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## **The Geopolitics of Swap Lines**

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# The Geopolitics of Swap Lines

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## **Abstract**

The U.S. Federal Reserve’s most powerful international crisis-fighting tool is its network of swap lines: dollar liquidity facilities extended to 14 foreign central banks that proved critical in meeting panicked global demand for dollars, calming international markets, and avoiding a disorderly sell-off of U.S. assets. As the only institution that can create dollar liquidity, the Fed acted as an international lender-of-last-resort in a market that uses the dollar as its key currency. But how does the Fed decide who receives swap lines? The question is important not just for crises, but for how recourse to dollar liquidity shapes the hierarchy of the international financial system. The literature to date, and the Fed’s own stated criteria, have focused primarily on economic determinants. I present an analysis of the historical record, as well as an empirical analysis of swap line selectivity, to show that closer political alignment with the U.S. and ownership of U.S. assets are associated with an increased likelihood of a country receiving a swap line in 2008 and early 2020. These findings align with the economic and geopolitical interests I propose the U.S. has at stake in enacting international lender-of-last-resort policies. The findings also have implications for U.S. policies that may affect the dominant role of the dollar in world markets (a necessary condition for many U.S. foreign and economic policy tools) in an era of increased currency competition.

# 1 Introduction

The decline of American hegemony is the watchword of the day in world politics and economics. Yet in world markets, the dollar reigns supreme. On many metrics, use of the dollar has risen in the years following the 2008 financial crisis. The dollar’s ongoing status as the world’s key currency is a potentially important tool for U.S. policymakers to manage the economic and political tension brought on by renewed great power competition. Yet despite the broad implications for U.S. policy, and active competition from the RMB and the euro, the role of policies that influence the dollar’s use are not yet well understood.

More than any other U.S. institution, the U.S. Federal Reserve (the Fed) plays the key role in the dollar’s global use, in no small part by acting as the *de facto* international lender-of-last resort. In times of crises, even those emanating from the U.S., investors scramble for dollars as the ultimate safe haven. The Fed — during the Great Financial Crisis (GFC), the European sovereign debt crisis and the market turmoil at the onset of COVID-19 — met that demand by, in the words of a former Fed official, “smearing dollars around the world” (BOG, Nov 2009). In practice, these are the swap lines: temporary transactions that provide dollars to as many as 14 central banks.<sup>1</sup> Dollar swap lines were widely credited with stabilizing the global financial system, particularly during 2008 Great Financial Crisis (GFC) and the onset of the COVID-19 pandemic. And swap lines avoided a sell-off of U.S. assets, which represent funding to the U.S. economy, by foreign investors in a time of crisis.

Swap lines are also an increasingly important feature of the global financial system beyond crisis-fighting. Both researchers and market participants are increasingly aware of the “hierarchy” that countries’ differing recourse to

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1. The central banks of Australia, Brazil, Canada, Denmark, the E.U., Japan, Mexico, New Zealand, Norway, South Korea, Singapore, Sweden, Switzerland and the United Kingdom.

swap lines create in global markets. Meanwhile, the central banks of both China and the European Union have expanded their own global networks of swap lines with the stated purpose of increasing use of the RMB and euro, respectively. China has also used access to its swap line network as a tool of economic statecraft to meet foreign policy objectives. Understanding how the Fed formulates swap line policies – who gets swap lines and *why* – is increasingly important not just for analyzing financial crises, but the structural features of the global financial system and geopolitics.

The literature to date has focused primarily on how the Fed prioritized economic criteria in choosing central banks to receive swap lines in 2008, namely the exposure of U.S. banks to a foreign economy, as well as a foreign economy’s economic “mass” and its economic policy choices and effectiveness. This paper looks instead at geopolitical determinants of swap lines. I present analyses which find that closer political alignment with the U.S. was positively correlated with a foreign central bank receiving a swap line in both 2008 and 2020. This finding is at first surprising relative to the historical record, where geopolitical factors are not explicit criteria in Federal Open Market Committee (FOMC) meeting transcripts. Nor was the Fed overruled by the executive branch, which reviewed its proposed swap line partners, in 2008. But a close reading of the FOMC’s meetings during 2008 adds nuance to the Fed’s “no politics” stance, showing discomfort with the hierarchy created by drawing a line at 14 central banks, an awareness of the signals the policy would likely create in world markets, and considerations for how its swap line partners aligned with the U.S.’s foreign policy relations. At a minimum, this analysis suggests the Fed incorporated geopolitics implicitly into its policy choices in both 2008 and 2020.

I also present evidence that suggests the Fed favored countries which held a larger share of U.S. assets, reflecting a desire to avoid a fire-sale in the market for assets which represent funding to the U.S. economy. The empirical evidence is supplemented by stronger evidence in the historical

record for 2008, both of the Fed’s decision making and awareness of the efforts of the rest of the U.S. government, such as then-Treasury Secretary Paulson’s entreaties to China not to dump its holdings of U.S. agency debt in the midst of a housing crisis. These findings add to a growing body of research that shows swap lines were directly beneficial to U.S. economic interests beyond mere global crisis-fighting.

The U.S. has framed swap lines as economic policy, but who gets them and why is a political question which in part reflects and defines the political and economic hierarchy of the global financial system. As the world economy continues to accommodate rising powers outside the traditional sphere of U.S. allies, this analysis suggests that geopolitical and economic interests risk coming into conflict. Should a country with sufficient economic mass and holdings of U.S. assets, but which was not a traditional U.S. ally, experience turmoil, how would U.S. policy respond? In 2008, much of the funding stress concentrated with U.S. allies in Europe, where banks had borrowed wholesale dollar funding or swapped euros for dollars in the FX markets to fund substantial lending to the U.S., especially mortgage-backed securities. More recently analysts have identified a shift in dollar borrowing to East Asian financial institutions, including banks and insurers, and to Emerging Market Economies (EMEs). East Asian economies — especially Japan, Korea and Taiwan — have also increased their holdings of U.S. assets. Thus, the epicenter of potential market stress is migrating to regions where geopolitical tensions are on the rise.

Beside crisis-fighting, the U.S. geopolitical strategy for the dollar must account for newly competitive “financial statecraft” among the great powers. The People’s Bank of China (PBoC), China’s central bank, has built the world’s largest network of swap lines partially to incentivize RMB internationalization. And it has opportunistically offered swap lines to countries unlikely to meet U.S. criteria. European policymakers have publicly called for a larger international role for the euro, in part to counter perceived misuse

of financial sanctions by the U.S. Euro swap lines are a principal component of that strategy. There are real frictions limiting RMB and euro internationalization, but these developments should nonetheless prompt a deeper consideration of the causes and implications of the dollar’s status as the key currency, which for decades has seemingly been a given. The dollar’s continued status does not contradict the inevitable: world politics and economics will necessarily have to accommodate rising powers; but it does represent a powerful and under-analyzed tool for the U.S. to manage the rising tension in both economic and foreign policy. With the Fed as only institution that can act as an international lender-of-last-resort to backstop dollar-based markets on a global scale, it’s critical that we understand how it arrives at its policy for doing so.

The rest of the paper proceeds as follows. Section II provides background on the offshore dollar market in which crises flare up, and the major changes since 2008. It also provides a technical discussion of how swap lines function, and evaluates their effectiveness through both a literature review and interviews with market participants. To motivate the analysis of swap line selectivity, Section III proposes a framework for the primary U.S. interests at stake in swap line policies, including economic and geopolitical criteria, as well as structural benefits from issuing the key currency. Section IV presents evidence of that both geopolitics and economic self-interest motivated swap line selectivity, through both a close reading of FOMC meeting transcripts (from the GFC and European sovereign debt crisis) and a quantitative analysis of swap lines in 2008 and 2020. Section V concludes.

## **2 The Offshore Dollar Market and Swap Lines**

### **2.1 The offshore dollar market**

The immediate objective of swap lines is to address funding constraints in the offshore dollar market during crises. The era following the Bretton Woods

system is most often associated with floating exchange rates, but just as important is the rise of the offshore dollar market that underpins the modern international financial system. Its key feature is the intermediation of savings and investment in dollars outside the jurisdiction of the U.S. It has in effect replaced a system of fixed exchange rates with one conducted in a single unit of account, the U.S. dollar, for international commerce and finance (Murau et al. 2020). As the “key currency,” the dollar plays a prominent role in this system beyond simply as a reserve currency.<sup>2</sup> It is the leading medium of exchange (one leg of 85% of all foreign exchange transactions and 40% of international payments), store of value (61% of official foreign exchange reserves), and unit of account (50% of trade invoicing<sup>3</sup>) (Davies et al. 2020). Researchers now estimate that the offshore dollar market creates more dollar-denominated credit than its onshore counterpart (Aldasoro and Ehlers, 2018).

Structural developments in the offshore dollar market have changed the dynamic of crises in several related ways since 2008. First, the market has become more geographically diverse, shifting from a concentration in U.S. allies such as Europe to East Asia and EMEs broadly. While total *global* dollar liabilities of non-U.S. banks leading up to the pandemic were as high as during the 2008 financial crisis (appx. \$13trn), Japanese, Chinese, Canadian and EME banks represented more of the global share of dollar liabilities than Europe (Davies et al. 2020). Asian economies in particular were more vulnerable to stress in dollar funding markets in 2020 (Park et al., 2020). This shift is notable in that increasingly countries that are not long-standing U.S. allies play a larger role as investors, borrowers and intermediaries in the offshore dollar market.

Second, non-bank financial institutions have become larger players, particularly life insurers in East Asia who hold large books of U.S. assets. Taiwanese life insurers, for example, held dollar assets worth approximately

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2. Formally the currency denomination of the majority of official reserves.

3. On trade invoicing, see: Gopinath (2015).

100% of GDP leading up to the COVID-19 crisis. (Davies et al., 2020). All told, these investors hold \$2.6 trillion worth of assets across all currencies (much of it dollar-denominated), as a result of low domestic interest rates and a surplus of savings relative to domestic investment (Davies et al 2020).

A third and closely connected development is the rise of so-called synthetic dollar funding via the FX swap and forward markets.<sup>4</sup> Synthetic debt is not treated as on-balance-sheet from an accounting perspective (compared to collateralized debt, such as a repo transaction).<sup>5</sup> The result is a lack of data that complicates the picture for policymakers, both with respect to crisis-fighting and macroprudential policy (Borio et al. 2020). FX swaps and forwards, 90% of which have the dollar as one side of the transaction, represented \$4.3 trillion, or 65% of average daily turnover as of April 2019. Estimates of non-U.S. bank gross dollar borrowing in FX swaps in mid-2019 was more than twice as large as on-balance-sheet dollar debt (Borio et al. 2017). Researchers also point to FX swaps and forwards in particular as being related to covered interest parity (CIP) deviations (Du et al. 2018).<sup>6</sup>

Non-bank financial institutions, such as the East Asian life insurers, are particularly active in the FX swap/forward markets: a mid-2019 estimate put their aggregate positions at \$18 trillion, compared to \$11.9 trillion of on-balance sheet debt (Borio, McGuire, McCauley 2020). Most positions are short term: investors buy long-term assets hedged with short-term FX swaps, over 80% of which are less than one-year maturity (Davies et al 2020).<sup>7</sup> As

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4. To create this type of funding, an investor uses existing local currency (e.g., insurance premiums paid in Japanese yen) or raises it in the market (e.g., through the issuance of debt) and either swaps it for dollars in the FX markets or combines a forward sale with a spot purchase of dollars.

5. Relative to other derivatives, notional value of swaps/forwards is exchange (i.e., cash is swapped), creating an actual debt for these transactions.

6. See Appendix II for a technical overview of covered interest parity and its use as a measure of funding stress.

7. Interviews with market participants suggested institutional borrowers commonly fund U.S. Treasury holdings at three-month maturities in FX swaps/forwards. (Interviews with the author.)



researchers and market observers have noted, when it becomes expensive or impossible to “roll” this funding, investors could face losses, prompting redemptions, the forced sale of securities, and further losses. Market observers in Asia noted that, as longer-term investors, insurers and other similar institutional investors are less likely to be pressured into forced sales, relative to banks, if the costs of funding rise temporarily; however, their analysis of whether stress is temporary in part hinges on expectations of future Fed actions, namely swap lines.<sup>8</sup> Nonetheless, ultimately the risk is that forced selling by these investors could trigger a liquidity spiral (Davies et al 2020).

## 2.2 Swap Lines: Function and Effectiveness

In a crisis, such as the GFC and in early 2020, dollar funding becomes scarce as investors shift to a “risk-off” positioning. For a foreign borrower holding dollar assets (such as a bank, or a life insurer holding USD loans or U.S. corporate bonds), the two private market channels of dollar funding (raising dollars directly or swapping local currency for dollars in the FX market<sup>9</sup>) become more expensive. In 2020 investors shifted holdings out of prime money market funds, causing a spike in both short-term financial and non-financial commercial paper borrowing costs relative to the fed funds rate.<sup>10</sup> Bank funding costs, as measured by spread between LIBOR and the Overnight Index Swap (OIS) rose considerably. In the second channel, the FX swap market, suppliers of hedging services similarly pulled back, causing the cross-currency basis in many major currencies to increase as well, in effect raising the cost of synthetic dollar borrowing.<sup>11</sup> Rising funding costs for both the financial and

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8. Interviews with the author.

9. Or, if a bank, for example, has local currency deposits, it can swap these directly into dollars.

10. Corporations that would normally fund commercial paper issuance from prime MMF investors similarly shifted to drawing down their credit lines with banks, further constraining bank lending capacity.

11. For a detailed technical discussion of the cross-currency basis and covered interest parity as a measure of stress, see Appendix II.

non-financial sector ultimately impacted businesses engaged in global commerce — which raise dollar funding to match revenue and costs in dollars — and threatened to exacerbate disruptions to global supply chains.

The alternative to private financing is the public sector, or as Hass, Murau, Rini (2020) put it, “the inherently instable private system [needs] public balance sheets as *deus ex machina* to prevent it from imploding.” In a domestic crisis, the central bank acts as lender-of-last-resort, providing liquidity in its currency. In an international crisis, the domestic central bank does not print the currency (dollars) in short supply.<sup>12</sup> Fed swap lines solve this problem by channeling dollars to foreign central banks, which lend them on to the banking sector. In effect, the Fed becomes the *international* lender-of-last-resort, using foreign central banks to channel liquidity around the world.

Swap lines work as follows. To initiate the swap, the Fed creates dollars and provides them to the foreign central bank for the equivalent amount of the foreign currency, at the spot exchange rate. Both parties agree to reverse the transaction at a future date at the same exchange rate (thereby eliminating FX risk). The Fed charges interest, at a spread over the OIS rate, such that the swap line will only be used as a backup to market-based funding. The foreign central bank loans the dollars on to its local banking system, at a rate and collateral of its choosing. Because the swap line is collateralized transaction with the foreign central bank, credit risk is minimized: if a foreign bank fails to repay its central bank, the central bank is nonetheless responsible to repay the Fed; if the central bank fails to repay the Fed, the Fed keeps the foreign currency. Swap lines thus channel dollar liquidity to foreign banking sectors at minimal cost and risk the Fed.

Research on swap line effectiveness fighting crises is robust. Bank of International Settlements (BIS) research on the 2008 crisis viewed swap lines

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12. If the foreign bank has a branch in the U.S., it can access the Fed’s discount window or other facilities. But doing so puts strain on U.S. money markets, and foreign banks without a U.S. branch or non-bank institutions such as insurance companies do not have this option.

as the “decisive innovation of the [Great Financial] crisis” (BIS, 2014, cited in Tooze, 2019). The ECB, in fact, lent out an amount of dollars greater than its own foreign reserves (Tooze, 2019). A Fed analysis concluded that swap lines were an important tool for crisis fighting and note that while FX swap market liquidity remained impaired through Spring 2009, the spillover of renewed financial stability concerns in early 2009 into funding markets was limited by the existence of the swap line backstop (Goldberg, Kennedy and Miu, 2010). Allen and Moessner (2010) show that the unlimited swap lines announced in October 2008 narrowed CIP differentials between the dollar and other major currencies, and effectively achieved the Fed’s goals. As Tooze (2019) observes: “The absence of a euro-dollar or a sterling-dollar currency crisis was one of the remarkable features of 2008. It was no accident. It was the swap lines that did the trick.”

Research on swap lines in 2020 finds similar results. Bahaj and Reis (2020a) again find that swap lines cap CIP deviations. By April 2020, the average cross-currency basis had reverted to zero, and the announcement of swap lines alone narrowed the basis by 80 basis points in those currencies relative to non-swap-line currencies (Barajas et al. 2020). Liao and Zhang (2020) observe that countries with the largest net positive external position were those that drew most heavily on swap lines. They attribute this observation to the “hedging channel of exchange rate determination,” that is, in countries where investors hold significant net positive external assets (especially Japan and the E.U.), the demand to hedge dollar positions by buying dollars in the spot market today and selling dollars vs. local currency forward is greater. Swap lines, which take the opposite position,<sup>13</sup> alleviate funding conditions by reducing the country’s net foreign asset position, lowering the balance sheet costs for intermediaries providing forward contracts, and re-

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13. Recall that in the swap line transaction, the Fed swaps dollars for the local currency today, and unwinds the transaction in the future; thus, the Fed can be said to be providing dollars in the spot market and buying dollars in the forward market, the opposite position of a foreign investor seeking to hedge their dollar assets today.

ducing future exchange rate volatility and therefore institutional hedging demand (Liao and Zhang 2020).

Swap lines were also beneficial to direct U.S. economic interests. Bahaj and Reis (2018) find that for European banks during the GFC, “swap lines ease[d] funding pressures reflected in the costs of foreign funding, the choice of investments they fund, and the stock prices of the investors.” Specifically, they show that the swap line spread puts a ceiling on CIP deviations.<sup>14</sup> As a result, the existence of a dollar swap line encourages European investment in (and raises the price / lowers the yield of) U.S. corporate bonds. Ivashina, Scharfstein and Stein (2015) show that during the European sovereign debt crisis, European banks, which during 2005-2007 originated 24% of syndicated loans in the U.S., participated in fewer dollar-denominated loan syndications relative to euro-denominated loans, despite the challenges facing the European economy. This was particularly true of banks that were reliant on money market funding, and that sought to replace these funds via synthetic dollar borrowing in the FX swap market. The Fed’s ECB swap line likely reduced this stress.

Fed researchers, in a series of notes, blog posts, and papers,<sup>15</sup> outline the mechanism by which swap lines eased funding conditions for U.S. corporates during the onset of COVID-19. Foreign investors are major funders of the U.S. leveraged loan market, often sourcing their funding through synthetic borrowing in the FX swap market. When CIP deviations are wide, and funding becomes more expensive, the rates charged to U.S. borrowers increase. They document a 2.9 basis point increase in the interest rate spread to leveraged loan borrowers for each 1 basis point decrease in the cross-currency basis. The 7 basis point average increase in CIP deviations in the month leading up to March 14, 2020 therefore caused a 20 basis point increase in the interest rate spread (compared to a mean spread of 370 basis points), a

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14. See Appendix II for discussion of this finding.

15. The references are: Cetorelli et al. (2020) and McCrone et al. (2020).

meaningful increase in the cost of financing for U.S. borrowers just as the economy entered a crisis.

What about swap lines makes them effective? Is it the actual increase in supply of dollars, the fact that they are available as a backstop, or the expectation that the Fed will make them available? Likely it is a combination of all three. Swap line borrowing peaked at \$449 billion in May 2020, relative to \$583 billion during the GFC (Aldasoro et al. 2020), suggesting that actual flows of dollars into the market are meaningful. Bahaj and Reis (2020a) show that CIP deviations decrease following the actual provisioning of dollar liquidity, even in countries where the swap lines were standing. Analysts point to a possible preference among banks to tap swap lines even when pricing is more expensive than prevailing market funding rates, to avoid moving the FX swap market<sup>16</sup> (Pozsar 2020b). Conversations with market participants elaborated on this existence/expectation nuance. In particular, market participants in the U.S. and in Asia noted a strong expectation in March 2020 that the Fed would reactivate its swap lines, although some uncertainty about whether it would do so with EMEs. Leading up to the Fed’s announcement, this expectation alone allowed investors, especially foreign official accounts, the confidence to take a “wait and see” approach in the early stages of the crisis, rather than dumping dollar assets and accelerating a tumultuous selloff in U.S. Treasury markets.<sup>17</sup> As the U.S. Treasury auctioned additional debt in April and May 2020, swap lines served to “soothe” the FX swap market, and generally calmed private markets in the months following the crisis (Pozsar 2020a). Taken together, the evidence is strong that swap lines – by increasing dollar supply, backstopping the offshore dollar market, and their signal effect – calmed global markets and supported U.S. domestic

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16. The intuition is that swap lines provide unlimited liquidity at a fixed price, whereas if the underlying liquidity of the FX swap market is unknown, incremental transactions may move the market by an unknown amount.

17. Interviews with the author. Market participants additionally suggested that there is not yet a consensus around whether swap line usage carries a stigma or is seen as positive cautionary borrowing.

and foreign economic conditions.

### 3 U.S. Interests

The Fed is not altruistic: the U.S. has significant economic and geopolitical interests in backstopping global dollar markets. To motivate the analyses that follow, here I present a general framework for the major interests at stake for the U.S. in formulating swap line policy.

The Fed has clear economic interests in protecting the U.S. economy. At a high-level, the U.S. is far too integrated in world markets to insulate itself from crises abroad. Maintaining global market stability is of clear interest to the U.S., including heading off contagion risk from a crisis emanating from abroad, as in Europe (a key U.S. ally) during the sovereign debt crisis. A more nuanced economic interest is maintaining stability in markets for U.S. assets, which represent funding to the U.S. economy. A disorderly sell-off of U.S. assets would interfere with the transmission of the Fed's monetary policy in the midst of a crisis, pushing rates up as prices decline, and likely triggering further sales. The turmoil in Treasury markets during the early 2020 reflects exactly these concerns.<sup>18</sup> By easing dollar funding conditions for foreign holders of U.S. assets, the Fed lowers the likelihood of triggering a spiral of forced sales that would disrupt U.S. economic conditions.

Swap lines also have important implications for U.S. geopolitical interests, especially when considering how swap lines are used by other central banks. Assuming foreign countries value receiving a swap line (and evidence presented in the next section suggests at least some did), the U.S.'s ability to offer it gives it potential power vis-à-vis the foreign country. There is little evidence to suggest the Fed used that power. In response to Turkish lobbying for a swap line in 2020, for instance, U.S. diplomats publicly explained the decision was an economic one for the Fed, not a matter of foreign policy (Pi-

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18. For discussion see DiMaggio (2020).

tel and Politi 2020). China, on the other hand, has in some instances used access to its RMB swap lines as a tool of financial statecraft, the “intentional use, by national governments, of domestic or international monetary or financial capabilities for the purpose of achieving ongoing foreign policy goals, whether political, economic or financial” (Armijo and Katada 2015).<sup>19</sup> Offensive financial statecraft, in particular, aims to influence the behavior of another state or alter the status quo (Armijo and Katada 2015).<sup>20</sup> McDowell (2019) reviews five examples of Chinese liquidity provisioning that align with the definition of offensive ends. For example, Mongolia, which received the largest portion of its 2017 multilateral lending package from China, publicly denounced a prior state visit by the Dalai Lama before receiving Chinese aid, and Korean officials privately worried that their use of U.S. missile systems would lead China to let its swap line expire. In at least two cases (Pakistan in 2013 and Argentina in 2015), RMB drawings were exchanged for dollars in FX markets to prop up reserves (McDowell 2019).<sup>21</sup>

Geopolitical interests might also *constrain* the U.S. from provisioning swap lines to countries where it would otherwise be economically beneficial to do so. Commentators calling for a swap line with China on economic grounds, for example, acknowledge the steep geopolitical hurdles present (Jones, 2020; Tooze, 2020). Similarly in Taiwan, with its mass of U.S. asset holdings, swap line policy would need to account for U.S.-China relations. There is much more robust evidence in the record that the Fed was at least aware of these constraints in 2008. As countries which are not long-standing U.S. allies play

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19. Armijo and Katada (2015) embed their analysis of financial statecraft in the broader topic of economic statecraft, generally defined as the use of economic policy as a means to geopolitical ends. See: Baldwin (1985) for an early analysis; Cohen (2019), especially Ch. 3, on “currency statecraft”; and Blackwill and Harris (2017) for economic statecraft in general.

20. Defensive financial statecraft, alternatively, aims to preserve a country’s domestic economic and political autonomy. McDowell (2019) notes that this construction resembles power as influence versus autonomy in Cohen (2005).

21. Ukraine drew on its line in 2016 to address its foreign exchange reserves, although it is unclear whether it swapped RMB for dollars.

a larger role in the world economy and financing to the U.S. economy in particular, the conflict between economic interests and geopolitical constraints will likely deepen.

The Fed contended with all the above interests, both directly and indirectly, in its deliberations surrounding swap lines. But a final interest that the Fed did not explicitly address is the benefit the U.S. enjoys by issuing the world’s key currency, particularly at a time of increased competition from the RMB and the euro. Typical of the U.S. policy perspective is former Treasury Secretary Paulson’s analysis that the dollar’s status at least allows the U.S. to pay lower interest rates on dollar borrowing and run a larger trade deficit, as well as enjoy highly liquid financial markets and advantage U.S. banks in global market (Paulson 2020). More broadly, the U.S. has an interest in maintaining the *structural* power it derives from the dollar’s key currency status, for example the ability to coordinate global policymaking, ensuring in times of economic upheaval that world governments and central banks act together rather than devolving into beggar-thy-neighbor policies.<sup>22</sup> One market participant, for example, cited the reassuring “peloton” of global central banks, led by the Fed, to market confidence during uncertainty in the early phases of a crisis.<sup>23</sup> U.S. economic leadership also likely has a broader halo effect on U.S. leadership in other forums of international politics.

Whether swap lines impact the dollar’s status is difficult to demonstrate empirically. Research suggests determinants of a currency’s international use include the size of the country’s economy and trade, openness and depth of capital and money markets, and expectations of low volatility and inflation for the currency (Chinn and Frankel, 2005). Network effects also play a role, reducing transaction costs for borrowers in lenders in the most-used currency, and leading firms to “naturally hedge” their dollar exposure in trade with funding exposure (Ibid., Davies et al., 2020). Network effects also lead to a

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22. Strange (1988) and Cohen (2019), among others, provide theoretical foundations for structural power as applied to the U.S. dollar, which I incorporate here.

23. Interview with the author.



tipping-point dynamic, whereby use of a new currency beyond a certain point will rapidly accelerate its use (Chinn and Frankel, 2005). These dynamics complicate any analysis of whether swap lines impact dollar use or not.

Nevertheless, the central banks of both China and the E.U. have made RMB and euro swap line networks, respectively, components of their strategy to internationalize the use of their currencies. China currently has the largest, with over thirty-five partner countries and approximately \$500bn in capacity (McDowell, 2019; Bahaj and Reis, 2020b). PBoC announcements and statements marking the signing of agreements make clear China’s desire to increase RMB trade settlement (PBoC, 2009; McDowell, 2019). ECB Executive Board members Fabio Panetta and Isabel Schnabel write that one motivation for swap lines is to “enhance the euro’s international role” (Panetta and Schnabel 2020).<sup>24</sup> Early research connect RMB swap lines to increased RMB use in countries that receive them (Bahaj and Reis 2020b). But the effects are small relative to the dominance of the dollar, and as McDowell (2019) notes, RMB swap lines face a catch-22: “they exist, in part, to promote the international use of the RMB; however, until the RMB is more widely used, countries will not have much reason to tap their swap lines in the first place.”

In the absence of empirical evidence, it seems reasonable to assume that swap lines *at least* do not contribute additional frictions against dollar use. If the overuse of sanctions has led states to respond by reducing their dollar exposure in finance and trade, the existence of a dollar international lender-of-last-resort would seem to have the opposite effect. Without a willing international lender-of-last-resort, the long-term risk (and market pricing) of financing in a currency may rise. If China pursues this policy and the U.S.

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24. The other motivations are preventing forced asset sales that negatively impact yields of euro-area sovereign bonds and mitigating spillover effects. Swap lines are one policy measure identified by the authors in pursuing euro internationalization, alongside providing a market of safe assets and investors’ trust in the currency’s central bank to “safeguard liquidity conditions in the financial system and avoid procyclical tightening during crises” (Panetta 2020).

does not, the relative attractiveness between the two currencies for larger segments of the market may shift. Similarly, governments may perceive the use of the dollar as a financial sector risk, and pursue macroprudential policies to discourage dollar use.

There is an ongoing debate as to whether the U.S. puts the benefits of issuing the world’s key currency to best use, and whether the magnitude of the costs associated with dollar demand, particularly on non-elites, outweighs the benefits.<sup>25</sup> But even relaxing this assumption to say that the advantages of issuing the world’s key currency are ambiguous, there may nonetheless be painful costs associated with the transition, such as the loss of balance of payments flexibility and macroeconomic policy autonomy during crises (Kirschner, 2008). Even in a shift away from U.S. hegemony, structural power has value. As the world political and economic order accommodates rising powers, especially China, the challenge facing global policymakers is to manage the transition peacefully, in economic and geopolitical theaters. Tools that help the U.S. manage this transition are valuable regardless of whether we conclude that sustained U.S. hegemony is in the interests of American or global welfare.

## **4 How the Fed Chooses Swap Line Partners: Qualitative and Quantitative Evidence**

### **4.1 Evidence from the Historical Record**

With these interests in mind, I turn to an analysis of the Fed’s FOMC meeting transcripts during the time of the GFC and the European sovereign debt

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25. For example: Bergsten and Gagnon (2012) argue costs of strong dollar hurts us trade interests. Feygin and Leusder (2020) argue that the U.S. suffers from a financial Dutch Disease, where the export of a single commodity (dollars, and dollar-denominated safe assets to be used as collateral in international market-based finance transactions such as repurchase agreements) harms the production of tradeable goods relative to services and financial rents, and that these effects are unevenly distributed across classes.

crisis that follows. The transcripts are not yet available for the Fed’s deliberations during the COVID-19 crisis. However, the Fed’s own public statements, published research and other sources provide some context for its reintroduction of the full swap line network in early 2020.

#### **4.1.1 Swap lines in the Great Financial Crisis of 2008**

The Fed’s rationale for initiating swap lines in 2008 is well-documented. The interests at stake for the swap lines to advanced economies were primarily the seizing up of global financial markets: the first two swap lines (with the ECB on December 6, 2007 and the SNB on December 11, 2007) responded to European banks scrambling to secure dollar funding, causing the fed funds rate to increase in the U.S. as markets opened.<sup>26</sup> As the crisis progressed, the Fed expanded its swap lines to other advanced economies following the Lehman bankruptcy (on Sep. 15, 2008) to include Canada, the U.K. and Japan (on Sep. 18), Australia, Denmark, Norway and Sweden (on Sep. 24), and finally New Zealand (on Oct. 28).<sup>27</sup> All countries were close U.S. allies, and there were years of precedent for swap lines with advanced economies;<sup>28</sup> geopolitical concerns, as a result, were not seriously considered.

The swap lines with EMEs (Brazil, Mexico, Singapore and South Korea), however, were without precedent,<sup>29</sup> and the Fed more specifically outlined its rationale and criteria. Here the rationale was both the ongoing market pressures, as with advanced economies, but also a sense that these countries were “innocent bystanders” despite their track record of effective policies.<sup>30</sup> Timothy Geithner, then Vice Chairman and President of the New York Fed,

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26. Lowery, Sheets and Truman (2020). Note that for legibility, I have moved citations to footnotes throughout this section, and cite specific dates and pages for FOMC transcript references.

27. Ibid.

28. See McCauley and Schenk (2020) for a history.

29. The exception is Mexico, which along with Canada had a swap line through the earlier North American Framework Agreement.

30. Lowery, Sheets and Truman (2020)

emphasized the distinction: “We have the same basic interest that led us to be responsive to the European need in some cases. These guys are different in that they actually have managed the countries’ balance sheets better because they at least have a huge amount of their assets in dollars.”<sup>31</sup>

In explaining the rationale to the Fed’s Federal Open Market Committee (FOMC), Nathan Sheets, then Director of International Finance, laid out three criteria for emerging market swap lines:

- The countries have significant economic and financial mass.
- The countries have pursued prudent economic policies in recent years, resulting in low inflation and balanced or positive current account positions.
- Swap lines would be helpful in mitigating financial stress in these countries (especially Brazil and South Korea) and as protection against future stress (especially in Mexico and Singapore).<sup>32</sup>

The FOMC also discussed the unique case for each country. Mexico was a national security priority and economically intertwined with the U.S. Singapore was a vital link to Asia. Brazil, despite being the “dodgiest of the lot,” represented a significant share of Latin American GDP and population and had made recent economic progress. South Korea had similarly exhibited successful policies and was a target of U.S. trade negotiations. Both Singapore and Korea were also unlikely to go to the IMF.<sup>33</sup>

There were also broad concerns about whether the Fed would stigmatize countries that were not included. Kansas City Fed President Thomas Hoening’s list of questions cut to the heart of the matter:

[...] for the moment we are creating kind of a broader in-list for these four countries and stigma with the non-accepted group at

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31. Board of Governors of the Federal Reserve System (BOG), Oct 28-29 2008, p 21.

32. BOG, Oct 28-29 2008, p 10, 33.

33. BOG, Oct 28-29 2008, p 17-18.

this point. What will happen, then, if we do have an issue that involves—pick a country—Chile? Are we going to send them to the IMF? Are we going to [...] make a decision as to whether to give them a swap? If we do that, will that then create uncertainties about others? Are you really not concerned about the stigma and the implications of this, especially—I guess they are asking this in anticipation of the possibility, even though they think it’s fairly remote—would we not be increasing the probabilities of a problem by doing this now?<sup>34</sup>

The FOMC considered these questions but did not include additional countries. Two themes emerged on boundary cases. First, the Fed would be confirming what observers already recognized: that these countries were at the top of the list of systemically important EMEs, and that there was a wide gap to the next countries.<sup>35</sup> India, another boundary case, for example, was less integrated into the global financial system and had a less-developed financial sector. Thus, the Fed would be “ratifying perceptions rather than creating new ones.”<sup>36</sup> Second, the IMF was at the same time creating additional facilities to address issues with other EMEs; in fact, Fed officials saw swap lines as in part dealing with the largest countries, thus preserving the IMF’s limited capacity for other interventions. Officials believed the speed at which the Fed was moving also provided compelling incentives for the IMF to create additional facilities.<sup>37</sup> Although the Fed would discourage other EMEs from requesting swap lines, and recognized the historic stigma of IMF assistance, the two policies clearly were intended to work in tandem as a makeshift safety net in response to the crisis.

Fed officials also expressed concern about credit risk: would the Fed be paid back? The swap agreements with EMEs contained additional safe-

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34. BOG, Oct 28-29 2008, p 30.

35. BOG, Oct 28-29 2008, p. 27-28.

36. BOG, Oct 28-29 2008, p. 28.

37. Interview with the author.

guards, namely the “offset rights” provision allowing the Fed to attach assets that foreign central banks held with the Fed as collateral.<sup>38</sup> This distinction created a subtle hierarchy between the advanced and emerging market economies.

FOMC officials also discussed whether disorderly selling of U.S. securities would impact the U.S. economy. These discussions reflected more on the decision to extend a swap line in the first place than on specific countries. The FOMC considered whether countries should rely on their foreign reserve holdings to meet dollar demand from their financial sector. That policy, however, would force foreign central banks to liquidate their holdings of U.S. assets in a period of panic.<sup>39</sup> The increased supply to the market of Treasury securities was already pushing up intermediate and longer-term Treasury yields, and the FOMC, along with Treasury, had even sharper concerns that a disorderly sale of agency-backed securities would “feed back on our mortgage markets” and “would not be in our interest” during the housing crisis.<sup>40</sup>

Broader U.S. economic diplomacy at the time similarly focused on avoiding large U.S. asset sales. Treasury, led by Secretary Paulson, successfully persuaded China, Japan and South Korea to hold their securities in the government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac. The Chinese notably decided against joining a Russian-sponsored initiative to sell GSE securities to harm U.S. economic interests.<sup>41</sup> While a similar logic did not enter FOMC conversations directly, the Fed’s liquidity program was nonetheless supportive of broader U.S. policy objectives to head off asset sales.

Discussion of EMEs addressed geopolitics more directly. Fed staff consulted with Treasury and State Department staff, which were both supportive of the Fed’s choices, and would likely have been amenable to additional EMEs

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38. BOG, Oct 28-29 2008, p 19.

39. BOG, Oct 28-29 2008, p 20.

40. BOG, Oct 28-29 2008, p 23.

41. Lowery, Sheets, & Truman. (2020).

if the Fed so chose.<sup>42</sup> Fed Chair Ben Bernanke noted that he “spoke to Secretaries Paulson and Rice about this,” and “there was an interesting confluence of agreement that, if you are going to do this, these are the right four countries and we probably shouldn’t do more, both from an economic perspective and a diplomatic perspective in the sense that these are the countries that among the emerging markets are the most important from a financial and economic point of view.”<sup>43</sup>

EMEs themselves clearly valued the swap lines based on their own economic and political interests. South Korea, for example, saw the swap line in 2008 as a vote of confidence in its financial market. Turkey’s Foreign Minister lobbied for a swap line to avoid potentially resorting to IMF support and fiscal constraints. And Chile’s central bank governor lobbied for a statement from the Fed saying that Chile did not need a swap line, though it would have been eligible.<sup>44</sup> FOMC transcripts also note that Iceland and Indonesia were both turned down.

Notably absent, however, were any direct indications that the Fed was pursuing specific bilateral foreign policy objectives, or considered the broader geopolitical interests of the dollar remaining the world’s key currency. In the case of the former, the Fed *was* implicitly assessing the effectiveness of certain EMEs’ policies: one of the three original criteria after all was sound economic policies. And Fed officials consistently recognized the importance of Mexico, for example, as a trading partner and direct neighbor. But at no point did the Fed explicitly draw a line from offering dollar liquidity in return for specific policy choices. Similarly, Fed officials, at least on the record, did not discuss whether by acting as the international lender-of-last-resort it would promote the dollar’s role as the key currency. At most, Fed officials recognized that they were the sole institution positioned to provide dollar liquidity to the

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42. Interviews with the author.

43. BOG, Oct 28-29 2008, p 16.

44. Examples derived from leaked diplomatic cables, cited in Harris (2015).

world, and had a responsibility but not an obligation to do so.<sup>45</sup>

#### **4.1.2 Standing swap lines and the European sovereign debt crisis**

While the Fed's deliberations for initiating swap lines largely focused on the criteria and challenges of bringing EMEs into the fold, deliberations in late 2009 on a proposal to initiate standing swap lines with the G-7 plus Switzerland, as well as with Mexico and Canada, focused on the system of swap lines overall.

Nathan Sheets, again, laid out the case for standing swap lines, drawing on insights from their use in the depths of the crisis. First, the swap lines had proved useful: maintaining standing lines would ensure that the institutional machinery remained in place in the event they were needed in the future (as would soon prove prescient). Second, the mere existence of swap lines seemed to have a calming effect on markets. Third, swap lines were a signal to markets of central bank cooperation. Fourth, the swap lines were an effective tool for the Fed to address domestic credit conditions due to lending from overseas. And finally, swap lines would incentivize foreign central banks to monitor their banking sectors' dollar liquidity positions and implement sound macroprudential policies.<sup>46</sup>

Although there was broad agreement that the swap lines were a valuable future policy tool, the question of where to draw the line on standing swaps provoked deep discussion. Officials grasped inconclusively for an appropriate set of criteria. Sovereign credit risk ratings were considered (although I would note that credit risk has the perverse logic that market expectation of a country's recourse to the Fed's swap lines may in itself influence that country's credit risk).<sup>47</sup> Boston Fed President Eric Rosengren offered size

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45. See also Sahasrabuddhe (2019) for a more detailed discussion of why capital account openness in particular mattered for the Fed, as well as how the Fed considered EMEs that were favorably disposed to U.S. interests in global economic governance forums.

46. BOG, Nov 3-4 2009, pg. 15.

47. BOG, Nov 3-4 2009, pg. 38-39.



as a criterion, and explicitly noted that this would avoid “stigmatizing [...] countries that want potentially to be a counterparty in part for the signaling benefit. The way we get around that is if we have a very clear criterion that says, ‘If you get to this size, then maybe we will think about having a swap line.’”<sup>48</sup>

Janet Yellen, then Vice Chair of the Federal Reserve, in fact supported widening the group of swap line participants. She expressed concern that, by being excluded from the group, a country like Korea might restrict capital flows, limit U.S. bank access to the country, or build an even bigger “war chest” of reserve holdings.<sup>49</sup> (We can only speculate, but Yellen’s role as president of the San Francisco Fed, the Fed’s window to Asia, may be colored by the criticism the U.S. faced during the Asian Financial Crisis when it did not participate in the rescue package for Thailand.<sup>50</sup>) St. Louis Fed President James Bullard supported Yellen’s position, arguing that a clear criterion would deflect from geopolitical concerns about why one country was in and another was out. In a telling exchange, he addressed the challenges of broadening the swaps beyond the Fed’s historical partners:

I can imagine Asian countries being moderately upset that the Swiss are in, for instance. When I say Swiss, “It’s a small country, come on. This is an old club that you guys have been fostering for years.” And “You just don’t like us because we’re in Asia.” I can imagine that that is sort of the attitude.<sup>51</sup>

Ultimately, while the swap lines with Mexico and Canada were renewed without objection in April 2010,<sup>52</sup> the Fed’s deliberations on standing lines were tabled and then subsumed by the emerging European sovereign debt

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48. BOG, Nov 3-4 2009, pg. 50.

49. BOG, Nov 3-4 2009, pg. 51-2.

50. For Yellen’s contemporary commentary on lessons from the Asian Financial Crisis, see Yellen (2007).

51. BOG, Nov 3-4 2009, pg. 52-53.

52. BOG, April 27-28 2010, pg 15.

crisis. But the important observation from these discussions were that the swap line program was increasingly not a *separate* decision for advanced economies (i.e., G-7 plus Switzerland) versus the EMEs, but rather a single broad policy decision about which countries of the world to include as swap line partners under what terms. Furthermore, tying inclusion to objective criteria avoided the geopolitical tensions that choosing swap line partners inherently presented.

Turning to the European sovereign debt crisis, and the Fed’s deliberations on reactivating the swap lines in May 2010, there are three new important points. First, rather than a global crisis, the challenges in Europe represented a geographically-defined crisis that risked triggering a global contagion. Donald Kohn speculated about this scenario the year prior: “I worry that we’ll have to get into the business of judging whether the underlying policies in that country are good. In this case, we had a generalized demand for dollars all over the world. So smearing the dollars all over the world was a good way of dealing with that. The next crisis could be more particular to an individual economy.”<sup>53</sup> In fact, the Fed *did* discuss the underlying policies of the European Union (at times harshly), but ultimately approved reactivating the swap lines with the ECB and other G-7 countries and Switzerland.

A second observation from the European sovereign debt deliberations is how the Fed judged credit risk. In its 2008 deliberations over EME swap lines, the Fed included provisions that used EMEs’ official holdings at the Fed as collateral (“offset rights”). The Fed considered incorporating similar provisions into swap lines to the ECB in 2010, but ultimately concluded it would look like a vote of no confidence.<sup>54</sup> As Nathan Sheets commented, “our primary source of surety is the goodwill guarantee that these major central banks give us that they will make good on unwinding the swap.”<sup>55</sup> Thus the relationship and trust between the Fed and the major central banks was in

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53. BOG, Nov 3-4 2009, pg. 37.

54. BOG, May 9, 2010, pg. 26.

55. BOG May 9, 2010, pg. 12.

a way the collateral against which it ultimately initiated the swaps.

Lastly, in part cognizant of the congressional scrutiny into the Fed’s actions, FOMC members emphasized the U.S. interests at stake. Fed officials sought to frame the Fed’s actions in terms of the potential for the crisis in Europe to harm the fledging U.S. recovery or to trigger another global crisis. Michelle Smith, then the Chief of the Office of Board Members, made the case as follows: “This is not novel—this is what central banks do. It is not a bailout, it’s not altruism — this is in our interest. We have a recovery just getting going here in the United States, and this helps keep European problems—and we wouldn’t say this in a statement — in Europe.”<sup>56</sup> But it is notable that the Europeans are among the closest of U.S. allies. The question lingers: would the U.S. deploy a swap line to China, for example, to keep Chinese problems in China?

#### **4.1.3 Early evidence from 2020**

Without the transcripts from FOMC meetings in early 2020, we cannot yet know to what extent the Fed considered similar criteria for reactivating its swap lines. Market participants, as well as a former Fed officials, speculated that with such a fast-moving crisis, the Fed likely elected to choose the same swap line partners as in 2008.<sup>57</sup> Other than the sheer speed at which the Fed rolled out its crisis fighting playbook, two important themes emerged from the Fed’s swap line program in response to the Covid-19 crisis.

First, compared to 2008 and 2010, the Fed has been much more public about the purpose of its swap lines program, and much more focused on U.S. domestic economic interests. An FAQ posted on the Fed’s website immediately following the reactivations of swap lines with the broader set of countries, for example, justifies the swap lines as follows:

The dollar liquidity swap lines are designed to help maintain the

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56. BOG, May 9, 2010, pg. 21.

57. Interviews with the author.

flow of credit to U.S. households and businesses by reducing risks to U.S. financial markets caused by financial stresses abroad. They improve liquidity conditions in U.S. and foreign financial markets by providing foreign central banks with the capacity to deliver U.S. dollar funding to institutions in their jurisdictions during times of market stress. By helping to stabilize foreign dollar markets, these swap lines also play a role in supporting foreign economic conditions, which also positively benefit the U.S. economy through many channels, including confidence and trade.<sup>58</sup>

The same statement also calls out the contagion risk, noting that swap lines lower the likelihood of a financial crisis emerging and spreading globally, and ultimately back to the U.S.<sup>59</sup>

Fed research related to the COVID-19 crisis also highlighted the impact swap lines had on the domestic economy, particularly the impact that reduced FX funding stress had on lowering rates for U.S. corporate borrowers in the leveraged loan market (McCrone et al, 2020). Between the Fed’s public statements, and its research, it is clear that swap line justification, at least publicly, was based primarily on U.S. economic interests. Again, we should be measured in our conclusions: the Fed’s mandate incentivizes it to focus on domestic economic interests in public statements, and without the full transcripts it is difficult to compare the extent to which it considered geopolitical factors.

Second, the Fed’s innovative FIMA facility (“Temporary Foreign and International Monetary Authorities Repo Facility”) was a creative solution to allow countries without swap lines to exchange U.S. Treasury holdings with the Fed for dollar liquidity. This very repo facility was in fact proposed during the 2008 swap line deliberations, as an alternative to expanding swap lines to EMEs. Whereas a swap line represents dollar lending to a foreign

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58. Federal Reserve Bank of New York (2020).

59. Ibid.

central bank collateralized by the foreign central banks' currency, the repo facility allows foreign central banks to access dollars against their Treasury holdings as collateral. At the time, Donald Kohn expressed concerns that the repo facility would create a stigma: "saying that we have enough doubts about these other countries that we need to take collateral—we don't have confidence that their central banks will meet the obligations that they have taken on."<sup>60</sup>

Nonetheless, by offering a new channel of dollar liquidity to countries that otherwise did not have a swap line, the new facility addressed the same broad market stress that motivated the original swap lines. Importantly, it also allowed sales of U.S. Treasury securities to be conducted directly with the Fed, rather than into an already disorderly market. Had foreign countries or their financial sectors sold U.S. assets into disorderly markets, U.S. economic conditions would have worsened just as the Fed was trying to ease them, and the U.S. government was prepared to increase its borrowing to combat the COVID-19 pandemic.

#### **4.1.4 Conclusions from the Historical Record**

Considering these three episodes together, U.S. economic interests were the foremost rationale for the swap lines. In particular, the Fed sought to address calamity in global markets that would almost certainly impact U.S. economic conditions. And it sought to limit fire-sales of U.S. assets, particularly Treasury and agency securities which would have driven up U.S. rates just as the Fed was easing monetary policy. While in 2008, deliberations expressed concern for EMEs as "innocent bystanders," increasingly officials sought to frame policy in light of domestic economic concerns, particularly in the European sovereign debt crisis and in the response to COVID-19.

In the record, geopolitics appear to be a constraint that didn't bind: the Fed faced no objections from Treasury or State on its partners. Yet

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60. BOG, Oct 28-29, 2008.

we cannot rule out decisively that the Fed considered geopolitics implicitly, rather than submitting to the executive branch countries that were likely to be politically troublesome. And officials were certainly aware of geopolitical events related to the countries they considered. The FIMA facility in 2020 provided a convenient path for countries that may have otherwise been unable to obtain a swap line for geopolitical reasons to access dollar liquidity, but until the FOMC transcripts are released we are unable to determine if this was a primary motivation. Nonetheless, there is no evidence that the Fed used swap lines to influence foreign policy, and cases such as Turkey were decided purely on economic grounds.<sup>61</sup> Finally, the Fed’s deliberations did not explicitly consider U.S. economic or geopolitical interests related to the dollar’s use as the global key currency, beyond an understanding that only the Fed could act as it did.

The Fed’s policy decisions do show an awareness that the swap lines create a hierarchy within the global financial safety net, which was itself evolving through the crises. For example, the Fed delineated the terms of its swap lines between major central banks, which faced the lowest collateral constraints, and EMEs which faced higher constraints. And this delineation may have in part been based on the relationships built with the major central banks, as U.S. allies, over time. In debating countries which would receive standing arrangements, it also drew a stark line between the major central banks and EME central banks. The Fed also considered stigma it would create by choosing partners, and the stigma countries might face if they went to the IMF. These findings in part support recent research into the hierarchical structure of the global financial system.<sup>62</sup> As the one entity that can create dollar liquidity, how the Fed chooses countries to initiate swap lines with, and how it prioritizes and balances different U.S. economic and geopolitical interests, will determine the shape of the global financial system.

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61. See Sahasrabudde (2019), however, for discussion of how the Fed prioritized countries whose interests aligned with the U.S. in global economic governance forums.

62. For a recent example, see Murau, Pape, Pforr (2021).

## 4.2 Empirical Analysis

The majority of the literature considers the influence of economic factors on swap line selectivity in 2008. Moessner and Allen (2010) find that swap lines were more likely to be received by countries that faced a dollar shortage<sup>63</sup> and that deviations from covered-interest parity tended to coincide with the currencies from nations that experienced a dollar shortage. They conclude the Fed was influenced by funding needs, including the risk that foreign banks were unable to replace funding. Aizenman and Pasricha (2009) find that, for the four EME swap lines (Brazil, Mexico, Singapore, South Korea), the exposure of U.S. banks alone explains 64% of the variation in swap line selectivity in EMEs. Broz (2014) extends Aizenman and Pasricha’s (2009) findings to the broader set of countries. These findings are robust even accounting for variables controlling for FOMC stated criteria, including a country’s GDP, liquid liabilities (i.e., M3), bilateral trade with the U.S., reserves (as a % of GDP), inflation and whether or not there is a “dollar shortage” in the country (as in Moessner and Allen (2010)). Sahasrabuddhe (2019) builds on prior models by testing for the likelihood that swap lines were more likely to be extended to countries whose economic *policies* aligned with U.S. preferences, using financial account liberalization as a proxy. Analyzing the broader political dynamics at the time, particularly the involvement of the EMEs in international economic forums, her broader conclusion is that the Fed sought to extend swap lines to countries whose economic policy preferences aligned with its own.

Finally, in a recent study on the 2020 swap lines, Aizenman, Ito and Pasricha (2021) find that military alliances are a significant variable of swap line selectivity.<sup>64</sup> To my knowledge, this is the first analysis of swap lines to investigate the determinants of the 2020 swap lines and to incorporate

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63. The measure of dollar shortage is derived from BIS banking statistics.

64. The paper was published after I conducted the primary analyses set forth in this working paper.

geopolitical variables as predictive of swap line selectivity.

#### **4.2.1 Data and Model Specifications**

I conduct two analyses related to the determinants of swap line selectivity. The first investigates the factors, including geopolitical ones, that most predict whether or not a country received a swap lines in 2008 and 2020. The second, addressing recent research related to the “hierarchy” created by swap lines, tests which factors most predict whether a country received an unlimited swap line, a limited swap line, or no swap line.

#### **4.2.2 Model 1: Swap Line Selectivity**

My approach builds on that of Broz (2014) and Sahasrabuddhe (2019). The dependent variable for the first model is SWAP LINE, defined as 1 if the country received a swap line in that year and 0 otherwise. I code separate observations for each year, 2008 and 2020, and include a binary variable, SWAP YEAR, to account for the different time periods.

The first explanatory variable is BANK EXPOSURE, defined as the consolidated claims of U.S. banks on the foreign country as a percentage of total claims of U.S. banks on the world as of Q4 2007 and Q4 2019. The motivation is that the Fed will prefer countries to which U.S. banks have substantial exposure. Broz (2014) finds this variable to be positive and significant for the GFC swap lines. I also include FINANCIAL OPENNESS, measured using the Chinn-Ito index, which ranges from 0 to 1, where 1 indicates a fully open economy and 0 indicates a closed economy (Chinn and Ito 2007). The index is as of 2007 for the GFC swap lines, and 2018 (the latest available) for the 2020 swap lines. Sahasrabuddhe (2019) finds this variable to be positive and significant for the GFC swap lines, suggesting a preference for economic openness.

I then introduce two new variables: U.S. ASSET OWNERSHIP and POLITICAL ALIGNMENT. To measure the foreign holdings of U.S. assets, U.S.



ASSET OWNERSHIP is the value of holdings of U.S. assets by residents of the foreign country divided by total foreign holdings of U.S. assets in the U.S. Treasury’s Treasury International Capital System (TIC). Assets in this context includes U.S. Treasury securities, agency securities, corporate debt, and equities. I use data as of June 2007 and June 2019 for the 2008 and 2020 swap lines, respectively. Because I hypothesize that the Fed will be motivated to avoid large-scale foreign sales of U.S. assets that would be disruptive to global capital markets and interfere with the transmission of lower interest rates in the U.S. during a crisis, I expect U.S. ASSET OWNERSHIP to be positively associated with a country receiving a swap line.

One challenge of both BIS banking statistics and TIC data is tax havens. Holdings of U.S. assets attributed to Cayman Islands, for example, likely obscures actual ownership. For the purposes of this analysis, I keep all offshore centers except the Cayman Islands in U.S. BANK EXPSURE and U.S. ASSET OWNERSHIP. The Cayman Islands are excluded both as an observation and in the global denominator to calculate percents for these variables.<sup>65</sup>

The graphs below present the changes in the ownership of U.S. assets for three groups of countries in 2008 and 2020: advanced economies that received swap lines, emerging markets that received swap lines, and a sample of economist that did not receive swap lines (Chile, India, Indonesia, Malaysia, Peru, Taiwan, Thailand, Turkey). One observation is the increase in 2020 holdings relative to 2008 in certain countries that did not receive swap lines,

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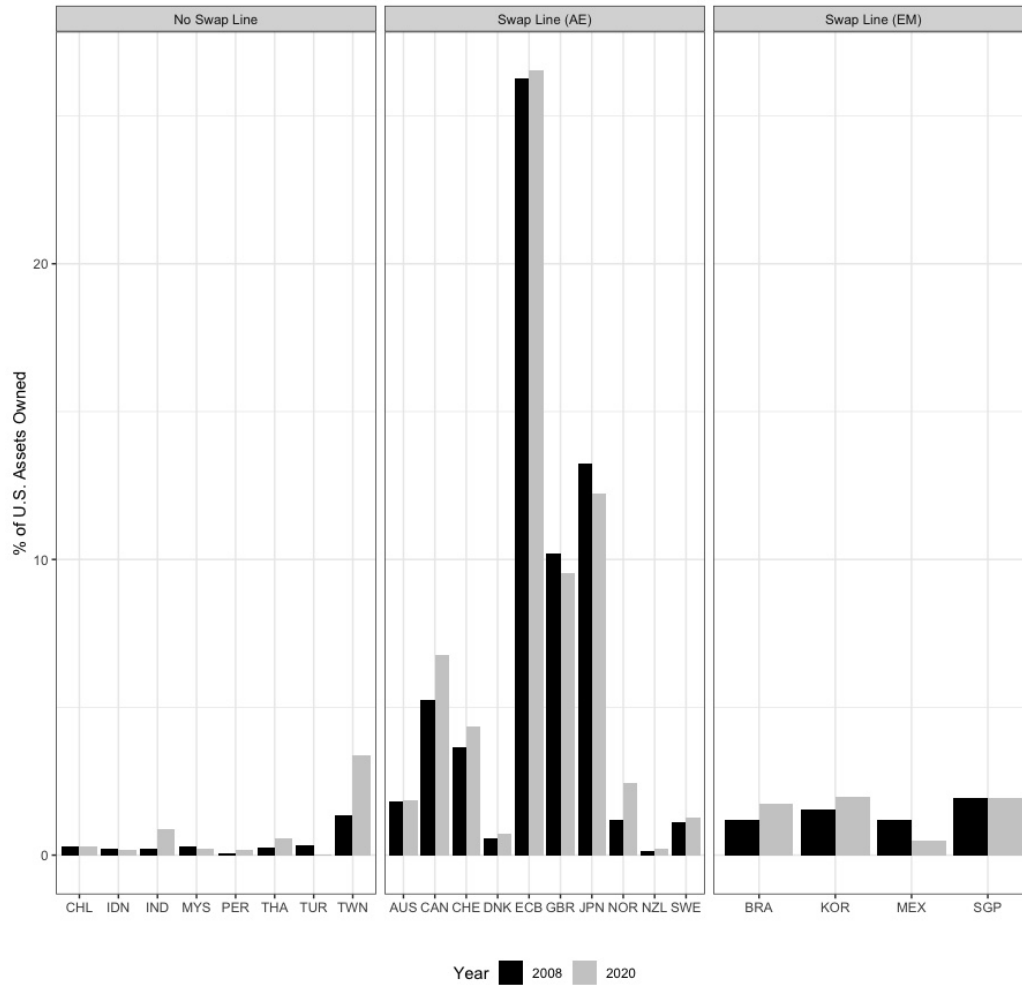
65. The Cayman Islands is the largest offshore financial center by a wide margin. This economy alone accounts for 10% of all U.S. Asset Ownership in foreign countries in 2020, approximately the same as the entire United Kingdom. The ratio of U.S. Asset Ownership (as % of all foreign asset ownership) to GDP (as % of World GDP) for the Cayman Islands was 195x, or 11.6 standard deviations above the mean of 2.8x. Furthermore, a significant portion of the assets reported as owned by Cayman Island entities are likely held by U.S. entities, especially hedge funds, which have recourse to financing through the U.S. banking system. While research has shown that Japanese investors in particular use Cayman Islands entities to hold portfolios of U.S. assets, especially collateralized loan obligations (CLOs), on the margin I exclude it given the U.S. focus. Finally, research into FOMC deliberations has not surfaced any meaningful discussion of the Cayman Islands or other countries where U.S. entities hold assets.

particularly India, Peru, Thailand and Taiwan.

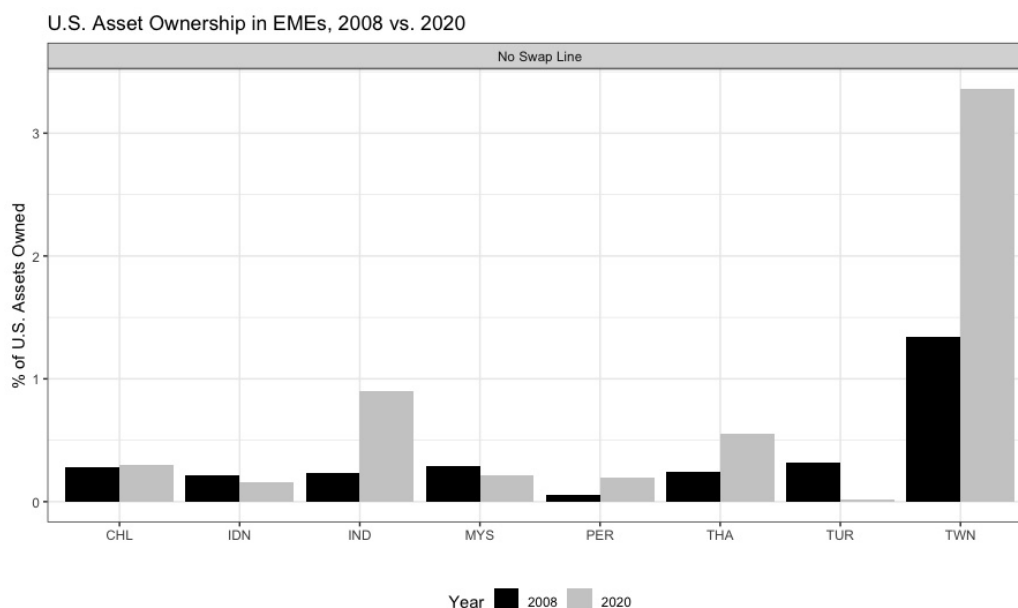
To measure the political alignment with the U.S., I introduce the independent variable `POLITICAL ALIGNMENT`. This variable consists of ideal point estimates of state preferences derived from Bailey, Strezhnev and Voeten (2017)’s analysis of United Nations General Assembly (UNGA) voting data. The authors show that ideal point estimates, which account for changes in the UNGA agenda, are more appropriate than a simple comparison of voting records used as a proxy in earlier research on political alignment. Following their analysis, `POLITICAL ALIGNMENT` is defined as the absolute value of a foreign country’s ideal point minus the U.S. ideal point in a given year, multiplied by negative 1. Thus, a negative value closer to zero indicates closer political alignment with the U.S., and a negative value further from zero indicates less political alignment. I use a ten-year trailing average (i.e., 1998-2007 for 2008 swap lines, and 2010-2019 for the 2020 swap lines). My hypothesis is not that the Fed seeks quid-pro-quo arrangements, but that it will be more likely to grant swap lines to long-standing U.S. allies, perhaps in deference to U.S. foreign policy interests and/or as a reassurance that the swaps will be used for their intended purpose. Therefore, I use a moving average rather than a single data point from the U.N. data, to represent longer-standing political alignment. For Hong Kong, which has separate observations for all other data points, I code China’s political alignment value. I expect `POLITICAL ALIGNMENT` to be positively associated with a country receiving a swap line.

Alternative measures of political alignment include both the existence of a military alliance or defense treaty, and general bilateral treaties. Data on treaties is limited, and data on military alliances is necessarily binary. I opt to use UNGA ideal points instead to capture the greater variation in political alignment. As noted, in a recent study, Aizenman, Ito and Pasricha (2021) find U.S. military alliances to be a significant predictor of swap line selectivity; although my model specifications are different, these findings lend

U.S. Asset Ownership, By Economy, 2008 vs. 2020



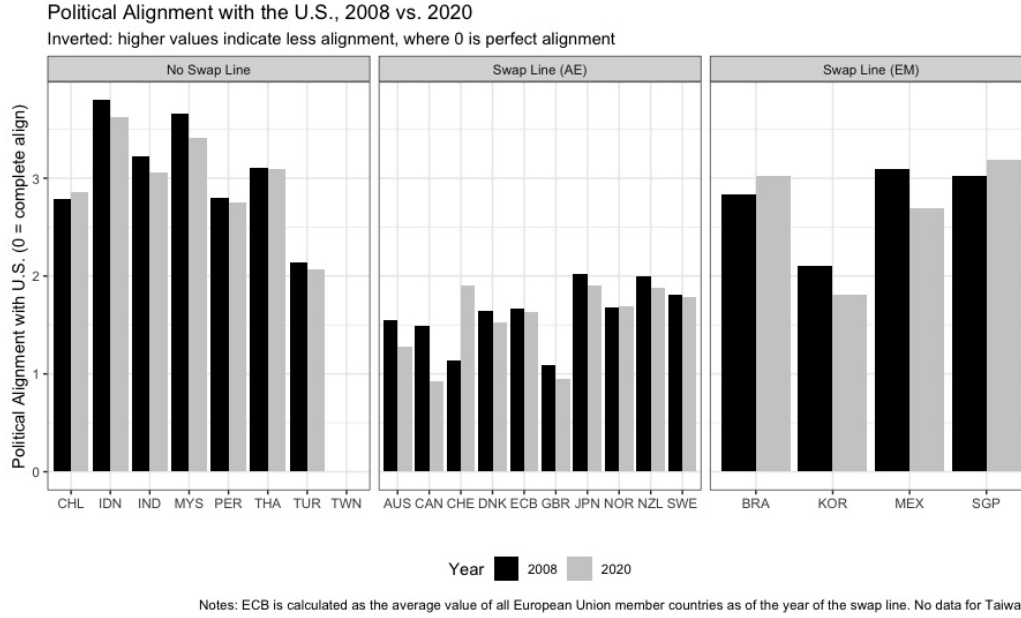
ECB is calculated as the total value of European Union member countries' holdings as of the year of the swap line.



weight to the view that political alignment matters.

Graph 3 presents the values of POLITICAL ALIGNMENT for the same categories of countries in 2008 and 2020. As expected, the advanced economies receiving swap lines have the closest political alignment with the U.S. EMEs receiving swap lines have lower political alignment, as do countries not receiving swap lines. Note that the axis is inverted : higher values indicate lower political alignment.

Finally, I include variables meant to capture the Fed's stated criteria, derived from the literature. To account for the Fed's preference for sound economic management, I include INFLATION, defined as average annual CPI change in the decade prior to the swap line year. I expect lower inflation to be positively associated with receiving a swap line. To capture the Fed's focus on large economies, I also include the variable ECONOMIC SIGNIFICANCE, which is defined as the first standardized principal component of three variables used as a proxy for a country's economic significance: GDP, measured as a country's GDP as a percentage of world GDP; U.S.



Trade Exposure, measured as a country's total bilateral trade with the U.S. divided by total U.S. trade; and Liquid Liabilities, measured as total M3 in a country divided by world M3.<sup>66</sup> Lastly, I include a control for RESERVES defined as the percentage of official reserves to GDP. For the ECB, I code a single value summing or averaging as appropriate all ECB members as of the date of the swap line for all variables.

Appendix I includes a list of all independent variables and sources, as well as descriptive statistics and a correlation table. One challenge is that U.S. ASSET OWNERSHIP is strongly correlated with both GDP and U.S. BANK EXPOSURE. This is not surprising, as large economies tend to have relationships with the U.S. banking sector and invest in U.S. assets. Nonetheless, it presents a challenge in isolating the effect of asset ownership alongside other economic variables.

66. This PCA approach follows Sahasrabuddhe (2019). GDP and U.S. Trade Exposure data is as of 2007 and 2019 for the 2008 and 2020 swap lines, respectively. Liquid Liabilities is as of 2007 for the GFC swap lines and 2017, the latest available data (except for Switzerland, which is as of 2016) for the 2020 swap lines.

Table 1 reports the results from six probit models. In Models 1 and 2, U.S. ASSET OWNERSHIP and POLITICAL ALIGNMENT are both positive and significant.<sup>67</sup> Models 4 and 5 include FINANCIAL OPENNESS alongside U.S. ASSET EXPOSURE and POLITICAL ALIGNMENT respectively. Both are again positive and significant. Model 6 includes all variables. Consistent with Broz’s (2014) findings, U.S. BANK EXPOSURE remains highly significant across all models. In Model 6, both U.S. ASSET OWNERSHIP and POLITICAL ALIGNMENT (as well as FINANCIAL OPENNESS) are positively signed and significant, though only at the 1% level. However, Model 6 correctly predicts 26 out of 27 swap lines correctly (with one false positive), more than any other model.<sup>68</sup>

#### 4.2.3 Model 2: Determinants of Swap Line Hierarchy

In the second analysis, I use an OLS regression to predict where a country will fall in the hierarchy of swap lines. The hierarchy is coded in a new variable, SWAP HIERARCHY, as follows: 0 if the country did not receive a swap line; 1 if the country received a limited swap line; and 2 if the country received an unlimited swap line.

Table 2 presents the results of univariate regressions for U.S. ASSET OWNERSHIP, POLITICAL ALIGNMENT, and includes TREASURY OWNERSHIP, a subset of U.S. ASSET OWNERSHIP defined as an economy’s holdings of U.S. Treasuries as a percentage of foreign holdings. All three are significant and positively signed. Table 3 presents regressions using the same variables as the prior section as additional factors. In Model 1, both

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67. Model 3 repeats the findings from the replication analysis of FINANCIAL OPENNESS as in Sahasrabuddhe (2019) for 2020, but with U.S. BANK EXPOSURE as a separate control rather than as a component of ECONOMIC SIGNIFICANCE (as in Sahasrabuddhe (2019)), as a reference point. The results confirm Sahasrabuddhe’s (2019) earlier findings from the 2008 swap lines that Financial Openness is positively associated with swap line selectivity.

68. Of the 28 swap lines (14 in each year), Canada’s 2020 swap line is not included due to missing Liquid Liabilities data.

Table 1: Results

	<i>Dependent variable:</i>					
	Swap Line					
	(1)	(2)	(3)	(4)	(5)	(6)
U.S. Asset Ownership	1.007*** (0.256)			1.914*** (0.628)		4.968* (2.658)
Political Alignment		0.839*** (0.253)			0.704** (0.310)	2.135* (1.114)
Financial Openness			4.191** (1.878)	6.527*** (2.439)	4.763* (2.702)	14.801* (7.978)
U.S. Bank Exposure	2.648*** (0.818)	2.290*** (0.837)	2.857*** (0.621)	4.229*** (1.105)	3.242*** (0.788)	9.852** (4.642)
Economic Significance	-1.666*** (0.466)	-0.440** (0.177)	-0.374** (0.162)	-2.398*** (0.750)	-0.391** (0.186)	-5.957** (2.952)
Inflation	-0.753*** (0.209)	-0.732*** (0.200)	-0.721** (0.292)	-0.712* (0.377)	-0.662* (0.348)	-1.422** (0.653)
Reserves	-0.065*** (0.017)	-0.035** (0.017)	-0.056*** (0.015)	-0.122*** (0.035)	-0.060*** (0.018)	-0.283** (0.133)
Year (2020)	-0.257 (0.654)	-0.233 (0.547)	0.246 (0.616)	-0.049 (0.705)	0.282 (0.701)	-0.855 (0.799)
Constant	0.027 (0.796)	2.167** (0.856)	-3.437 (2.263)	-6.177** (2.900)	-2.689 (3.210)	-8.842 (6.689)
Observations	176	174	161	161	161	161
Log Likelihood	-16.154	-17.045	-15.345	-10.201	-13.305	-6.530
Akaike Inf. Crit.	46.308	48.090	44.689	36.403	42.610	31.061

*Note:*

\*p&lt;0.1; \*\*p&lt;0.05; \*\*\*p&lt;0.01

POLITICAL ALIGNMENT and BANK SHARE are both significant at the 1% level, but U.S. ASSET OWNERSHIP, however, is not significant. Models 2 tests for U.S. TREASURY OWNERSHIP rather than U.S. ASSET OWNERSHIP, which is positive and significant at the 1% level, suggesting the Fed prioritized economies that hold a greater level U.S. Treasuries for higher positions in the swap line hierarchy.

Table 2: Results

	<i>Dependent variable:</i>		
	Swap Hierarchy		
	(1)	(2)	(3)
Asset Ownership	0.105*** (0.006)		
Treasury Ownership		0.074*** (0.007)	
Political Alignment			0.207*** (0.027)
Year (2020)	0.005 (0.032)	0.005 (0.038)	0.013 (0.041)
Constant	0.051** (0.022)	0.066** (0.026)	0.706*** (0.083)
Observations	309	309	307
R <sup>2</sup>	0.491	0.274	0.161
Adjusted R <sup>2</sup>	0.488	0.270	0.155
Residual Std. Error	0.280 (df = 306)	0.334 (df = 306)	0.360 (df = 304)
F Statistic	147.863*** (df = 2; 306)	57.830*** (df = 2; 306)	29.110*** (df = 2; 304)
<i>Note:</i>		*p<0.1; **p<0.05; ***p<0.01	



Table 3: Results Including Controls

	<i>Dependent variable:</i>	
	Swap Hierarchy	
	(1)	(2)
U.S. Asset Ownership	0.036 (0.050)	
U.S. Treasury Asset Ownership		0.041*** (0.013)
Political Alignment	0.129*** (0.043)	0.130*** (0.043)
Financial Openness	0.162*** (0.058)	0.169*** (0.056)
U.S. Bank Exposure	0.073** (0.030)	0.099*** (0.014)
Economic Significance	-0.026 (0.035)	-0.063*** (0.024)
Inflation	-0.009*** (0.003)	-0.009*** (0.003)
Reserves	0.001 (0.003)	-0.00004 (0.003)
Year (2020)	-0.006 (0.055)	-0.0001 (0.053)
Constant	0.383** (0.151)	0.368** (0.149)
Observations	161	161
R <sup>2</sup>	0.614	0.641
Adjusted R <sup>2</sup>	0.593	0.622
Residual Std. Error (df = 152)	0.332	0.320
F Statistic (df = 8; 152)	30.191***	33.923***
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01	

## 5 Conclusion

The Fed’s swap line policies are a key feature of the international financial system beyond crisis-fighting tools; their prominence during a crisis, if anything, serves merely to throw their importance in global markets into sharper relief. Swap lines were uniquely effective at alleviating funding pressure in the offshore dollar market. But they also supported key U.S. interests including the stability of U.S. banks that had lent overseas, and averting a potentially disorderly sell-off of assets that represent funding to both the U.S. economy and government in the midst of a crisis. And while it’s impossible to say for sure, it is more likely than not that the willingness of the Fed to act as an international lender-of-last-resort – or at least the market’s belief that it will – supports the use of the dollar as the international key currency, which serves as the foundation of many tools of U.S. foreign and economic policy.

Despite the Fed’s reluctance to signal to the market where countries ranked in its hierarchy, the swap lines did just that. Some economies, such as the E.U. and Japan, had access to unlimited swap lines, whereas smaller U.S. allies and EMEs had access to limited swap lines. Those without swap lines had recourse to the Fed’s FIMA facility (provided they had existing holdings of U.S. assets to post as collateral) or, as a last resort, the IMF.

This analysis shows that the Fed incorporated many U.S. interests as determinants in its selection of foreign central bank swap line partners. U.S. economic interests were certainly a determinant, as the exposure of U.S. banks to a foreign country continued to be an important factor in 2020 as it was in 2008.<sup>69</sup> Consistent with the Fed’s discussions about a sell-off of U.S. assets and actions of the broader U.S. government to prevent one, this analysis shows that it was likely the Fed favored countries which had significant holdings of U.S. assets. These finding complements more recent research, including the Fed’s own, on the benefits of swap lines to the U.S. economy

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69. The analysis also confirms earlier findings that the Fed preferred countries with open current account policies and low inflation, as a proxy for sound economic management.

during times of crisis.

Furthermore, the analysis provides evidence that, somewhat contrary to the historical record, geopolitical factors played a role in determining which countries received swap lines. The Fed never explicitly considered geopolitics, nor did Treasury, State or other executive branch institutions overrule its selection. Nonetheless, the empirical evidence suggests that, controlling for other potential factors, political alignment with the U.S. played a role in determining a country's likelihood of receiving a swap line and where it placed in the hierarchy. One explanation may be that the Fed self-censored its selection based on prevailing geopolitics. Or, echoing President Bullard's comments about the "old club that you guys have been fostering for years," perhaps the Fed sought to prioritize countries with which the U.S. had closer relations to avoid misuse of the swap lines (such as intervention to support an exchange rate). Recalling the cases where recipients of China's swap lines intervened to prop up their currencies, this concern is perhaps not invalid. Nonetheless, even accounting for other factors in the literature, politics appear to have influenced the Fed's policy choices both in whether to extend a swap line, and where a country ranked in the hierarchy of swap line availability.

One implication of these results is the ongoing uncertainty over which counterparties will be included in the Fed's international lender-of-last-resort policies. Broz (2015) notes some of the implications of the uncertainty, including the incentives for nations to "self-insure" through the accumulation of foreign currency reserves and to rethink regional arrangements such as the Chiang Mai Initiative. That may in part explain why reserves are negatively correlated with swap lines: we cannot know for sure, but it is possible countries with higher levels of reserves did not request a swap line in the first place. Nations without access to the Fed's swap lines might also seek alternative sources of dollar liquidity, such as China, in times of stress. Turkey, for example, secured dollar liquidity ultimately from Qatar in 2020 (Kucuk-

gocmen and Coskun 2020). It is likely that these arrangements could be charged with their own geopolitical factors, as instances of financial statecraft. Regardless, the additional uncertainty over the effect of geopolitics on swap lines suggests this trend will continue.

For policymakers, this analysis points to an emerging tension between economic interests and geopolitical interests: increasingly we should expect that the countries that meet economic criteria for swap lines (including ownership of U.S. assets) will not be those with the same historical political closeness to the U.S. as the E.U., Japan, the U.K and other swap line partners. Officials were comforted that their selection of swap line partners confirmed prevailing market beliefs about the most important EMEs; whether the Fed will be able to shift its policies with market beliefs going forward, however, remains to be seen.

The Fed's FIMA facility may be seen as a step towards addressing the dollar liquidity needs of economies that did not receive swap lines, including for geopolitical reasons. But the signal the hierarchy sends to markets may be as important as the recourse to dollar liquidity itself. There may also be instances where it is geopolitically beneficial for the U.S. to offer strategic swap lines to economies that would not otherwise meet economic criteria such as size or low inflation. Prominent cases have yet to arise, but increased competition in financial statecraft suggests the U.S. may need to prepare for the possibility. Creative policies will likely be required to resolve this tension in future crises. In the long-term, the determinants of U.S. swap line policy should inform efforts to overhaul the global financial safety net, such as providing for a role for the IMF in swap line policy.<sup>70</sup> Within the U.S. government, the history of the U.S. Treasury's own swap lines through the Exchange Stabilization Fund, in more limited cases, may be instructive for resolving the institutional delineation between the Fed, which is not a creature of geopolitics, and the executive branch, which is.<sup>71</sup>

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70. See for example Truman (2011 and 2020).

71. For a brief history of the U.S. Treasury's swap lines, and a discussion of the coordi-

So long as the dollar remains the world's key currency, the Fed is the only institution that can act as a true international lender-of-last-resort to the global investors and borrowers whose use of the dollar underpins the network effects that sustain its role in the international financial system. My analysis suggests, however, that the Fed's ability to do so is both guided and constrained by U.S. interests, including geopolitical ones. As geopolitical tensions continue to rise and these interests come into conflict, the U.S. will likely face difficult choices between bilateral considerations and its interests in supporting the overall dollar-based system through its swap line policies.

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nation required between Treasury and the Fed to warehouse foreign exchange for Treasury swap lines, see Humpage (2008).

# Appendix I: Additional Tables and Figures

Table 5: Descriptive Statistics of All Variables

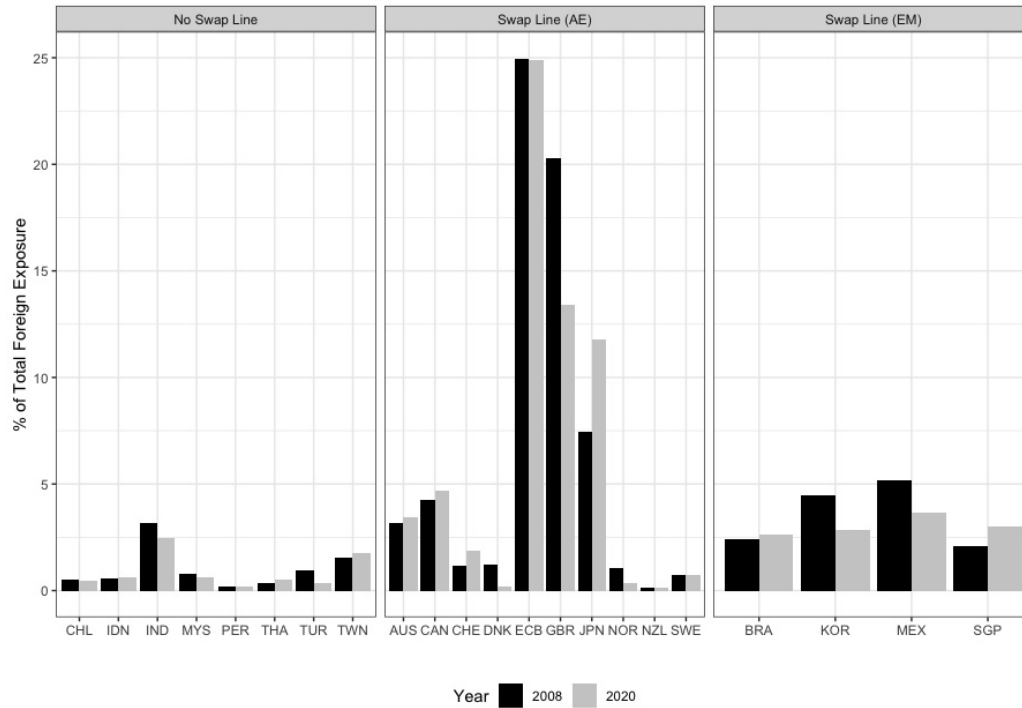
Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
U.S. Bank Exposure	274	0.716	2.781	0.00004	0.002	0.243	24.972
U.S. Trade Exposure	408	0.480	2.068	0.00000	0.002	0.128	17.797
U.S. Asset Ownership	416	0.472	2.294	0.000	0.0001	0.044	26.524
Financial Openness	296	0.535	0.354	0.165	0.165	1.000	1.000
Reserves as Perc. GDP	295	21.995	19.635	0.702	10.763	26.169	151.566
Inflation	285	5.718	9.018	-0.348	1.867	6.807	89.460
GDP as Perc. of World	355	0.422	1.839	0.00005	0.007	0.167	21.970
Political Alignment	353	-2.858	0.808	-4.458	-3.381	-2.338	-0.160
Liquid Liabilities	317	0.518	2.608	0.0002	0.003	0.131	29.319

Correlation of Independent Variables

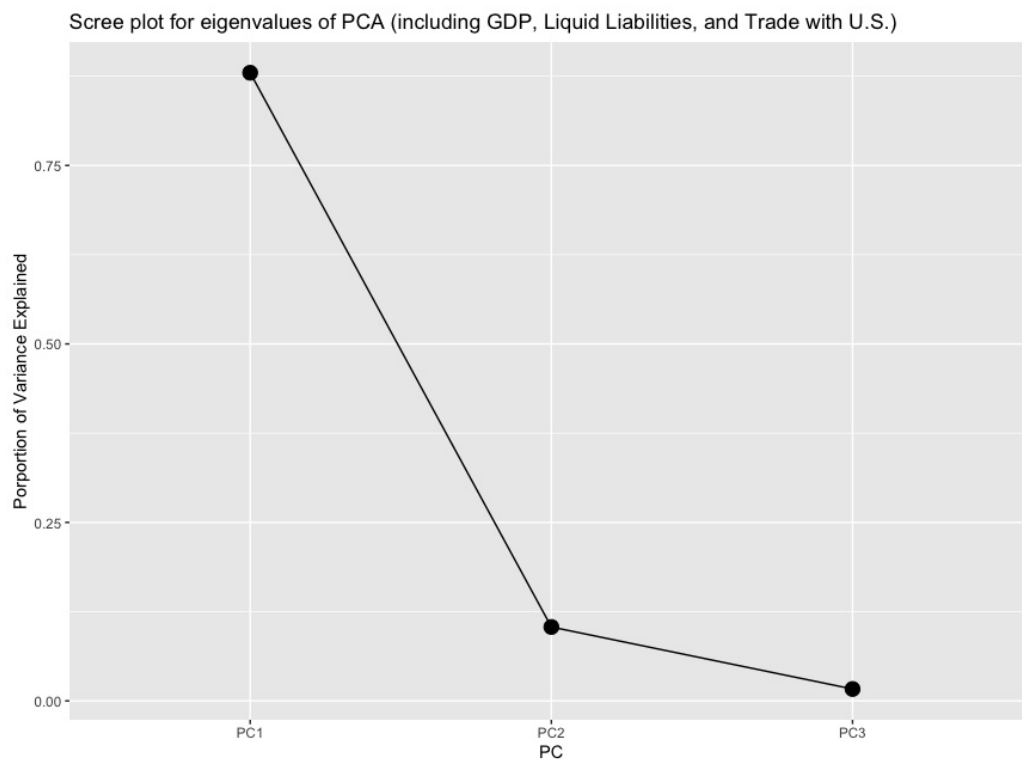
	<i>U.S. Bank Exposure</i>	<i>U.S. Trade Exposure</i>	<i>U.S. Asset Ownership</i>	<i>Financial Openness</i>	<i>Reserves</i>	<i>Inflation</i>	<i>GDP</i>	<i>Political Alignment</i>	<i>Liquid Liabilities</i>
<i>U.S. Bank Exposure</i>		0.650***	0.919***	0.190**	-0.078	-0.091	0.815***	0.289***	0.709***
<i>U.S. Trade Exposure</i>	0.650***		0.734***	0.135*	-0.057	-0.077	0.743***	0.170**	0.733***
<i>U.S. Asset Ownership</i>	0.919***	0.734***		0.191***	-0.032	-0.094	0.902***	0.226***	0.845***
<i>Financial Openness</i>	0.190**	0.135*	0.191***		0.050	-0.083	0.097	0.337***	0.085
<i>Reserves</i>	-0.078	-0.057	-0.032	0.050		-0.170**	-0.068	-0.085	-0.041
<i>Inflation</i>	-0.091	-0.077	-0.094	-0.083	-0.170**		-0.069	-0.144*	-0.083
<i>GDP</i>	0.815***	0.743***	0.902***	0.097	-0.068	-0.069		0.166**	0.947***
<i>Political Alignment</i>	0.289***	0.170**	0.226***	0.337***	-0.085	-0.144*	0.166**		0.152**
<i>Liquid Liabilities</i>	0.709***	0.733***	0.845***	0.085	-0.041	-0.083	0.947***	0.152**	

Computed correlation used pearson-method with pairwise-deletion.

Exposure of U.S. Banks, By Economy, 2008 vs. 2020



ECB is calculated as the total value of U.S. Banks' exposure to European Union member countries as of the year of the swap line.





## Appendix II: Covered Interest Parity and the Cross-Currency Basis

In the years following the GFC, systemic and persistent deviations from covered interest parity (CIP) have emerged as an unusual features of currency markets, and an important measure of market stress. Theory, however, says that they should not exist, or an arbitrage condition would arise.<sup>72</sup>

As an example, consider a foreign investor located in Japan holding U.S. dollar assets, such as U.S. Treasury bonds. The investor has liabilities (i.e., deposits from its own investors or, if it is an insurance company, premiums from its policyholders) in yen. However, it holds dollar assets. To fund these purchases, or the hedge the currency exposure, one approach the investor may take is to engage in an FX swap. In this transaction, the investor will effectively swap yen for dollars in the FX market today, with a promise to do the reverse transaction at a later date, often in three months. Covered interest parity states that the cost of this transaction should reflect the interest differential between the two countries whose currencies constitute the swap.

Formally:

$$\left(1 + y_{t,t+n}^{\$}\right)^n = \left(1 + y_{t,t+n}^{\text{¥}}\right)^n \frac{S_t}{F_{t,t+n}} \quad (1)$$

where  $y_{t,t+n}^{\$}$  and  $y_{t,t+n}^{\text{¥}}$  are the risk-free rate in dollars and yen (for term  $n$ ) respectively,  $S_t$  is the spot exchange rate in yen per dollars, and  $F_{t,t+n}$  is the forward exchange rate in terms of yen per dollars at time  $t+n$ .<sup>73</sup> If CIP holds, an investor should be indifferent between holding dollars invested at the dollar risk free rate and holding yen invested at the yen risk free rate over the same time period. If CIP does not hold, an arbitrage opportunity arises.

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72. This section is developed from Du et al. (2018), Bahaj and Reis (2019) and Bahaj and Reis (2020a).

73. The specific reference is Du et al. (2018).

Research has shown persistent deviations from the CIP condition since the GFC, even controlling for transaction costs and credit risk. In other words, the arbitrage condition exists. This deviation is frequently referred to as the “cross-currency basis,” and, for the investor, can be thought of as the incremental cost of the FX hedge. In other words, when the basis is large, as it typically becomes in a crisis, the investor faces higher costs to hold dollar assets relative to yen. Formally, the basis,  $basis_{t,t+n}$ , for term  $n$  is given as:

$$\left(1 + y_{t,t+n}^{\$}\right)^n = \left(1 + y_{t,t+n}^{\yen} + basis_{t,t+n}\right)^n \frac{S_t}{F_{t,t+n}} \quad (2)$$

In practice, the basis is more typically defined against LIBOR. Nonetheless, the inclusion of the basis term raises the costs of dollar financing or hedging for our example investor. Interviews with market participants indicate that investors consider “FX adjusted returns” – that is, they consider the return from investing in non-local-currency assets after including hedging costs. As a result, an increase in the cost of hedging dollars, for example, should decrease investor appetite for dollar assets, all things equal. Similarly, if the costs of hedging a position rise unexpectedly and significantly, as they have been shown to do against the dollar in a crisis, market participants suggested that investors and especially banks would need to liquidate their holdings.

The source of CIP deviations is the subject of ongoing research. The main thesis (again, in Du et al., 2018) is that they arise from the regulatory costs of bank balance sheets. The intuition is that banks are the major provider of hedging services to the investor (i.e., they provide the dollars today on the other side of the trade). Due to regulations, balance sheet is “scarce,” for example due to requirements that banks hold equity capital against their risk assets. Research in particular has shown that at quarter end, when banks submit their balance sheets to regulatory scrutiny, the basis widens as banks pull back capital from offering hedging services.

In a crisis, such as during COVID-19, the basis tends to widen. One

primary cause is a decrease in banks' risk taking behavior, for example due to banks' corporate customers drawing down their standing credit facilities which consumes scarce balance sheet. The result is less balance sheet capacity available to enter into FX contracts, and higher hedging costs.

The Fed's swap lines "cap" CIP deviations between the dollar and a foreign country's currency, at the interest rate over the OIS rate that the Fed charges on the swap line, setting an outside spread in the market. The intuition is that if the basis persisted beyond the swap line rate, a local bank could borrow dollars from the swap line, convert them into local currency in the FX market, and deposit them in its central bank for near risk-free profit.<sup>74</sup> The graph on the following page presents Bahaj and Reis's (2020a) findings that CIP deviations indeed fell to within the swap line rate during the COVID-19 crisis. The second graph shows persistent CIP deviations for countries without a swap line. As seen in the graph, for countries with a swap line, CIP deviations resolved to below the red-dashed line, which indicates the swap line rate.

The key point for market participants, and for policymakers, is that in crises, the conditions that lead to deviations from CIP are exacerbated, leading to higher hedging costs for foreign holders of U.S. assets. Swap lines bring these costs down to a level set by the Fed, promoting stability in dollar FX markets and preventing large scale sales of U.S. assets.

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74. The specific intuition is from Bahaj and Reis (2019) and Bahaj and Reis (2020a).

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