[21] In other words, $\overline{N}$ is the largest possible date such that

$$\frac{1-(\rho^f)^{\overline{N}+1}}{1-\rho^f}V(\epsilon^O) < V(1-\epsilon^C).$$

We now define the following indifferent points for each $n \leq \overline{N}$. We define M_0^n for $n \leq \overline{N}$ by

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

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

[21] If $\rho^f \geq 1$ then this follows trivially, while if $\overline{\rho}^f < \rho^f < 1$ it follows since the limit of the finite series is $\frac{1}{1-\rho^f}V(\epsilon^O) > V(1-\epsilon^C)$.

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

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

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

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

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

Given we know that M_1 increases in M_0, π_1 decreases in M_0, and $\pi_1(\epsilon^O) = 1-\epsilon^C > M_1(\epsilon^O)$, then by continuity there exists $M_0^{1*} \in [\epsilon^O, M_0^1]$ such that $M_1(M_0^{1*}) = \pi_1(M_0^{1*})$. If $M_0^{1*} \geq M_0^2$, then $M_0^{1*} \in \mathbf{M}_1$ and so is a feasible graduation step. In this case, we have found an equilibrium. If not, then we have $M_0^{1*} < M_0^2$ and can proceed as follows.

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

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

and therefore we have from Bayes' rule that $\pi_N(M_0^N) < 1-\epsilon^C$. Since $\pi_N(\epsilon^O) \geq 1-\epsilon^C \geq M_N(\epsilon^O)$, then there exists a crossing point M_0^{N*} at N. If $M_0^{N*} \in \mathbf{M}_N$ then we are done, and if not we continue. Finally, observe that at $N = \overline{N}$ we have $\mathbf{M}_{\overline{N}} = [\epsilon^O, M_0^{\overline{N}}]$. Thus if we find an equilibrium before $\overline{N}$ we are done. If we have not found an equilibrium at $\overline{N}$, then we have $M_0^{\overline{N}*} \in \mathbf{M}_{\overline{N}}$ and we have found a valid equilibrium. Therefore, an equilibrium exists if $\rho^{f*} > \rho^f > \overline{\rho}^f$.

Case of $\rho^f \leq \overline{\rho}^f$

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

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

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

Lemma 3 *Suppose that $M_0 = M_0^\infty$. Then if $\pi_n > M_n$ for some n, then $\pi_{n+s} > M_{n+s}$ for all $s \geq 0$.*

Proof of Lemma 3. *If $\pi_n > M_n$, then we have*

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

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

Lemma 3 tells us that there are only two possible manners of convergence of π_n to π_∞. The first is convergence from below, in which case $\pi_n \leq M_n$ for all n. If it happens to be the case that convergence happens from below, then we would have an equilibrium with $N = \infty$.

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

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

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

Now, let us take the date $\underline{N}$. Suppose first that we have a strict inequality, $\pi_{\underline{N}}(M_0^\infty) > M_{\underline{N}}(M_0^\infty)$. We know that $\pi_{\underline{N}}(1-\epsilon^C) < M_{\underline{N}}(1-\epsilon^C)$, so we know there exists a crossing point $M_0^{\underline{N}*} \in [M_0^\infty, 1 - \epsilon^C]$. We additionally know that this crossing point satisfies $M_0^{\underline{N}*} < M_0^{\underline{N}}$, where $M_0^{\underline{N}}$ is the threshold for graduation at $\underline{N}$ as defined in the previous part of the proof.

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

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

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

A.II.G Proof of Proposition 3

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

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

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

where the proof follows from the same argument as Lemma 1. Therefore, higher M_0 is associated with a lower graduation step. Therefore, as in the proof of Proposition 2, a higher candidate graduation step $N^{**} > N$ has a candidate initial reputation $M_0^{**} < M_0^*$. From here, the contradiction proceeds from exactly the same steps as in the proof of Proposition

2.

A.II.H Derivations for Section 5 and Proposition 4

We begin with the optimal debt policy of the committed type. Let us define $\mathcal{M}_t \equiv \mathcal{M}(M_t) = p + (1-p)M_t$ to be the probability the capital control is not exercised and $\bar{n}^i \equiv pn^H + (1-p)n^i$ as the expected net worth multiplier. From here, the proof of Proposition 1 proceeds identically to its current proof, yielding a threshold rule $\mathcal{M}^* \in [0,1]$ for opening up. The debt policies are $D^i(\mathcal{M}_t)$ and the interest rate is $R(\mathcal{M}_t)$ for the same functions defined in Proposition 1. The indirect utility of the committed type government is

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

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

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

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

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

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

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

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

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

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

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

which reduces to equation 12 when $p = 0$.

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

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

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

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

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

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

where we have defined $\varrho(M_n) = \frac{1-\beta p}{\beta(1-p)} \frac{G(M_n)-1}{G(M_n)}$. This transition equation is precisely the same form as equation 15 from the baseline model, up to the changes in definitions. If investors are homogeneous ($n^s = n^f$), then this equation reduces to $V(M_{n+1}) = \varrho(M_n)V(M_n) + V(M_0)$.[22]

[22] It is notable that it is no longer trivial that $G^f < G^s$. The reason is that $G^f > G^s$ given R_H is a positive constant, i.e., the proportional gains from the good state are higher when h_t is larger. As long as the effect of proportional gains from imposing capital controls dominates this latter effect, we have the same jump dynamics as in the baseline model.

A.II.H1 A Simple Foundation

We provide a simple foundation for the reduced form description of the High state above. In the High state, the economy is in a boom, and the intermediary gains access to a valuable new investment project. This investment project converts one unit of the consumption good in the middle of date t into $R^H > 0$ units of the consumption good at the end of date t. We assume that $\gamma R^H > 1$. We further assume that the cashflows of this new project are fully pledgeable to both classes of investors, that is $h^H = 0$ for new project cashflows regardless of the investor base. Since the new project has higher returns than the existing project and is fully pledgeable, the intermediary optimally redeploys all of its existing assets as well as any new borrowing to the new project. Let $D_t^{\ell,H}$ be the intermediary debt level in the middle and $R_t^{\ell,H}$ the interest rate on that debt. The High state pledgeability constraint is therefore $R_t^{\ell,H} D_t^{\ell,H} \leq R^H(\gamma Q I_t - R_t D_t + D_t^{\ell,H})$, where $\gamma Q I_t - R_t D_t + D_t^{\ell,H}$ is total intermediary investment in the new project. As long as $R_t^{\ell,H} \leq R^H$, any level of borrowing $D_t^{\ell,H}$ satisfies the pledgeability constraint. The payoff to the intermediary in the High state is

$$c_t^H = R^H(\gamma Q I_t - R_t D_t) + (R^H - R_t^{\ell,H}) D_t^{\ell,H},$$

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

In the High state, foreign investors can either lend to the intermediary or invest in a project outside the country with return R^H.[23] The objective of investors is therefore

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

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

The interest rate $R_t^{\ell,H}$ is determined by market clearing. Regardless of τ, $R_t^{\ell,H} < R^H$ cannot be an equilibrium: the intermediary demands infinite borrowing (intermediary case (iii)), while investors supply at most the finite amount $R_t^i D_t^i$ (investor case (i), (ii), or (iii)). $R_t^{\ell,H} > R^H$ also cannot be an equilibrium, since investors have infinite supply (investor case (v)) whereas intermediaries have no demand (intermediary case (ii)). On the other hand,

[23] For expositional purposes, we assume in this extension that investors in the Beginning have a within-stage-game discount rate for High state cashflows of R^H and for Low state cashflows of 1, so that we recover the same slope $\overline{R}$ and slope b of the interest rate schedule as in the baseline model. This assumption is made to minimize departures of our extended reduced form model, and is not necessary for the analysis.

$R_t^{\ell,H} = R^H$ clears the market at $D_t^{\ell H,i} = R_t^i D_t^i$ regardless of the capital control choice. If $\tau = 0$, the bank is in case (i) and is indifferent to any borrowing level, while investors are in both cases (i) and (iv) and are indifferent to any borrowing level. If $\tau = \overline{\tau}$, then the bank is in case (i) and is indifferent to any borrowing level, while investors are in case (iv) and are indifferent to any level of at least $R_t^i D_t^i$. In sum, we have

$$R_t^{\ell,H}(\tau) = R^H, \quad \tau \in \{0, \overline{\tau}\}$$

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

$$c_t^H = R^H(\gamma Q I_t - R_t D_t),$$

regardless of whether or not the capital control has been imposed. Without loss of generality, we let $D_t^{\ell,H} = R_t D_t$.

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

A.II.H2 Proof of Proposition 4

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

A.II.I Model Extensions

A.II.I1 Domestic Debt Issuance

Suppose that in addition to inside equity A, there is also an amount $D_t^d \leq \overline{D}^d$ available to borrow from domestic households. Households inelastically save domestically at the equilibrium interest rate R_t (equivalently, the government can apply a tax/subsidy on savings). Moreover, there is financial repression: domestic households are forced to maintain their investment in the bank at date one regardless of pledgeability. It follows that from the government's perspective domestic household savings and inside equity are equivalent given financial repression, and that the model is equivalent to one in which inside equity is $A^* = A + \overline{D}^d$.

Financial repression forces households to roll over $\overline{D}^d$ at interest rate R_t^ℓ, which gives final payoff to households of $R_t^\ell R_t \overline{D}^d$ and reduces final payoff to intermediaries by the same amount.

A.II.I2 Investor Utility Functions and Opening Up

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

$$\frac{\partial U(M_t, R_t^i, D_t^i)}{\partial D_t^i} = 0,$$

which defines an optimal debt policy $D^i(M_t, R_t^i)$ as a function of reputation M_t and the promised yield R_t^i. Note that $D^s(M, R) = D^f(M, R)$ for all (M, R).

We make two key assumptions on the utility function U.

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

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

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

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

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

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

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

(c). The flighty investor debt policy is

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

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

$$\max_{D_t^s, D_t^f} \quad c_t = \frac{h_t}{\gamma - (1 - h_t)} \left(\gamma Q I_t - R_t D_t \right)$$

subject to the pledgeability determination

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

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

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

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

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

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

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

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

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

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

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

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

Finally, we note that by Envelope Theorem,

$$\frac{\partial V^s(M_t)}{\partial M_t} = n(h^s)\Big(\gamma Q - R(M_t)\Big)\frac{\partial D_t^s}{\partial M_t} > 0,$$

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

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

$$V^f(M_t) = n(h^f)\gamma QA + 2n(h^f)\Big(\gamma Q - R(M_t)\Big)D^s(M_t, R(M_t)).$$

In this case, note that by Envelope Theorem we have

$$\frac{\partial V^f(M_t)}{\partial M_t} = 2n(h^f)\Big(\gamma Q - R(M_t)\Big)\frac{\partial D_t^s}{\partial M_t} > 0.$$

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

$$V^s(M) \geq V^f(M).$$

Begin first with the case in which $n(h^s)/n(h^f) < 2$. We show that $\Delta(M) \equiv V^s(M) -$

$V^f(M)$ is monotone decreasing in M, and hence there exists an $M^* \in [0,1]$ such that the result holds (where by convention, we denote $M^* = 0$ if the economy is always open and $M^* = 1$ if the economy is always closed). By Envelope Theorem we have

$$\begin{aligned}
\Delta'(M) &= \frac{\partial V^s(M)}{\partial M} - \frac{\partial V^f(M)}{\partial M} \\
&= n(h^s)\Big(\gamma Q - R(M_t)\Big)\frac{\partial D_t^s}{\partial M_t} - 2n(h^f)\Big(\gamma Q - R(M_t)\Big)\frac{D^s(R_t(M_t), M_t)}{\partial M_t} \\
&= \Big[n(h^s) - 2n(h^f)\Big]\Big(\gamma Q - R(M_t)\Big)\frac{\partial D_t^s}{\partial M_t} \\
&< 0
\end{aligned}$$

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

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

$$V^S - V^f = \Big(n(h^s) - n(h^f)\Big)\gamma QA + \Big(n(h^s) - 2n(h^f)\Big)\Big(\gamma Q - R(M_t)\Big)D^s(M_t) \geq 0$$

and hence the country never opens up and we define $M^* = 1$.

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

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

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

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

A.II.I4 Further Heterogeneity in Demand Curves

Investor heterogeneity plays a crucial role in the dynamics of opening up. In this appendix we allow for further heterogeneity in terms of parameters of the demand curve, like slope and intercept, as well as capping the total amount of financing that can be obtained by stable investors.

We think of the demand for the country's bonds by stable investors even at low levels of reputation as a special characteristic of countries that could become a reserve currency, like China. Most other countries, like many emerging markets, do not have this option and instead open up directly facing flighty investors. We think of stable investors as cheaper than private flighty ones but also a smaller overall pool of capital.

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

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

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

$$R_t = \begin{cases} \frac{R^s + \frac{1}{2}b^s D_t}{1-(1-M_t)\overline{\tau}}, & D_t \leq \overline{D}^s \\ \frac{R^f + \frac{1}{2}b^f (D_t - \overline{D}^s)}{1-(1-M_t)\overline{\tau}}, & D_t > \overline{D}^s \end{cases} \tag{A.1}$$

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

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

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

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

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

Substituting back into the interest rate schedule, we get

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

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

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

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

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

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

Finally substituting back into the interest rate schedule, we obtain

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

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

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

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

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

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

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

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

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

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

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

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

A.III Two-Way Capital Flows

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

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

We return to the baseline model of Section 4.2 with heterogeneous investors. We generalize that model by assuming that domestic households have an endowment W of liquid wealth at each date t. Households also own the intermediation sector, where $E_t \equiv V_t$ is the total value of the intermediation sector equity at date t. Thus, their total wealth position is $W + E_t$. At the beginning of each date, households can invest an amount K_t in illiquid foreign assets, which pay out R^K at the end of the date. Households invest the remainder $W - K_t$ in illiquid non-intermediary investments, and we normalize the return of these assets to 1 for simplicity.[24] In the main text we assume that shares in the intermediaries cannot be traded, since inside capital A is fixed and domestically held. In Appendix A.III.1, we relax this assumption and show that it generates a jump in both gross assets and liabilities that occurs at the opening up step.

Households have an adjustment cost for sending capital abroad based on their total wealth, given by $\Psi(k_t)(W + E_t)$, where $k_t = \frac{K_t}{W+E_t}$ is the fraction of their total wealth that they send abroad and where 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: $\Bigg(R^K k_t - \Psi(k_t) + (1 - k_t)\Bigg)(W + E_t)$. 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

[24] 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.

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 $B<0$ helps us capture the extra value attributed by the government compared to households to investments abroad that help build the currency globally. Given the government's objective, its optimal allocation is $\Psi'(k_t)=R^K-(1+B)$. If $B>0$, then the government chooses to send less capital abroad than households would have privately chosen, and it imposes limits on domestic capital flowing abroad concurrently with the limits on inflows by foreigners (this latter part has been the focus of our model so far).[25]

Solving the model with two-way asset holdings follows the same steps as the model solution in Section 4.2. Since k_t is constant over time, the government's objective function is an affine transformation of $E_t=V_t$ generating similar dynamics. We further impose a realistic restriction that the marginal value of an additional unit of inside equity is less than two, so that the marginal return on an additional unit of inside equity is less than one hundred percent.[26] We summarize the dynamics in the proposition below.

Proposition 2 *In the model with two-way capital flows, both gross foreign assets and liabilities increase in reputation. The country's net foreign assets deteriorate as reputation improves.*

As reputation builds up, gross flows happen simultaneously: foreigners hold more of the domestic bond market and domestic capital flows abroad. Foreign assets, $K_t=k(W+E_t)$, increase in constant proportion ($k<1$) to the equity value of the intermediation sector. Intuitively, as reputation builds, the equity value of the intermediation sector also builds, and so does household net worth, making it more attractive to send more wealth abroad. Foreign liabilities D_t increase faster than the value of intermediation (see proof of Proposition 2 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

[25] 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 state-owned entity projects that the government selects. In the case of China, for example, there are tight controls on private holdings of foreign securities, but at the same time entities like SAFE and AIIB make large investments abroad using domestic savings. This could be accommodated in our framework by introducing two types of foreign investments, one over which B is positive and one over which it is negative.

[26] See the proof of Proposition 2 in Appendix A.III.A for discussion of where this condition applies.

levels of reputation, and while being a net foreign creditor, the country chooses to borrow some capital from foreigners in order to start building future reputation. As that reputation is built, the desire for borrowing increases faster than the desire to invest domestic savings abroad, leading to a net foreign asset deterioration. The model captures the tendency of countries that are established reserve currency providers, like the U.S., to be net foreign debtors and characterizes their dynamic adjustment toward this position.

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

In the main text analysis of two-way flows, the intermediation sector inside equity is fixed and capital sent abroad is drawn from other domestic investments. Foreign assets are a constant percent of domestic wealth. When the country opens up to flighty foreign investors there is a jump up in the total value of the intermediation sector which increases foreign assets via its effect on wealth. Here we allow households to extract some of the intermediation sector inside equity and redeploy the capital abroad. This leads to a more than proportional increase in foreign assets when the country lets in flighty investors. To focus solely on this effect, we assume, for simplicity, that any money kept in the domestic economy is invested in the intermediation sector.

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

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

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

$$-\frac{R^K - \bigg(1 + \Psi'(k_t)\bigg)}{\Psi'(k_t)k_t - \Psi(k_t) + 1} = -\underbrace{\Big(\frac{h_t}{\gamma - (1 - h_t)}\gamma Q - 1\Big)}_{\text{Return on Inside Equity}} \tag{A.2}$$

Equation A.2 shows that k_t depends on the return on intermediary inside equity.[27] The LHS increases in k_t, so that a *decrease* in the return on inside equity leads to an increase in foreign

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

investment in percent terms, k_t. Since the marginal return on inside equity *falls* at opening up due to the higher h_t, this means that foreign investment is a constant k^s before opening up and is a constant k^f at and after opening up, with $k^s < k^f$ indicating that there is a disproportionately large increase in outflows from the domestic economy after opening up.

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

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

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

where we have defined $g^*(M_n) \equiv \frac{R^K k_n - \Psi(k_n)}{1-k_n} + g(M_n)$. The transition dynamics are the same as before, except for replacements of $g(M_n)$ with $g^*(M_n)$.[29] This change has two effects. The first effect is that it further dampens the slope of the AR(1) process both before and after opening up, since $g^*(h_n) > g(h_n)$ due to the added value from sending a fraction of wealth abroad. Intuitively, as the country begins deriving more value from sending wealth abroad, it needs smaller increases in the value of inside equity to compensate for greater reputation.

The second effect comes from the change in the coefficient on $V(M_0)$ to $\frac{g^*(h_0)}{g^*(h_{n+1})}$ from $\frac{g(h_0)}{g(h_{n+1})}$. This coefficient is still equal to one before opening up. After opening up, there are two competing effects that determine whether the intercept is amplified or muted relative to before. The first effect is that the value of imposing the capital control falls after opening up, which lowers not only net worth but also the gains from sending capital abroad. This pushes the constant further towards zero and inserts a negative wedge in the transition dynamics at and after opening up. This reflects the intuition that a country that resets its reputation also benefits from a higher proportional value of inside equity in the good state. The second

[28] For simplicity, we assume that the adjustment cost for the opportunistic type is determined based on the market value E_t that arises if the capital control is not imposed.

[29] Notice that the component $g(h_n)\rho(h_n)$ in the slope of the AR(1) is correct as before, because it comes from the indifference condition which depends on g. By contrast, the other terms come from the Bellman equation, which depends on g^*.

effect arises from the increase in capital sent abroad, $k^f > k^s$, after opening up. This effect is ambiguous on the constant. On the one hand, it dampens the constant because the average return on foreign capital, $R^K - \frac{1}{k_n}\Psi(k_n)$, falls as capital is sent abroad. On the other hand, it amplifies the constant because as more capital is sent abroad, less is retained at home, and so larger reputation changes are required to maintain indifference.

A.III.A Proof of Proposition 2

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

$$NFA_t = k(W + E_t) - D_t.$$

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

$$\frac{\partial E_t}{\partial M_t} = -n_t \frac{\partial R_t}{\partial M_t} D_t = \frac{v_t}{\gamma Q} R_t D_t \frac{1}{1-(1-M_t)\overline{\tau}}\overline{\tau}$$

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

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

$$\frac{\partial NFA_t}{\partial M_t} = \left[k\frac{v_t}{\gamma Q}\frac{R_t D_t}{1-(1-M_t)\overline{\tau}} - \frac{1}{b}\gamma Q\right]\overline{\tau}.$$

From here, we note that

$$\frac{\partial^2 NFA_t}{\partial M_t^2} = k\frac{v_t}{\gamma Q}\frac{\partial}{\partial M_t}\left[\left(\frac{1}{2}\gamma Q + \frac{1}{2}\frac{\bar{R}}{1-(1-M_t)\overline{\tau}}\right)\frac{1}{b}\left(\gamma Q - \frac{\bar{R}}{1-(1-M_t)\overline{\tau}}\right)\right]\overline{\tau} = \frac{1}{b}k\frac{v_t}{\gamma Q}\frac{\bar{R}^2}{(1-(1-M_t)\overline{\tau})^3}\overline{\tau}^2$$

so that if $\left.\frac{\partial NFA_t}{\partial M_t}\right|_{M_t=1} < 0$, then NFA is everywhere deterioriating as reputation builds. NFA is deteriorating at $M_t = 1$ if $k\frac{v_t}{\gamma Q} b R_t D_t - \gamma Q < 0$. Substituting in for R_t and D_t and rearranging, we have the sufficient condition

$$k < \frac{2}{v_t}\frac{(\gamma Q)^2}{(\gamma Q)^2 - \bar{R}^2}$$

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

Next, note that at $M = M^*$, we have continuity in E_t but an upward discontinuity in

D_t. Therefore, NFA discretely deteriorates at M^*.

Finally for $M_t > M^*$, we can repeat the same steps to get

$$\frac{\partial NFA_t}{\partial M_t} = \left[k\frac{v_t}{\gamma Q}\frac{R_t D_t}{1-(1-M_t)\overline{\tau}} - \frac{2}{b}\gamma Q\right]\overline{\tau}.$$

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

Appendix Figures and Tables

Table A.I: Fund Sample Summary Statistics: 2020

		Total AUM (USD mi)		**Total FC AUM (USD mi)**		**Average Share of Total AUM in FC Assets**	**Average Share of FC Assets in LC Government Bonds**
		Mean	Median	Mean	Median		
Funds	828	1,970	532	560	132	74%	57%
of which Domiciled in							
EMU	429	1,170	454	416	132	80%	56%
USA	181	5,035	1,159	1,170	126	42%	64%
CAN	65	977	509	237	95	82%	43%

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

Table A.II: Summary of Rankings for Alternative Estimations

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

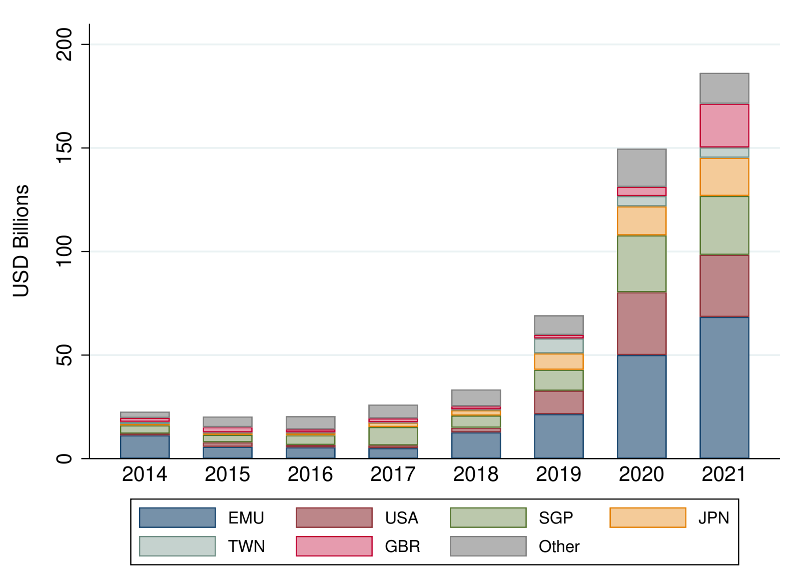
Notes: This table compares the ranking of CNY to the DM and EM averages for each alternative subset of the data. To compute rankings we sort the estimated correlations in each case in descending order.

Table A.III: Gravity Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	$\alpha_{c,i}$	$\alpha_{c,i}$	$\alpha_{c,i}$	$\alpha_{c,i}$	$\alpha_{c,i}$	$\alpha_{c,i}$	$\alpha_{c,i}$	$\alpha_{c,i}$
β_{DM}^{BRL}					-0.088***	-0.088***	-0.088***	-0.088***
					(0.005)	(0.005)	(0.005)	(0.005)
β_{DM}^{CNY}					-0.003	-0.003	-0.002	-0.003
					(0.007)	(0.007)	(0.007)	(0.007)
β_{DM}^{JPY}					0.181***	0.184***	0.182***	0.184***
					(0.009)	(0.009)	(0.009)	(0.009)
Distance	-0.006***			-0.004***	-0.006***			-0.004***
	(0.001)			(0.001)	(0.001)			(0.001)
Trade Flow		0.212***		0.175***		0.127***		0.082**
		(0.044)		(0.045)		(0.038)		(0.039)
Legal System			0.002	0.001			-0.001	-0.001
			(0.001)	(0.001)			(0.001)	(0.001)
Observations	24,787	24,665	24,787	24,665	24,787	24,665	24,787	24,665
R-squared	0.238	0.237	0.236	0.238	0.446	0.443	0.444	0.444
DM Share	No	No	No	No	Yes	Yes	Yes	Yes
Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

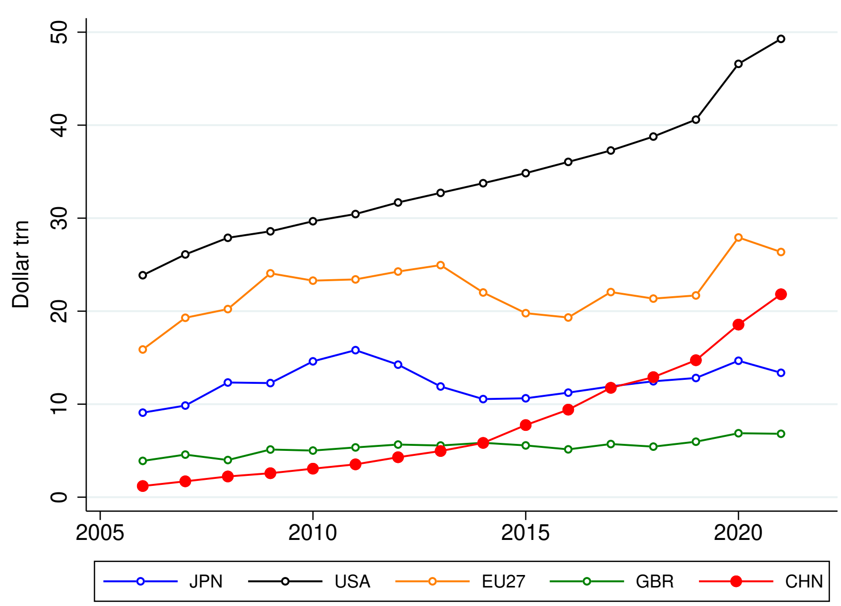
Notes: Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. This table reports the coefficient estimates of the gravity regressions. To simplify exposition instead of reporting all the β^{DM} (one for each currency) we only report estimates for the BRL, CNY and JPY estimates. All specifications include currency and fund domicile fixed effects. DM Share indicates whether the specification includes the variables $\alpha_{DM,c,i}$.

Figure A.I: Geography of Private Holders of Renminbi Bonds



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

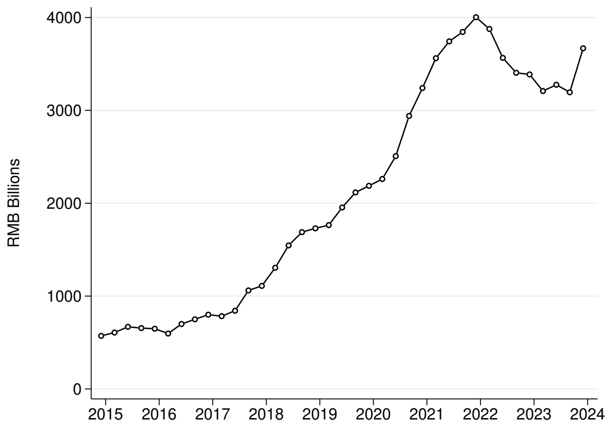
Figure A.II: The World's Largest Bond Markets



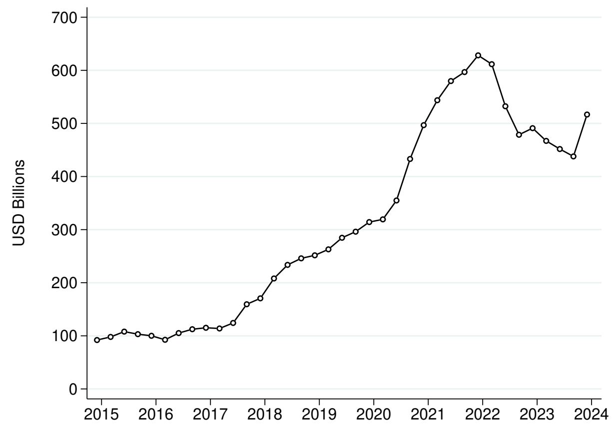
Source: BIS Total Debt Securities by Resident Issuer

Figure A.III: Foreign Ownership of China's Domestic Bonds

(a) in RMB



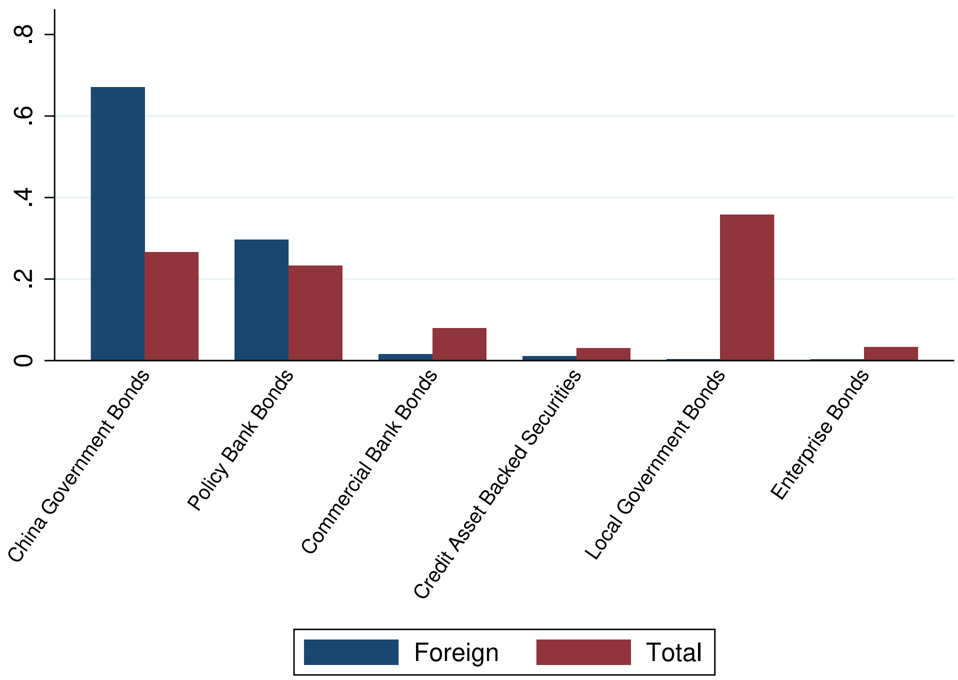
(b) in USD



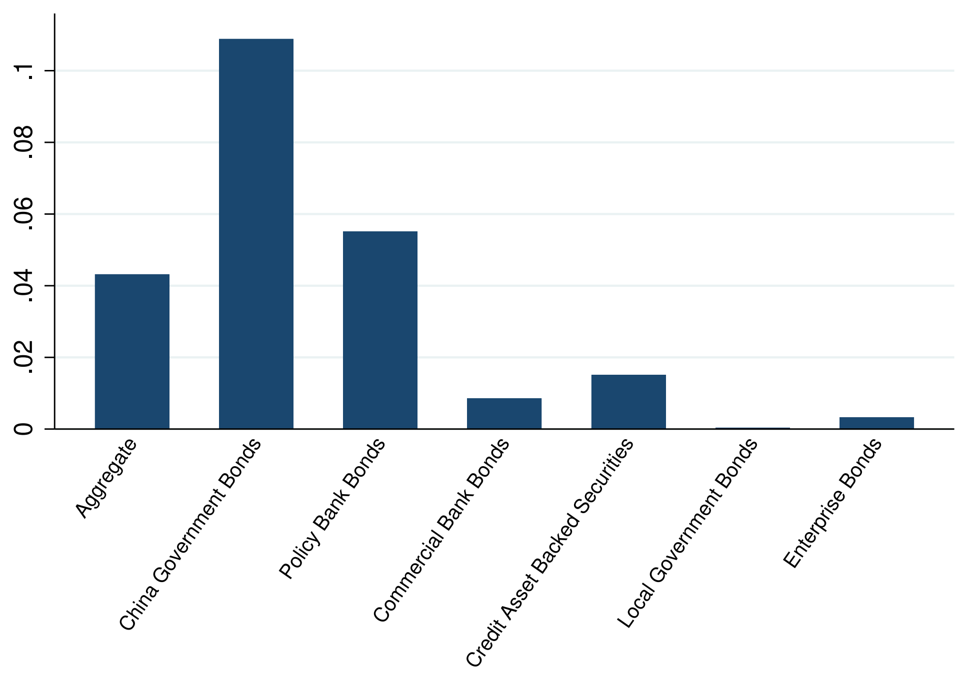
Source: Data from Bond Connect, CCDC, and SHCH.

Figure A.IV: The Composition of Foreign Ownership of RMB Bonds

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



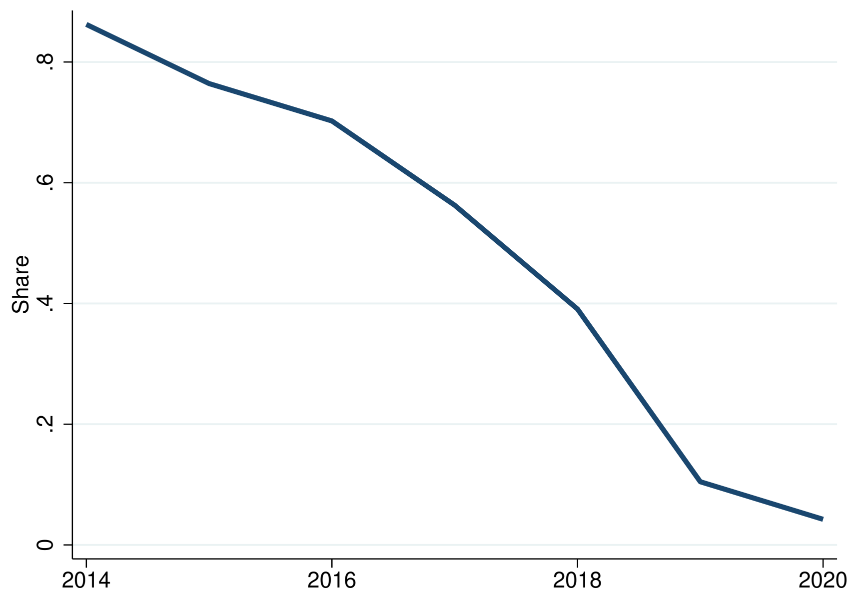
(b) Share of Outstanding Bonds Owned by Foreign Investors



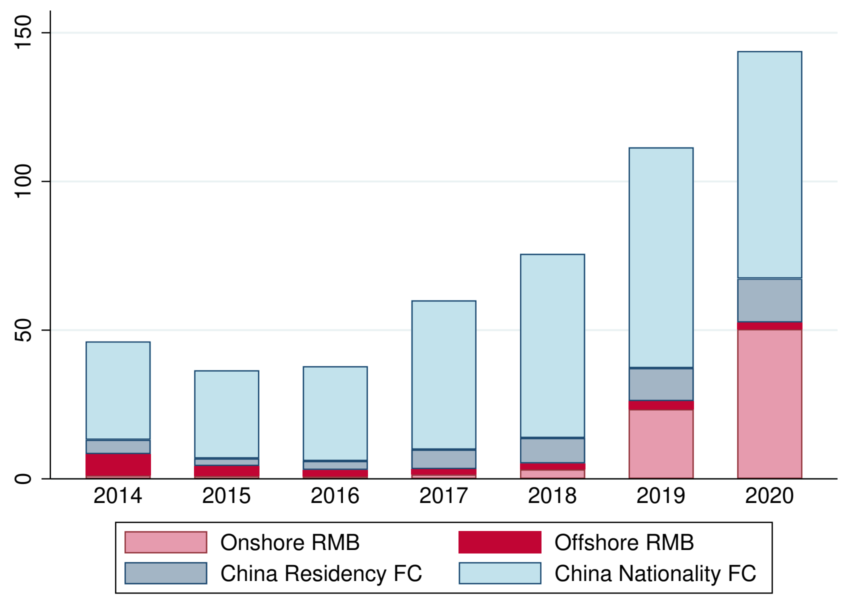
Notes: Data from China Central Depository & Clearing (CCDC). Top panel calculates the share of the foreign and total investment portfolio in each of the various categories of bonds. The bottom panel reports what share of each bond type is owned by foreign investors.

Figure A.V: Mutual Fund and ETF Investment in RMB

(a) Share of Foreign Investment in Offshore RMB



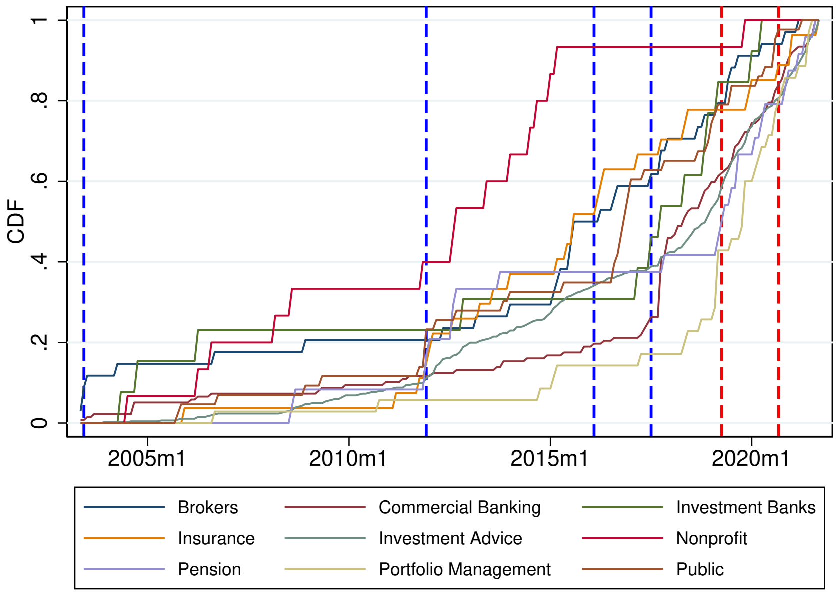
(b) Forms of Bond Investment in China and RMB



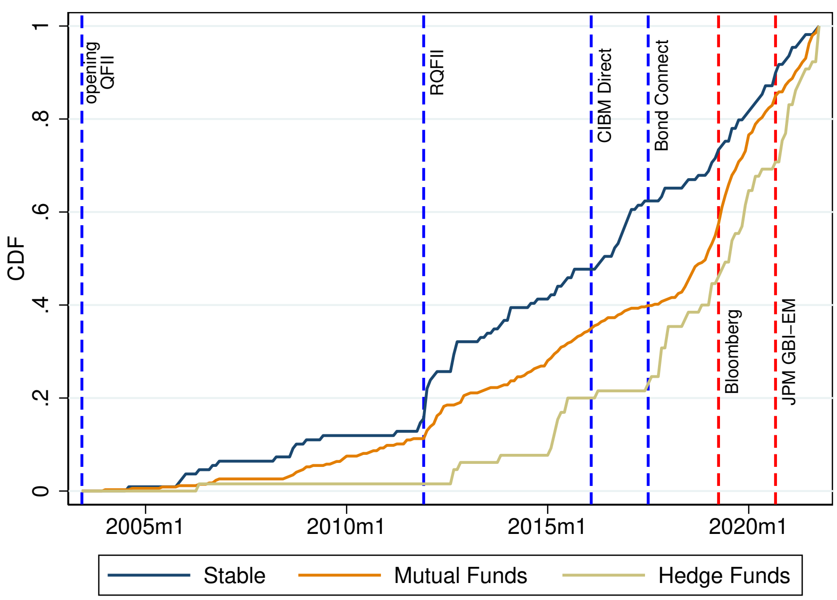
Notes: The top panel plots the share of foreign-owned RMB denominated bonds that were issued in onshore and offshore markets in global mutual fund and ETF portfolios. Offshore markets are defined as bonds classified as Eurobonds or Global by FIGI or bonds listed as being denominated in CNH. The bottom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

Figure A.VI: Foreign Investors' Entry in China's Domestic Bond Market

(a) All investor types

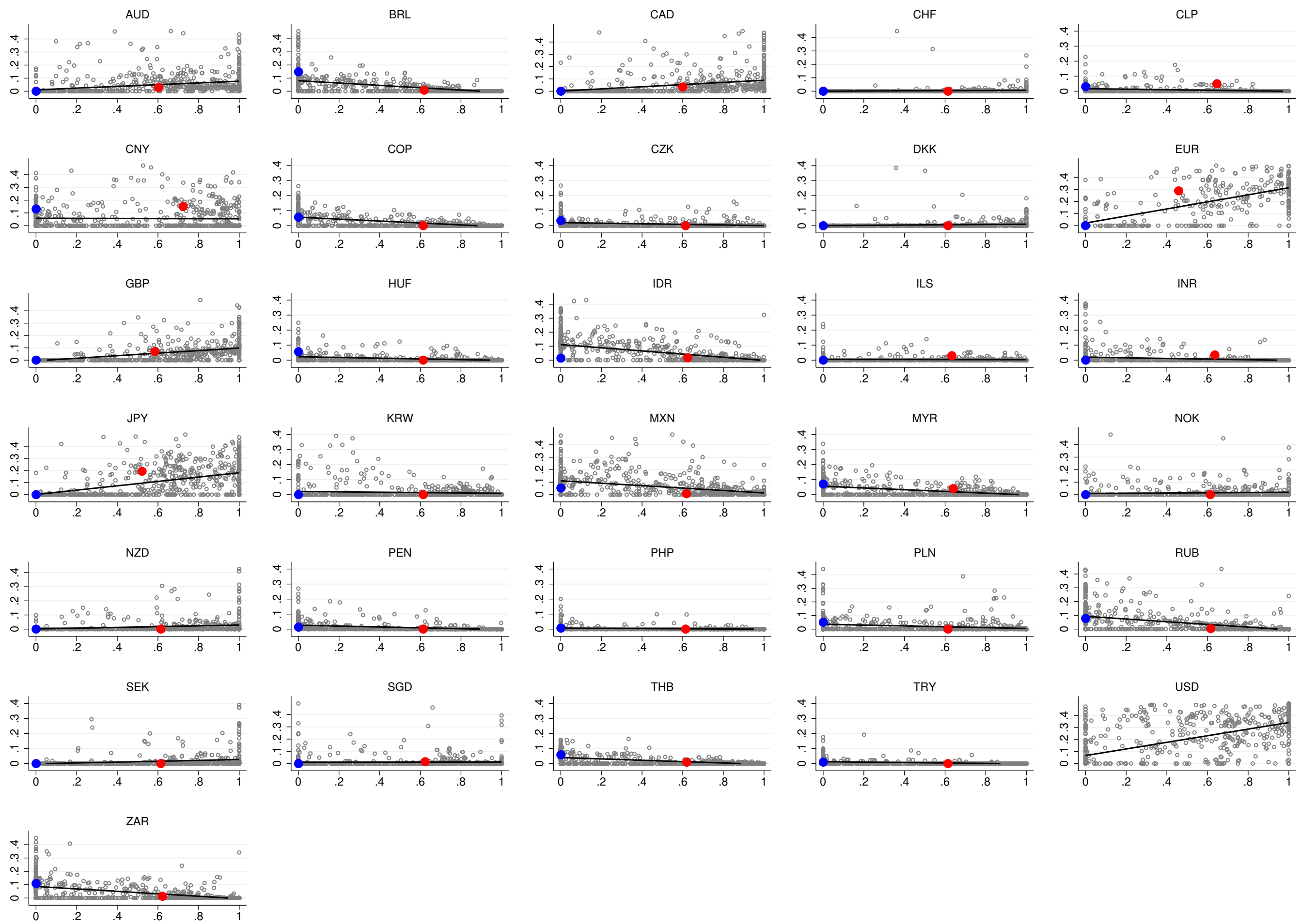


(b) Mutual and Hedge Funds



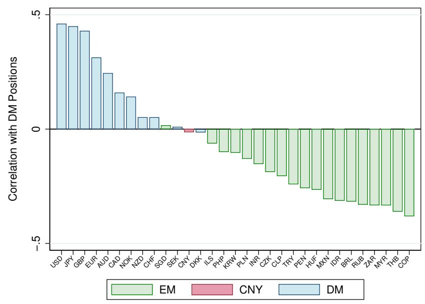
Notes: Panel (a) plots the share of each investor type that had entered the market by 2021 at a given date at a more refined investor category. Panel (b) plots the share of each investor type that had entered the market by 2021 at a given date breaking down Flighty investors into Mutual and Hedge Funds. We reclassified investors categorized as "portfolio managers" or "investment advice" companies according to the most frequent category among the subsidiaries.

Figure A.VII: Portfolio Shares by Currency, 2020Q4

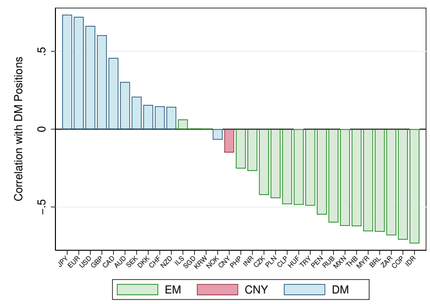


Notes: In each figure, an observation is the portfolio holdings of a particular fund in the 4th quarter of 2020. The y-axis corresponds to the share of foreign currency portfolio holdings in a particular currency, and the x-axis to the share of the remaining (once we exclude this currency) foreign currency portfolio in DM currencies. In each panel, the blue dot represents the holdings of the PIMCO Emerging Markets Local Currency and Bond Fund and the red dot represents the holdings of the T. Rowe Price International Bond Fund. Notice the two funds are domiciled in the U.S. and, as explained in the text, their portfolio shares in USD are not considered for the analysis.

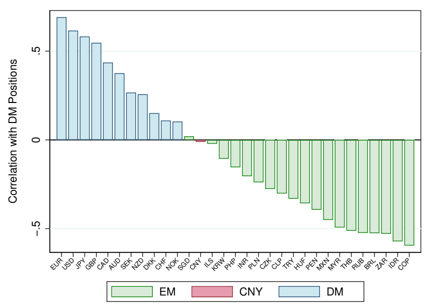
Figure A.VIII: Cross-Section of Estimates in 2020: Alternative Specifications



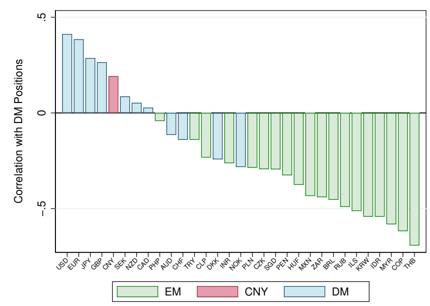
(a) UST as Reference



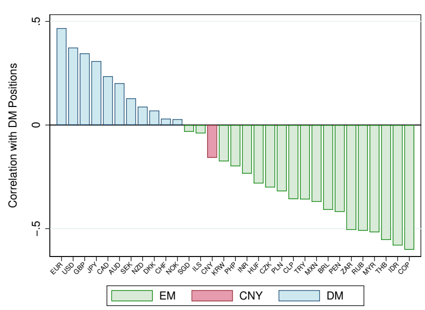
(b) Weighted by FC AUM



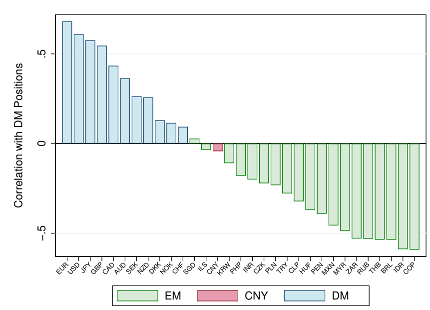
(c) Excluding Index Funds



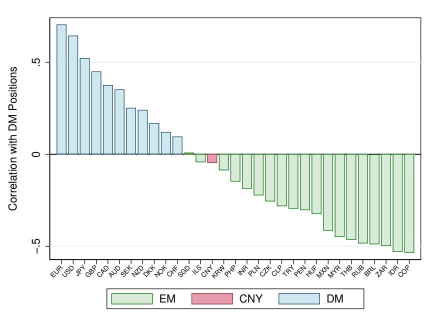
(d) Intensive Margin



(e) Alternative Specialist Threshold (98%)



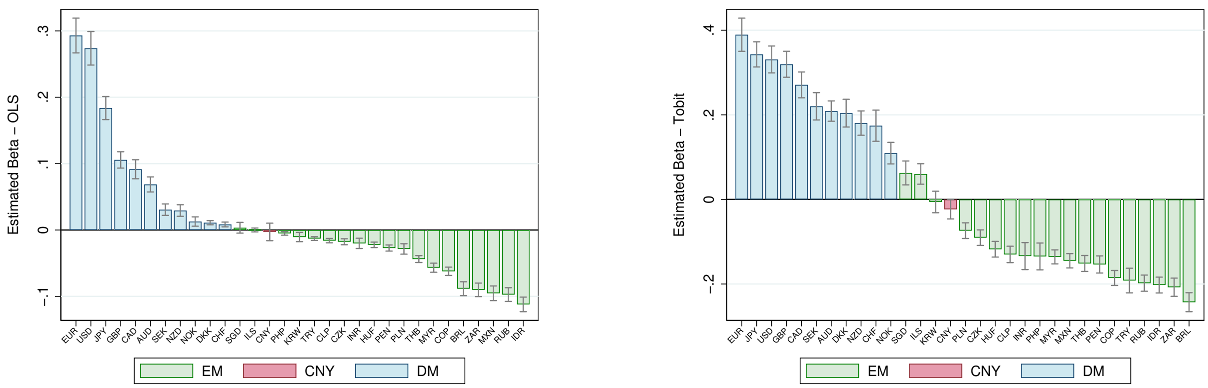
(f) Alternative Minimum FC AUM



(g) Alternative FC Definition

Notes: Figures report the correlation between the holdings of bonds in each currency and holdings in Developed Markets (DM) currencies for alternative specifications.

Figure A.IX: Cross-Section of Beta Estimates in 2020

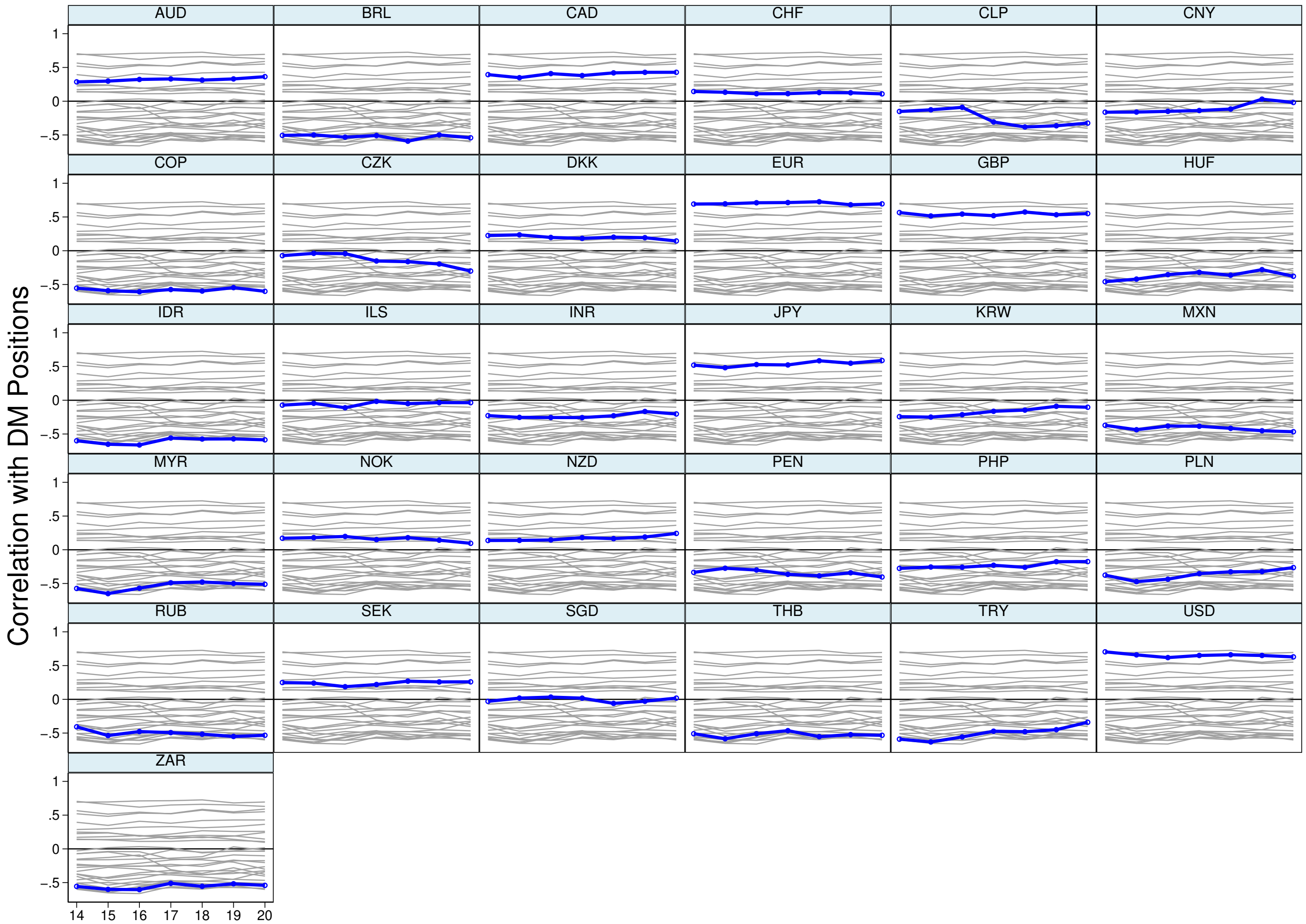


(a) OLS

(b) Tobit

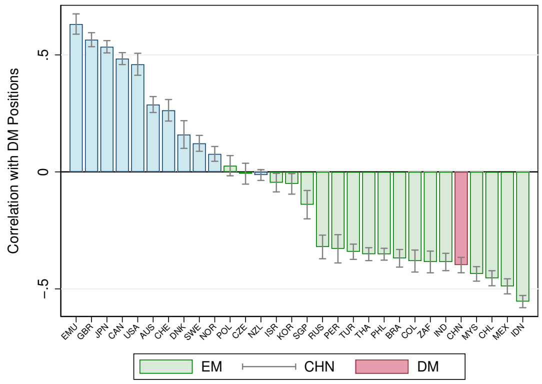
Notes: These figures plot the estimate β^c_{DM} in the gravity regressions including distance, trade flow and the common legal system dummy, as well as currency and fund domicile fixed effects. Gray lines correspond to 95% confidence intervals computed via bootstrapping.

Figure A.X: Portfolio Similarity with Developed Countries' Local-Currency Government Bonds: 2010 to 2020

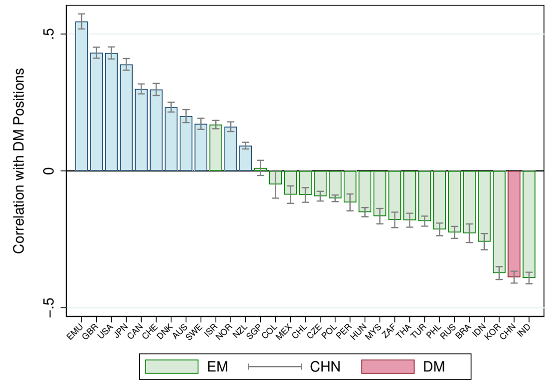


Notes: Figure plots the evolution of the portfolio share correlation with DM Local-Currency Government Bonds. Gray lines correspond to the other currencies. We plot currencies that accounted for at least 0.3% of the total foreign currency investment in government bonds on average between 2014 and 2020.

Figure A.XI: Cross-Section of Correlation Estimates in 2020



(a) USD Corporate Bonds

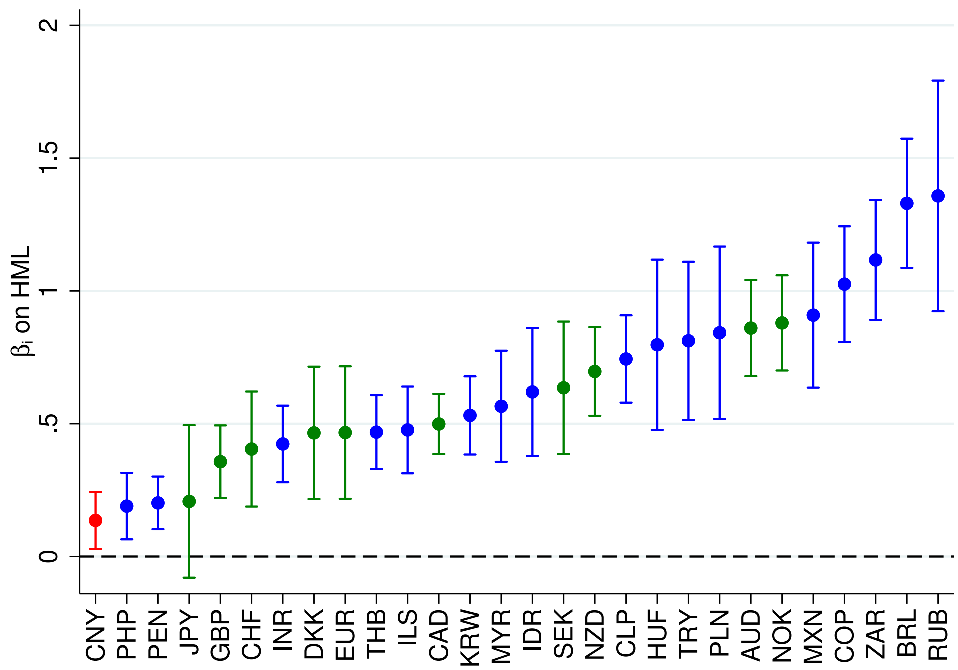


(b) Equities

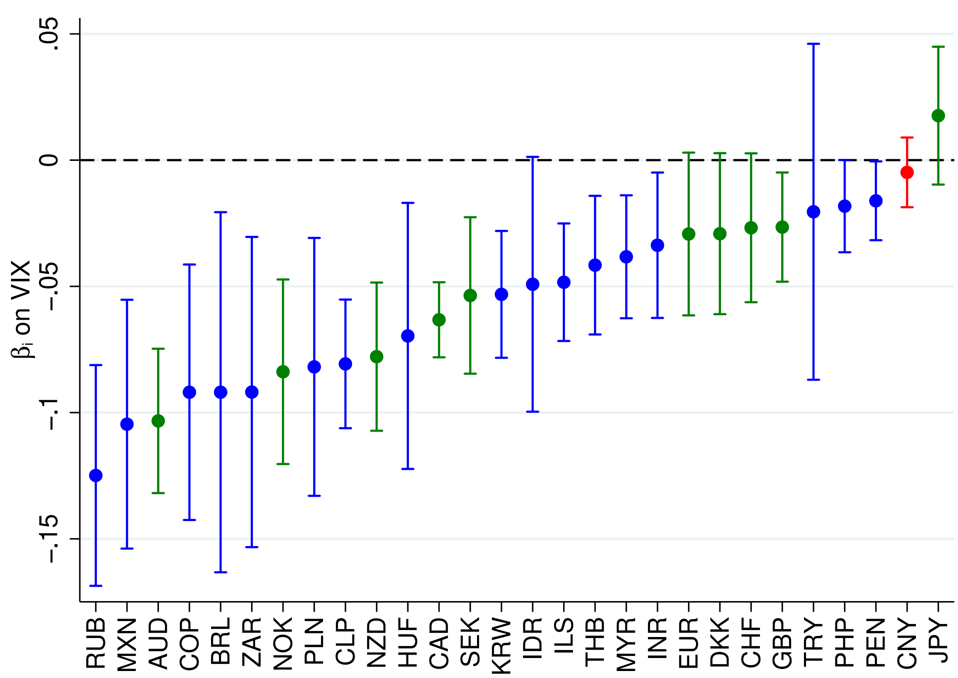
Notes: These figures report the correlation measure by nationality of the issuer for different types of assets. Gray lines correspond to 95% confidence intervals computed via bootstrapping.

Figure A.XII: Returns on RMB relative to EM and DM Currencies

(a) HML

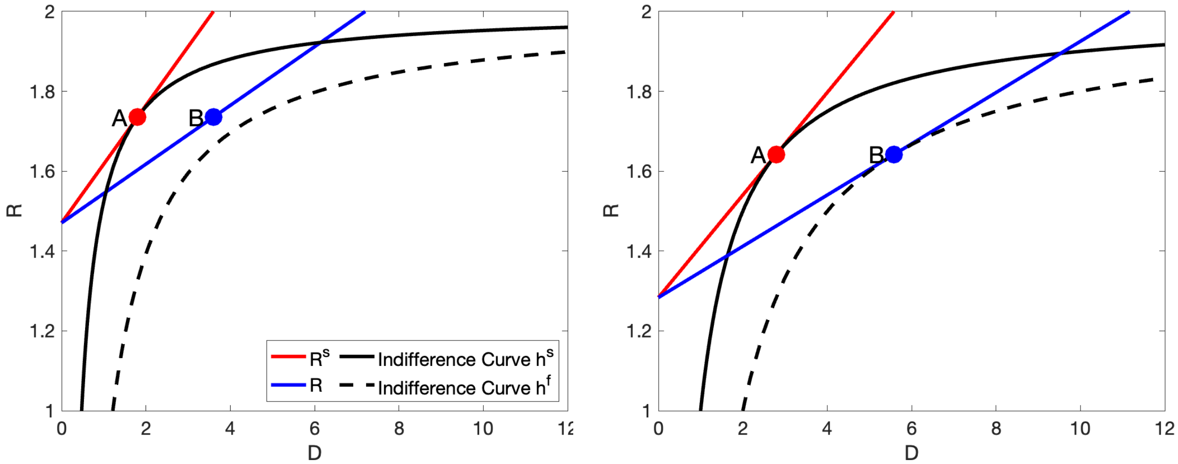


(b) VIX

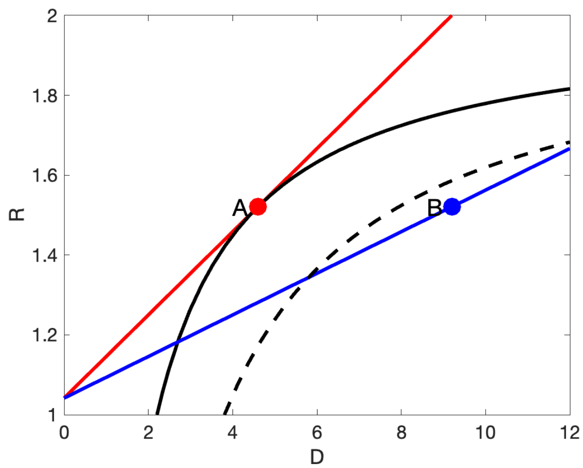


Notes: 2010-2021. Quarterly returns based on 3m Government bond yields. β_i estimated via univariate country-specific regressions of quarterly bond returns on the factor (HML in the top panel, and the log change in the VIX in the bottom panel). Data from Du et al. (2018).

Figure A.XIII: Understanding the Opening Up Decision



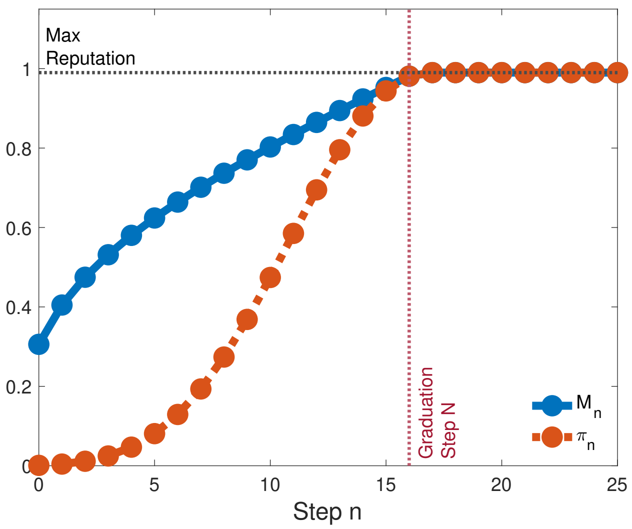
(a) Committed Gov. Issuance When $M < M^*$ (b) Committed Gov. Issuance When $M = M^*$



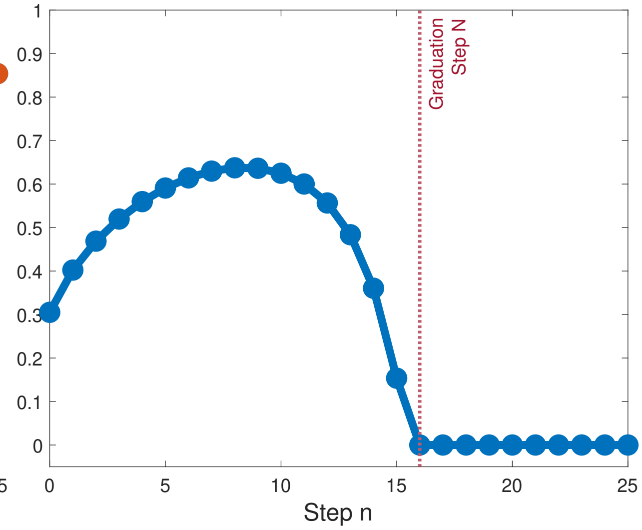
(c) Committed Gov. Issuance When $M > M^*$

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

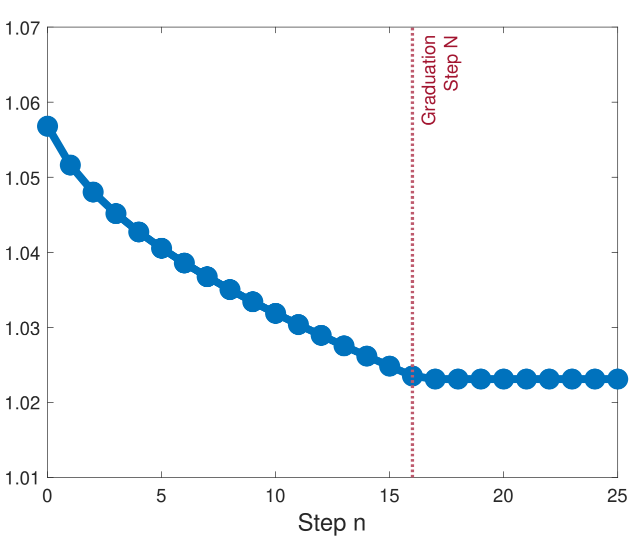
Figure A.XIV: Equilibrium Reputation Cycle: Homogeneous Foreign Investors



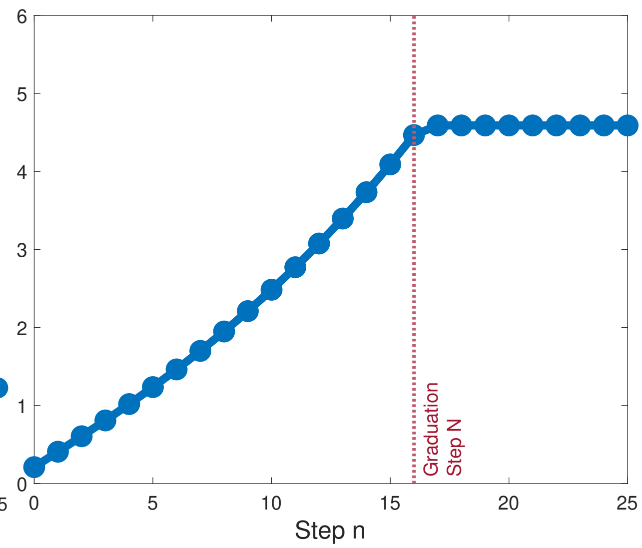
(a) Reputation M and Beliefs π



(b) Mimicking Probability m



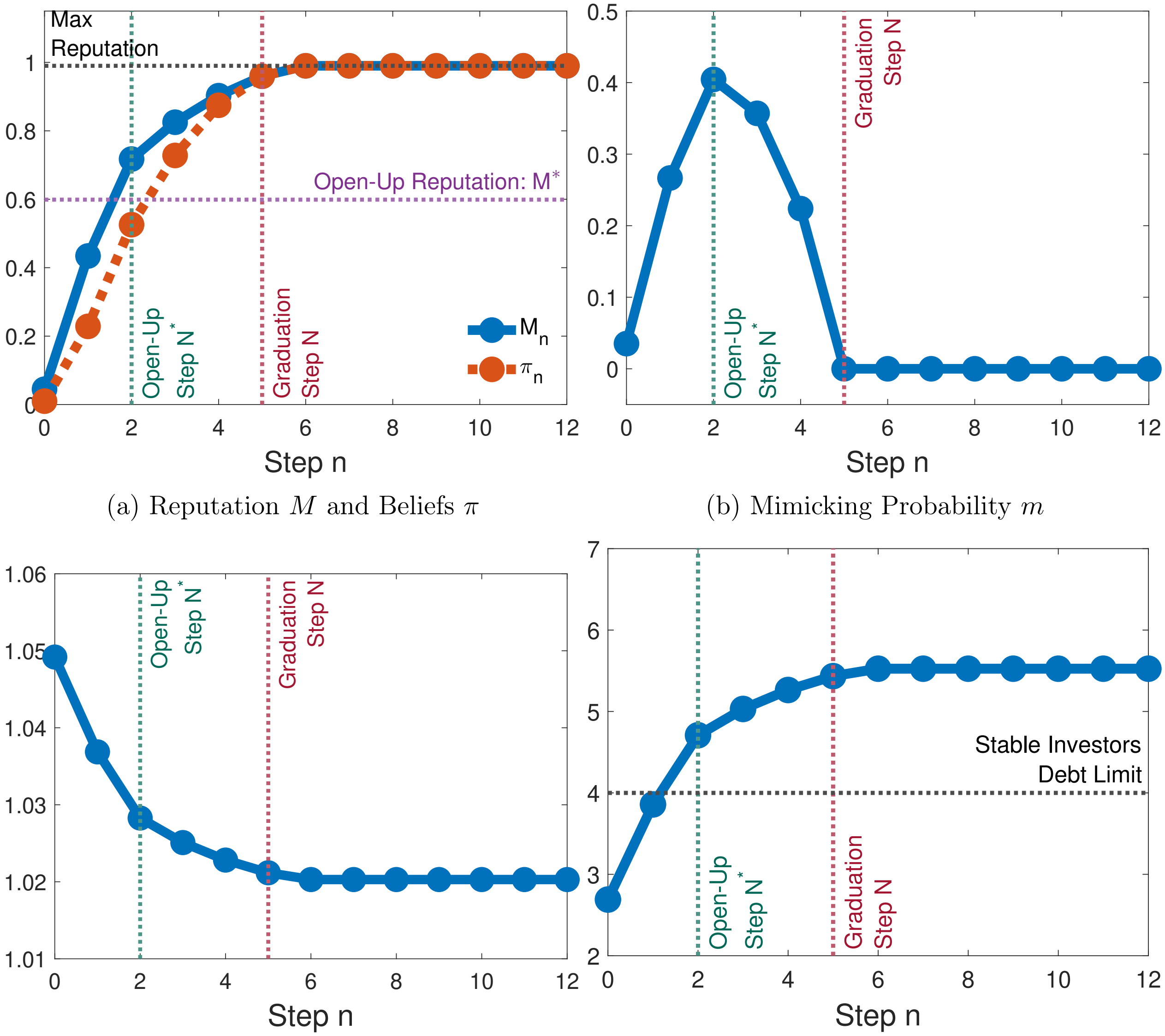
(c) Interest Rate R



(d) Debt Issuance D

Notes: Numerical illustration of the equilibrium of the model when foreign investors are homogeneous. The N dashed-red line is the graduation step.

Figure A.XV: Equilibrium Reputation Cycle: Heterogeneous Foreign Investors Demand Curves



(a) Reputation M and Beliefs π

(b) Mimicking Probability m

(c) Interest Rate R

(d) Debt Issuance D

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

References

Arslanalp, Serkan, Barry Eichengreen, and Chima Simpson-Bell, "The stealth erosion of dollar dominance and the rise of nontraditional reserve currencies," *Journal of International Economics*, 2022, p. 103656.

Carpenter, Jennifer N, Fangzhou Lu, and Robert F Whitelaw, "Government Bond Risk and Return in the US and China," 2022.

Conte, Maddalena, Pierre Cotterlaz, and Thierry Mayer, "The CEPII Gravity Database Highlights," 2022.

Coppola, Antonio, Matteo Maggiori, Brent Neiman, and Jesse Schreger, "Redrawing the map of global capital flows: The role of cross-border financing and tax havens," *The Quarterly Journal of Economics*, 2021, *136* (3), 1499–1556.

Dooley, Michael, David Folkerts-Landau, and Peter Garber, "Asia, interest rates, and the dollar," *Deutsche Bank,*, 2008.

Du, Wenxin, Joanne Im, and Jesse Schreger, "The us treasury premium," *Journal of International Economics*, 2018, *112*, 167–181.

Fund, International Monetary, "Survey on the Holdings of Currency in Official Foreign Currency Assets," 2015.

Lustig, Hanno, Nikolai Roussanov, and Adrien Verdelhan, "Common risk factors in currency markets," *The Review of Financial Studies*, 2011, *24* (11), 3731–3777.

Maggiori, Matteo, Brent Neiman, and Jesse Schreger, "International currencies and capital allocation," *Journal of Political Economy*, 2020, *128* (6), 2019–2066.

Obstfeld, Maurice, Jay C Shambaugh, and Alan M Taylor, "Financial stability, the trilemma, and international reserves," *American Economic Journal: Macroeconomics*, 2010, *2* (2), 57–94.