Global Club Goods and Regimes For International Financial Crisis Management[1]

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Abstract

It is generally regarded that a robust global financial safety net is a global public good. Yet public goods models that explain the existence of the global financial safety net cannot also explain why it is highly fragmented and provisioned so inequitably. This study shows that the global financial safety net's existence, fragmentation, and inequitable coverage can be explained by modelling the global financial safety net as a global club good. The primary finding of the model is that when a state has a monopoly on the provision of a non-rival and excludable good (i.e., a club good), separate multilateral and bilateral club governance structures emerge, each with a unique structure and cost. Brief case studies of the global financial safety net provisioned by the International Monetary Fund, the Federal Reserve, and the Bank for International Settlements strongly support the model.

KEYWORDS

Global Financial Governance; Club Model; Global Financial Safety Net; International Monetary Fund; Bank for International Settlements; Federal Reserve.

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Introduction

The global financial safety net exists to manage financial crises around the world and is one of the foremost non-regulatory institutions capable of supporting international financial stability.[3] This safety net consists of emergency credit facilities provisioned through multiple arrangements, including the International Monetary Fund (IMF), the Federal Reserve's swap-line network, and, on an ad hoc basis prior to 1998, the Bank for International Settlements (BIS). The existence of these arrangements, let alone their proliferation, constitutes a long-standing theoretical puzzle in international political economy as their founding must overcome a collective action problem.[4] Numerous resolutions to this collective action problem have been proposed, with most research finding that large financial powers have a self-interest in delivering the global public good of international financial stability.[5]

Notwithstanding the role self-interest plays in founding the global financial safety net, the same motives cannot, on their own, explain its long-standing fragmentation and why borrower states face highly inequitable access. This is especially puzzling given that the United States is the dominant actor governing all facets of the contemporary global financial safety net. While the wider international relations literature has extensively researched the existence of multiple international arrangements aimed at governing a single issue, to the best of my knowledge, these insights have yet to be applied in a rigorous way to the politics of the global financial safety net.

This article offers a new resolution to this collective action problem through a formal club goods model. The model retains a core assumption from the existing public goods literature that large financial powers have a self-interest in promoting international financial stability. Where the model innovates over those in the literature is by showing that while multiple possible regime structures exist, would-be global financial safety net providers have incen-

[3] Frieden (2016).
[4] Broz (1998); Kaul et al. (1999); Eichengreen (1999).
[5] See Broz and Hawes (2006); Norrlof (2010); McDowell (2012, 2016); Frieden (2016).

tives to structure the regime to their advantage by exploiting the club good characteristic of liquidity, and especially its excludability. The model offers a new explanation for why the global financial safety net is fragmented into multiple segments that effectively channel borrower states into either a high-cost multilateral institution or a low-cost bilateral arrangement. Predictions from the club goods approach are confirmed using brief case studies of the lending practices of the IMF, the Federal Reserve, and the BIS.

This study contributes to many strands of the international relations literature. First, a regime-centred approach to global club governance has significant advantages over existing club models of global financial governance. For example, while existing club models can explain why club members might agree to incur an adjustment cost to obtain an exclusive benefit,[6] they cannot adequately explain the founding of multiple, and differently structured, clubs that accomplish essentially the same task. The second contribution is to the politics of global public goods and the foundations of collective action more generally. In much of the public goods literature, the collective action problem centers on obtaining sufficient contributions to the public good because non-excludability renders the free-rider problem binding.[7] Results from this study imply that the free-rider problem is a red herring when collective action dilemmas involve excludable goods. As will be discussed further in the conclusion, when the status quo favors the provision of a club good, the collective action problem disappears and re-emerges as a delegation problem centred on convincing those currently provisioning a club good to make it non-excludable.

[6]Drezner (2008); Tsingou (2015).

[7]The joint products model, which is a popular model applied in the context of the global financial safety net, emerges as a natural solution to this framing of the collective action problem.

I Managing financial crises: public goods vs. club goods

In much of the economics and political science literature, a public good is defined as being *non-rival* and *non-excludable*.[8] Given that markets generally under-produce non-excludable goods because they are susceptible to free-riding, arguments in favor of the state provision of public goods are persuasive. The global financial safety net is a system of credit facilities designed to manage international financial crises and the normative case for its provision is typically motivated in public goods terms.[9] The case rests on this safety net contributing to international financial stability, which is a benefit that is both non-rival and non-excludable.[10]

In the political science literature, contemporary theoretical explanations for the existence of a global financial safety net are typically grounded in the joint products model of public good provision. For example, Broz and Hawes (2006) argue that the IMF owes its existence to its ability to produce joint products because its international financial rescues are conjoined with foreign policy benefits for its major creditor nations. McDowell (2012, 2016) likewise argues that the joint interests of its national financial system and major U.S. banks explain why the Federal Reserve extended swap-lines to peer states during the global financial crisis.[11]

While public goods approaches are a perceptive solution to the collective action problem underlying the global financial safety net, they were not intended to explain why the architecture of the global financial safety net is inordinately fragmented or why access remains highly uneven.[12] For example, the main external credit facilities that constitute the global

[8] *Non-rival* refers to one agent's consumption not lowering the consumption of others and *non-excludable* refers to the inability to exclude consumers from consuming Cornes and Sandler (1996). Examples of non-rival goods include roads, intellectual property, and television programs. Natural resources held in common are examples of non-excludable goods.

[9] Obstfeld (2009).

[10] Frieden (2016).

[11] See especially McDowell (2016), p. 179.

[12] Weder and Zettelmeyer (2017).

financial safety net are lending from the IMF and central bank bilateral swap-lines.[13] Yet the Federal Reserve's swap-line network, which is by far the most effective element of the global financial safety net, is limited to central banks in major advanced economies and a handful of emerging market economies, while all other states must resort to the conditional lending of the IMF. Indeed, while there is some evidence of coordination between elements of the global financial safety net,[14] it is difficult to reconcile the motivations underpinning public goods models with a recent IMF policy report that confirms that only reserve currency issuing advanced states are adequately served by the contemporary global financial safety net.[15]

There is a large and growing literature in international relations that seeks to explain why global governance arrangements may become fragmented. For example, the literatures on regime complexity[16] and contested multilateralism[17] offer competing explanations for why states dissatisfied with the status quo may seek to build alternative international arrangements.[18] However, these literatures are ill-suited to the politics of the global financial safety net. In short, the indispensable role of the US dollar to the global financial system severely limits opportunities for the development of a non-dollar based global financial safety net.

Like existing public goods approaches, the model developed below is grounded in the proposition that the US dollar is the world's preeminent currency. Yet it differs in a critical respect. In the public goods theories of the global financial safety net discussed above, financial stability is the public good produced by the global financial safety net provider. And collective action is facilitated because concerns over free-riding are dominated by the interest the United States has in maintaining international financial stability. Yet in some of the

[13]Regional financing arrangements, such as the Chiang Mai Initiative, are also typically included in the definition of the global financial safety net but these arrangements are less reliable and largely untested.

[14]Mahdavi et al. (2019); Schneider and Tobin (2020).

[15]International Monetary Fund (2016), p. 32.

[16]Raustiala and Victor (2004); Alter and Meunier (2009).

[17]Morse and Keohane (2014).

[18]At their most basic, regime complexity theory focuses on spaces of dynamic and overlapping claims to authority while contested multilateralism focuses on how coalitions of states contest and create sets alternative institutional arrangements.

economics literature, it is recognized that liquidity, and not stability per se, are the public good. For example, Mehrling makes the case that the "...emergent system [of central bank swap-lines] recognizes the essential fact that *liquidity* is a public good, indeed a global public good."[19] The distinction between stability and liquidity is also clear in the work of Charles Kindleberger, who in his landmark study of financial crises asserts that "*money* is a public good..."[20]

Distinguishing between financial stability and the liquidity that brings it about has implications for the development of theory. Consider that while financial stability is clearly non-excludable, the same is not necessarily true of the liquidity that brings it about. Given that it is widely believed that the Federal Reserve declined many requests for the extension of a swap-line during the global financial crisis[21] and many states continue to find accessing the IMF unpalatable, effective access to the global financial safety net is acutely political. Consider that if global liquidity is made widely available and on very easy terms, then, following Merhling, the global financial safety net can be rightly described as a non-rival, non-excludable global public good.[22] Conversely, if global liquidity is made scarce and borrower states are carefully screened, then the global financial safety net is best described as non-rival and excludable, which are characteristics that define a global club good.[23] The latter insight motivates the model below.

[19]Mehrling (2009), p. 114, *emphasis added*.

[20]Kindleberger and Aliber (2011), p. 19, *emphasis added*.

[21]Broz (2015); Sahasrabuddhe (2019).

[22]Few goods are purely non-rival and international last resort lending is no exception. However, for all intents and purposes, international last resort lending is non-rival because lenders rarely, if ever, face substantive barriers to assisting a state because their resources are tied up elsewhere. This is especially true for lenders who can create their own liquidity such as central banks.

[23]See Cornes and Sandler (1996) for an introduction to the economic approach to club goods. Recent political science studies have begun to classify some financial products as club goods (Selmier, 2014), but to the best of my knowledge this article is the first to characterize international last resort lending as a global club good. See Krahmann (2008) on the distinction between public and club goods in the context of security.

Club models are growing in popularity in the international political economy literature, although to date they are largely confined to the politics of international financial regulation.[24] In this literature, club governance emerges when small states willingly abide by standards set by large financial powers. For example, Drezner (2008) argues that small states may voluntarily incur an adjustment cost to adopt the regulatory standards of the large financial powers because doing so buys them an international seal of approval. Likewise, Tsingou (2015) argues that club governance includes a social element whereby new members are socialized into adopting the financial standards of existing club members. Despite these advances, club governance models remain under-explored. Below is a model whereby club structures emerge from the incentives large states have when they govern access to a club good. A key feature of the model is that excludability can lead to a club governance regime consisting of multiple clubs that have unique structures and costs for club members.

II A club goods theory of the global financial safety net

The model builds on the basic structure of Thompson and Verdier (2014). In their model, the "Founder" of an international public goods regime, which is assumed to be a large, hegemonic state, organizes the provision of a public good by soliciting contributions to its formation. To elicit compliance, the Founder offers incentives to member states that are funded out of the "member surplus" that is produced when the public good is brought into existence. Regimes are composed of a single multilateral arrangement, a series of bilateral arrangements, or a combination of the two. In a pure multilateral arrangement, states agree to a single policy and receive compensation from the Founder equal to that required to elicit participation by the state with the highest compliance cost. However, these costs are offset by the multilateral

[24] Club models are evident in the literature on the international political economy of trade. Examples include Gowa and Kim (2005) and Davis and Wilf (2017).

regime's low transactions costs. Conversely, a regime composed of bilateral arrangements has high transactions costs, but sees the Founder compensate member states only enough to elicit their participation. The levels and tradeoffs between transactions costs and compliance cost determines the regime type chosen by the Founder.

The model below extends the work of Thompson and Verdier (2014) in two ways. First, the mechanism leading to the creation of multilateral and bilateral institutions does not follow from the Founder compensating member states out of the surplus produced by the public good. Rather, as a club goods model, the Founder leverages its status as the only state capable of provisioning a global financial safety net and extracts compensation for borrower states on the brink of crisis. Multilateral, bilateral, and dual regimes all emerge from this framework even under conditions of zero transactions costs. Second, club goods-based regimes are shown to have different implications for member states. For example, accessing the global financial safety net on a bilateral basis is shown to be less costly relative to equivalent access on a multilateral basis.

Model setup

The model is a full information three period sequential game consisting of interactions between a hegemonic state that holds a monopoly on the production of the global reserve currency and a continuum of borrower states. Given its position at the apex of global regimes of international financial crisis management, the hegemon is denoted as the global financial safety net provider (GFSNP).

In period 0, commercial banks in each borrower state i invest one unit of deposits in an illiquid investment. Deposits consist of α units in the global reserve currency and $1-\alpha$ units in local currency.[25] In the model, α represents the degree to which state i's banking system

[25]Following Huang and Goodhart (1999), local and global reserve currencies are assumed to have a fixed one-to-one exchange rate. This assumption is without loss of generality.

is internationally integrated. However, borrower states are not all internationally integrated in the same way. Of the α units of the global reserve currency, citizens of the GFSNP claim fraction $\Omega_i \in [0, 1]$, leaving the remaining fraction $1 - \Omega_i$ claimed by local residents. Notice that Ω_i determines the distribution of foreign currency deposit losses in the event of a crisis in state i.[26]

Also in period 0, the GFSNP determines the structure of the global financial safety net regime. In doing so, the GFSNP faces a tradeoff between the cost for borrowers to access each regime type and, consequently, the number and characteristics of states that will eventually seek access in a crisis. This tradeoff sees the GFSNP settle on a particular Ω_i that will be the "cut point" that divides states between those that will and will not access particular segments of the global financial safety net regime.[27] The model considers three regime structures that provision a global financial safety net: a *multilateral* regime that devises a borrowing rule applicable to all borrower states equally; a *bilateral* regime comprised of customized bilateral arrangements; and a *dual* regime comprised of separate multilateral and bilateral arrangements.

In period 1, commercial banks face a liquidity withdrawal by depositors. The model characterizes a situation where the borrower state's central bank is capable of provisioning sufficient local currency liquidity, but not sufficient liquidity in the global reserve currency. The latter deficiency drives borrower states to the GFSNP.[28] If a borrower state cannot provision sufficient foreign currency liquidity, its banks face a liquidity crisis with probability π. This results in potential losses of $\alpha\Omega_i$ for foreign depositors and $\alpha(1 - \Omega_i)$ for local depositors. As borrower states are inward-looking and seek to maximize the financial wealth holdings of

[26]For example, if foreign currency deposits equal to α are lost in a crisis, residents of borrower state i lose $\alpha\Omega_i$ while residents of the GFSNP lose $\alpha(1 - \Omega_i)$. Therefore, crises in low Ω_i states concentrate losses domestically while crises in high Ω_i states concentrate losses abroad.

[27]Note that while Ω_i is taken as given in each borrower state, for the GFSNP it is a choice variable.

[28]To keep the model simple, we assume that the GFSNP is the sole issuer of emergency liquidity in the global reserve currency. Furthermore, we assume that borrower states do not use foreign currency reserve holdings to meet the liquidity needs of the banking system. This assumption is without loss of generality.

their citizens, these states are willing to pay at most $\alpha(1-\Omega_i)$ to borrow from the GFSNP, which equals its citizens' ownership of global currency reserve deposits. Payoffs are realized in period 2.

Multilateral regime

A multilateral regime consists of the GFSNP devising a borrowing rule applicable to all states equally. That rule says that states willing to incur cost τ_m may borrow, in principle, enough newly printed global reserve currency to arrest the liquidity shortfall facing their commercial banks.[29] A multilateral regime consists of a decision by the GFSNP in period 0 on the level of τ_m and a cut-point, Ω_m. While no state is actively prevented from borrowing from the GFSNP, when setting τ_m the GFSNP faces a tradeoff between the return it receives from those that borrow and the number of states that will self-select out of the regime because of its high cost. Given this, the GFSNP chooses the cut point Ω_m, defined as the equilibrium value of Ω_i under a multilateral regime, by solving the following optimization problem.

$$\int_0^{\Omega_m} \tau_m \, d\Omega \;-\; \pi \int_{\Omega_m}^1 \alpha\Omega_m \, d\Omega$$

Evaluating the integrals and substituting $\tau_m = \alpha(1-\Omega_m)$, the GFSNP chooses Ω_m to maximize

$$\alpha(1-\Omega_m)\Omega_m - \frac{\alpha\pi}{2} + \frac{\Omega_m^2\alpha\pi}{2} \tag{1}$$

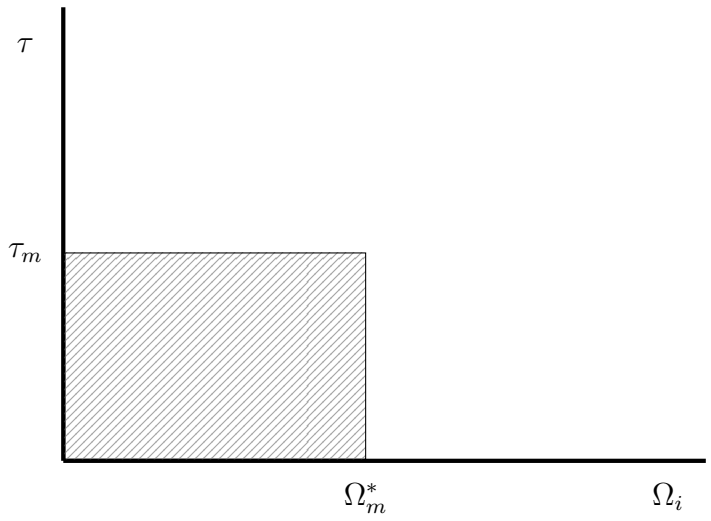
From equation (1) it follows that the optimal solution is obtained at $\Omega_m^* = \frac{1}{2-\pi}$ and $\tau^* = \frac{\alpha(1-\pi)}{2-\pi}$. Derivations of this solution and others are found in the supplementary appendix. Borrower states with $\Omega_i \leq \frac{1}{2-\pi}$ borrow from the GFSNP because their expected foreign currency losses exceed τ_m. Borrower states with $\Omega_i > \frac{1}{2-\pi}$ do not borrow and fall into crisis

[29] τ_m is interpreted generally in the model and may include policy reforms and interest costs on loans from the GFSNP.

with probability π. Evaluating Ω_m^*, we see that as the probability of a borrower state liquidity crisis falls (i.e., π decreases), the probability that citizens of the GFSNP face deposit losses also falls, which decreases Ω_m^* and renders the multilateral regime more exclusive. At the same time, a fall in π sees τ_m^* increase, which renders the multilateral regime more expensive for the remaining borrower states.

A diagrammatic depiction of the benefits to the GFSNP from the multilateral regime is shown in Figure 1. In the multilateral regime, states with $\Omega_i \leq \Omega_m^*$ borrow from the GFSNP and each incur the cost τ for the privilege. However, high Ω_i states, where citizens of the GFSNP own a high fraction of state i's foreign currency deposits, select out of the multilateral regime. This motivates the GFSNP to explore other regime structures.

Figure 1: GFSNP utility under multilateral regime



Bilateral regime

In a bilateral regime, the GFSNP foregoes a universal lending rule and bargains with each borrower state over the cost the latter will incur to access the GFSNP's liquidity facilities. Given that borrower states and the GFSNP both incur losses when crises occur in borrower

states, the model uses Nash bargaining to set the "price", ρ_i, paid by borrower state i. Let $\rho_i \in [\delta, \mu]$, where μ is the ideal price to be received by the GFSNP and δ is the ideal price paid by the borrower. For simplicity, μ and δ are assumed to be common in all bilateral bargains and are interpreted generally as ideal policy positions of the GFSNP and borrower states, respectively. Because the bargaining space spans an interval equal to $\mu - \delta$, a borrower state that adjusts its policy position from δ to ρ_i results in a net utility gain for the GFSNP of $\mu - \delta - (\mu - \rho_i) = \rho_i - \delta$. Conversely, the same policy movement results in a reduction in net utility of $\delta - \rho_i$ for borrower states.[30] Similarly to unsupported states in the multilateral regime, if a negotiated solution cannot be achieved, then unsupported states face a probability π of falling into a liquidity crisis.

The Nash product for each state i of this bargaining game consists of the product of the utilities of the GFSNP and the borrower state, net of the loss each incurs if a negotiated solution cannot be achieved.

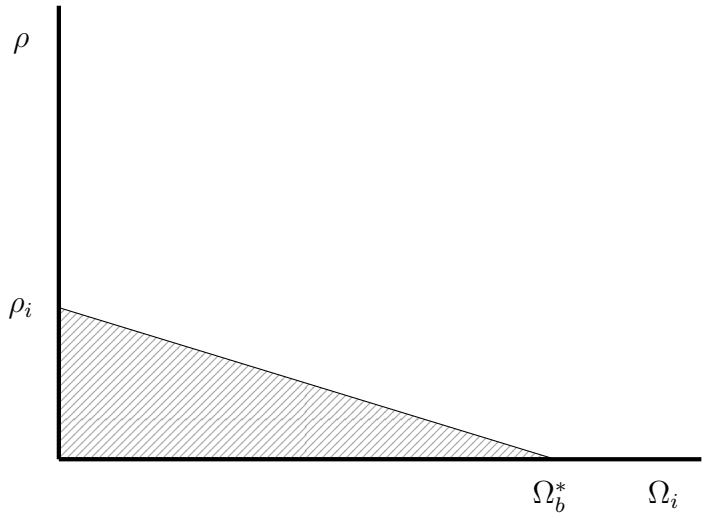
$$[\rho_i - \delta - \pi(-\alpha\Omega_i)][\delta - \rho_i - \pi(-\alpha(1 - \Omega_i))] \tag{2}$$

The Nash bargaining solution to (2) is $\rho_i = \frac{2\delta - 2\pi\alpha\Omega_i + \pi\alpha}{2}$. Despite δ being common to all bilateral bargains, the GFSNP receives a unique payoff from each borrower state because ρ_i is a decreasing function of Ω_i. This is shown in Figure 2 by the decreasing utility received by the GFSNP at higher values of Ω_i. This redistribution of losses from borrower states to the GFSNP at higher values of Ω_i shifts the bargaining solution in favor of the borrower state. Unlike in the multilateral regime, the cost to borrower states, ρ_i, is decreasing in α.[31]

[30] These utilities are derived assuming $0 \leq \delta \leq \mu$. This assumption is without loss of generality and merely ensure that the utility of the GFSNP is positive and the utility loss of the borrower is negative.

[31] This result holds if $\Omega_b^* \geq \frac{1}{2}$, which is the result that holds in equilibrium.

Figure 2: GFSNP utility under bilateral regime



Under a bilateral regime, the GFSNP chooses the cut point Ω_b by solving the following optimization problem.[32]

$$\int_0^{\Omega_b} \rho_i \, d\Omega$$

Substituting $\rho_i = \frac{2\delta - 2\pi\alpha\Omega_i + \pi\alpha}{2}$ and evaluating the integral sees the GFSNP choose the Ω_b that maximizes

$$\frac{2\delta\Omega_b - \pi\alpha\Omega_b^2 + \pi\alpha\Omega_b}{2} \tag{3}$$

From equation (3) it follows that the optimal solution is obtained at $\Omega_b^* = \frac{2\delta + \pi\alpha}{2\pi\alpha}$. The cut-point for inclusion in the bilateral regime is a decreasing function of α and π and an increasing function of δ. These results imply that an GFSNP will lend to a larger fraction of states when global financial integration decreases, liquidity crises in unsupported states are

[32]Deposit losses by citizens of the GFSNP are embedded in ρ_i, and thereby do not appear in the optimization problem as a separate integral as in equation (1) above.

less likely, and when the policy distance between borrower states and the GFSNP decreases.

Dual regime

A dual regime is the third possible regime type. In a dual regime, the GFSNP segments borrower states into clubs that access its lending facilities on either a multilateral or bilateral basis.[33] As in the multilateral regime, the GFSNP does not prohibit borrower states from accessing the multilateral segment of the dual regime, but, as shown below, its relatively high cost ensures that borrower states with a high Ω_i self-select into the regime's bilateral segment. The range of borrower states granted access to the dual regime is the same as that covered by the bilateral regime because both regimes incrementally incorporate states with a higher Ω_i until $\rho_i = 0$. However, the GFSNP can achieve a higher payoff because segmenting the regime into multilateral and bilateral arrangements allows the GFSNP to better target each segment.

In a dual regime, the GFSNP chooses the cut point Ω_d by solving the following optimization problem.

$$\int_0^{\Omega_d} \tau_d \, d\Omega \quad + \quad \int_{\Omega_d}^{\frac{2b+\pi\alpha}{2\pi\alpha}} \rho_i \, d\Omega$$

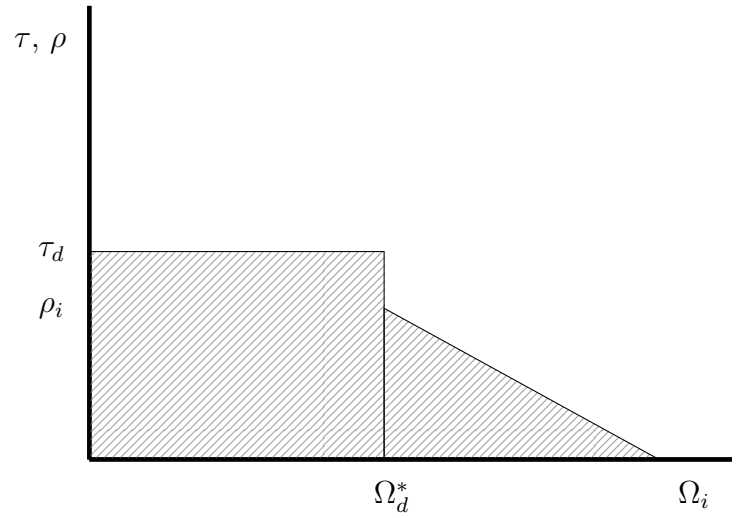
Evaluating the integrals and substituting $\tau_d = \alpha(1 - \Omega_d)$ and $\rho_i = \frac{2\delta - 2\pi\alpha\Omega_i + \pi\alpha}{2}$, the GFSNP chooses the cut point Ω_d to maximize

$$\alpha(1-\Omega_d)\Omega_d + \frac{2\delta\frac{2\delta+\pi\alpha}{2\pi\alpha} - \pi\alpha\frac{2\delta+\pi\alpha}{2\pi\alpha}^2 + \pi\alpha\frac{2\delta+\pi\alpha}{2\pi\alpha}}{2} - \frac{2\delta\Omega_d - \pi\alpha\Omega_d^2 + \pi\alpha\Omega_d}{2} \tag{4}$$

[33] In the supplementary appendix, it is shown that the GFSNP strictly prefers to limit its multilateral regime to borrower states with a low Ω_i and its bilateral regime to borrower states with a high Ω_i.

From equation (4) it follows that the optimal solution is obtained at $\Omega_d^* = \frac{\alpha(2-\pi)-2\delta}{2\alpha(2-\pi)}$. Under a dual regime, borrower states with $0 \leq \Omega_i \leq \Omega_d^*$ access the global financial safety net through a multilateral arrangement and borrower states with $\Omega_d^* < \Omega_i \leq \frac{2\delta+\pi\alpha}{2\pi\alpha}$ access it bilaterally with the GFSNP. A diagrammatic depiction of the optimal dual regime is shown in Figure 3.[34]

Figure 3: GFSNP utility under dual regime



An increase in α influences the structure of the dual regime in two ways. First, it raises Ω_d^*, which increases the fraction of borrower states channelled through the multilateral segment. Second, it lowers $\frac{2\delta+\pi\alpha}{2\pi\alpha}$, the threshold beyond which borrower states select out of the bilateral segment of the dual regime altogether. Together these results imply that as global financial integration increases, the bilateral segment of the dual regime is squeezed both from an expanded multilateral segment and a lower threshold for states included in the dual regime. Increases in δ and π have the opposite effects of α, as increases in these variables shrink the

[34]The lower cost of the bilateral arrangement accounts for the discontinuity at Ω_d^* in Figure 3. This is discussed further in Proposition 2 below. Intuitively, for states that access the dual regime through a bilateral arrangement, the use of Nash bargaining gives these states greater leverage over the GFSNP relative to those that access the regime through the multilateral arrangement. This results in a lower "price" paid by states in the bilateral segment, even as $\Omega_i \rightarrow_+ \Omega_d^*$. However, this discontinuity is not inevitable, and it disappears in the joint products version of the model presented below.

multilateral segment and expand the bilateral segment of the dual regime, respectively.

Choosing a Regime

For the GFSNP the choice between a multilateral, bilateral, or dual regime to govern the global financial safety net is decided by comparing the expected utilities it receives from each. These utilities are shown in Table 1. From these utilities three propositions are derived.

Table 1: GFSNP utility from each regime type

Multilateral	Bilateral	Dual
$U_m = \Omega_m^* \alpha(1-\Omega_m^*)$	$U_b = \int_0^{\frac{2\delta+\pi\alpha}{2\pi\alpha}} \rho_i \, d\Omega$	$U_d = \Omega_d^* \alpha(1-\Omega_d^*) + \int_{\frac{\alpha(2-\pi)-2\delta}{2\alpha(2-\pi)}}^{\frac{2\delta+\pi\alpha}{2\pi\alpha}} \rho_i \, d\Omega$
$U_m = \frac{\alpha(1-\pi)^2}{2(2-\pi)}$	$U_b = \frac{(\pi\alpha+2\delta)^2}{8\pi\alpha}$	$U_d = \frac{\alpha^2\pi(2-\pi)+4\delta^2}{4\pi\alpha(2-\pi)}$

Proposition 1: *The dual regime is the dominant strategy for the provider of the global financial safety net.*

It is straightforward to compare utilities to prove Proposition 1 and complete details are provided in the supplementary appendix. First, comparing the utilities from the dual regime to the multilateral regime, it can be shown that

$$\frac{\alpha^2\pi(2-\pi)+4\delta^2}{4\pi\alpha(2-\pi)} \geq \frac{\alpha(1-\pi)}{(2-\pi)^2} \;\; \forall\, \alpha \in [0,1], \delta \in [0,\infty), \pi \in [0,1] \tag{5}$$

Second, comparing the utilities from the dual regime to the bilateral regime, it can be shown that

$$\frac{\alpha^2\pi(2-\pi)+4\delta^2}{4\pi\alpha(2-\pi)} \geq \frac{(\pi\alpha+2\delta)^2}{8\pi\alpha} \;\; \forall\, \alpha \in [0,1], \delta \in [0,\infty), \pi \in [0,1] \tag{6}$$

The dominant strategy of choosing a dual regime to govern the global financial safety net emerges because the dual regime permits the GFSNP to best leverage the tradeoffs and relative benefits of multilateral and bilateral arrangements to its advantage. The result of Proposition 1 has important consequences for borrower states, two of which are formalized in Propositions 2 and 3.

Proposition 2: *In a dual regime, borrower states incur lower costs when borrowing through the bilateral segment than the multilateral segment.*

In the supplementary appendix it is proven that the cost to borrower states in the multilateral segment of a dual regime, τ_d^*, is greater than the cost incurred in the bilateral segment $\delta - \rho_{i,d}^*$ at Ω_d^*. Moreover, this proposition holds for $\alpha \in [0,1]$ and $\delta \in [0,\infty)$. This result follows from the GFSNP wanting to charge a lower cost to states that its citizens are highly invested in (i.e., high Ω_i states) because liquidity crises in these states are particularly costly to the GFSNP. The lower costs incurred by borrower states in the bilateral segment of a dual regime is a key implication of the club model and is discussed in greater detail in the case studies.

Proposition 3: *Borrower states incur higher costs to access the multilateral segment of a dual regime than equivalent access within a pure multilateral regime.*

The proof of Proposition 3 is straightforward and follows from the existence of a bilateral option in the dual regime reducing the range of states accessing the multilateral segment. That is, because $\Omega_d^* > \Omega_m^*$, it immediately follows that $\tau_m^* > \tau_d^*$.

In this club model, no collective action problem needed to be overcome to bring a global financial safety net into existence. Rather, the excludability of liquidity and the potential for costly crises were enough to motivate the monopoly producer of the global reserve currency. The next section considers an extension of this model where the global financial safety net contains a global public good component. However, even here the model finds that excludability continues to drive the emergence of a dual regime.

The global financial safety net as a global public good

Here the model considers the potential for positive spillovers from the global financial safety net. In this formulation the global financial safety net produces a public good in addition to private benefits for the GFSNP. This public benefit is in the form of a reduced probability that a crisis in one state will spread to another, which is in line with common conceptions of how the global financial safety net provisions financial stability benefits for all.[35] Yet even in a joint products formulation, the model's findings are consistent with those outlined above.

Consider the joint products setup of Cornes and Sandler (1984), where the utility of the GFSNP lending to state i consists of three components,

$$u = u(c, x, Z)$$

The first component, $c \in \{\tau, \rho_i\}$, is the price paid by borrower state i. Following Cornes and Sandler (1984), x is a private benefit received by the GFSNP and equals $\alpha\Omega_i$. This private benefit equals the foreign currency deposits of its citizens that are saved when state i accesses the global financial safety net. Lastly, let z be produced jointly with x, where z is a non-excludable public good. The aggregate public benefit, denoted as Z, is the spillover benefits enjoyed by all borrower states when the GFSNP lends to borrower state i. These spillover

[35] Frieden (2016).

benefits are interpreted as a reduction in the possibility for contagion, whereby lending to state i reduces the probability of crises in state j. Let $\gamma \in [0,1]$ be the amount by which the probability of a crisis in state j is reduced by the GFSNP's lending to state i.

In a dual regime, the aggregate amount of the public good equals $Z = \frac{2\delta+2\alpha\gamma+\pi\alpha}{2\pi\alpha}\int_0^1 \gamma\alpha$.[36] Intuitively, the total public benefit equals the sum of global reserve currency liabilities held by all depositors, weighed by the reduction in probability of losing these deposits in a contagion crisis and the total number of states covered by the dual regime.[37] The solution for the dual regime in a public goods framework sees the GFSNP chooses the cut point $\Omega^*_{d,p}$ by solving the following

$$\int_0^{\Omega_{d,p}} (\tau_{d,p} + \alpha\Omega_{d,p})\, d\Omega \quad + \quad \int_{\Omega_{d,p}}^{\frac{2\delta+2\alpha\gamma+\pi\alpha}{2\pi\alpha}} \rho_i\, d\Omega \quad + \quad \frac{2\delta+2\alpha\gamma+\pi\alpha}{2\pi\alpha}\int_0^1 \gamma\alpha\, d\Omega$$

Evaluating the integrals and substituting $\tau_{d,p} = \alpha(1-\Omega_{d,p})$ and $\rho_i, = \frac{2\delta-2\pi\alpha\Omega_i+\pi\alpha}{2}$, it follows that the optimal solution is obtained at $\Omega^*_{d,p} = \frac{\alpha(2-\pi)-2\delta}{2\alpha(1-\pi)}$. This and other points that define the equilibria of the multilateral, bilateral, and dual regimes under joint products are shown in Table 2.

The plane depicted in Figure 4 shows values of $\Omega^*_{d,p}$.[38] The "flat" spaces of Figure 4 correspond to the areas where $\Omega^*_{d,p} = 1$ and $\Omega^*_{d,p} = 0$ and depict areas where the dual regime collapses into either a multilateral or bilateral regime, respectively. A multilateral regime results when international financial integration is highly advanced and crises in unsupported states are very likely. Conversely, when international financial integration is low, the GFSNP channels all borrowers into bilateral arrangements irrespective of the level of π. A dual

[36] In the supplementary appendix, it is shown that the dual regime lends to states where $\Omega_i \leq \frac{2\delta+2\alpha\gamma+\pi\alpha}{2\pi\alpha}$

[37] In Cornes and Sandler (1984), each community member h contributes am amount z_h to public good. Each consumer consumes the total amount produced Z. In the model here, the GFSNP is the monopoly supplier of the global financial safety net and is the only producer of the spillover benefits generated by the global public good.

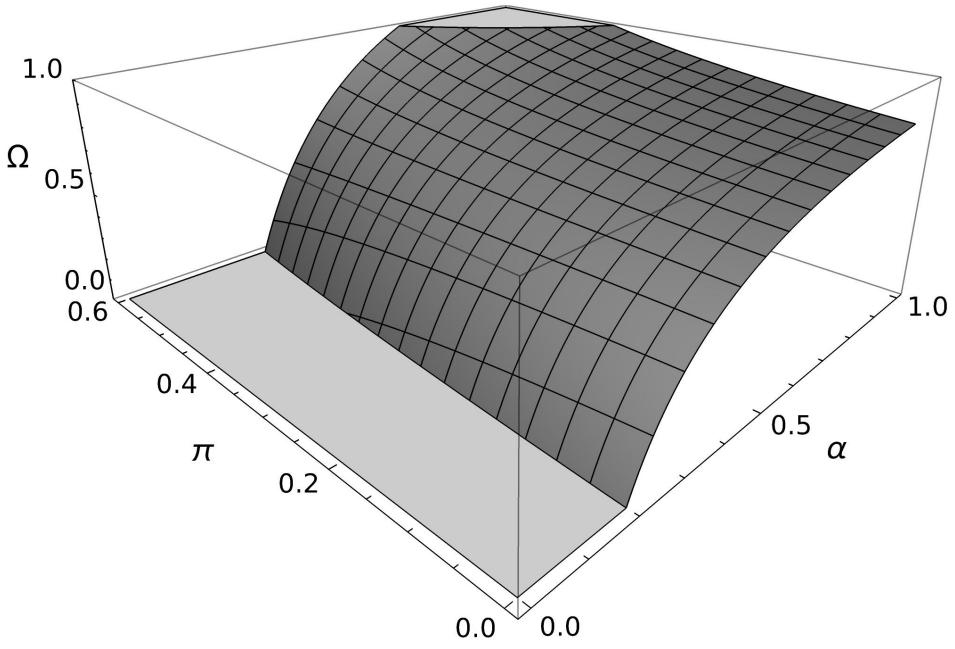
[38] Note that Figure 4 has been produced with $\Omega^*_{d,p}$ evaluated at $\delta = 0.2$. Given that δ is the ideal price paid by a borrower to access the global financial safety net, intuition says that δ should generally be low. Nevertheless, the general shape of the plane depicted in Figure 4 continues to hold for other parameter values.

Table 2: International last resort lending regimes under joint products

Multilateral	Bilateral	Dual
$\tau^*_{m,p} = \alpha(1 - \Omega^*_{m,p}) = 0$		$\tau^*_{d,p} = \alpha(1 - \Omega^*_{d,p})$
	$\rho^*_{b,p} = \frac{2\delta - 2\pi\alpha\Omega^*_{b,p} + \pi\alpha}{2}$	$\rho^*_{d,p} = \frac{2\delta - 2\pi\alpha\Omega^*_{d,p} + \pi\alpha}{2}$
$\Omega^*_{m,p} = \frac{1+\gamma}{1-\pi} = 1$	$\Omega^*_{b,p} = \frac{2\delta + 2\alpha\gamma + \alpha\pi}{2\alpha\pi}$	$\Omega^*_{d,p} = \frac{\alpha(2-\pi) - 2\delta}{2\alpha(1-\pi)}$

regime emerges at values of $\Omega^*_{d,p} \in (0, 1)$ and in Figure 4 occurs at most combinations of α and π. Just as in the base version of the model above, an increase in α tilts the dual regime towards an expanded multilateral segment and a shrunken bilateral segment. The effect of π depends on the level of α, with increases in π expanding the multilateral segment at higher values of α and shrinking the multilateral segment at lower values of α.

Figure 4: Equilibrium cut-points between multilateral and bilateral segments of the dual regime under joint products



Incorporating public goods features into the politics of the global financial safety net does not alter the results of Propositions 1, 2, and 3. With respect to Proposition 1, the dual regime continues to be the dominant strategy as it yields utility at least as great as either the multilateral or bilateral regime. On Proposition 2, in a dual regime borrower states that access the bilateral arrangement incur costs equal to or less than borrowers states that access the multilateral arrangement.[39] Lastly, for Propositions 3 it continues to be the case that $\Omega^*_{d,p} > \Omega^*_{m,u} \implies \tau^*_{m,u} > \tau^*_{d,p}$.

Model predictions

While Proposition 3 is of primarily of theoretical importance since a multilateral regime and a dual regime cannot simultaneously exist, Propositions 1 and 2 contain important predictions regarding how the global financial safety net is governed in practice. Proposition 1 shows that choosing a dual regime is a dominant strategy for the GFSNP. This leads to two interrelated predictions. The first is that the global financial safety net will be fragmented into a multilateral arrangement and a series of bilateral arrangements. The second is that the multilateral arrangement will be reserved for states where the cost of a crisis to the global hegemon are low and that bilateral arrangements will be reserved for states where these costs are high.

Proposition 2 states that the cost to borrower states will differ within the multilateral and bilateral segments of the dual regime and that the cost to borrower states is higher in the former. Given that the model interprets these costs generally, this implies that states in the multilateral arrangement will face institutionalized mechanisms driving up their borrowing costs. These costs may include *quid pro quo* policy reforms, interest costs, and restrictions on the amount of lending available. In contrast, states with a bilateral arrangement face far fewer costs overall and no institutionalized mechanism to extract such costs. Predictions

[39] While at $\Omega^*_{d,p}$ borrowing costs are equal, for $\Omega_i > \Omega^*_{d,p}$, it holds that $\delta - \rho^*_{d,p} < \tau^*_{d,p}$ for parameter restrictions $\pi \in (0,1)$, $\alpha \in (0, 2\delta)$, and $\delta > 0$.

from these propositions permeate the discussion that follows regarding the lending operations of the IMF, the Federal Reserve, and the BIS.

III The global financial safety net as a global club good

III.I The International Monetary Fund

Memories of the Great Depression weighed heavily on the minds of delegates who gathered at Bretton Woods in 1944. What emerged from Bretton Woods was a new set of institutions to govern the international monetary system following the end of the war. The IMF was the centerpiece of the negotiations and was designed to disburse loans to states facing temporary current account deficits. One of the key factors leading to this outcome was the status of the United States as the world's premier creditor nation. The United States used this position to disparage proposals that required symmetrical adjustments by surplus countries and those that did not permit some degree of policy leverage over deficit countries.[40]

While IMF loans were originally designed to maintain a global system of fixed exchange rates, the IMF's lending structure strongly resembles the multilateral segment of a dual regime. Most tellingly, the IMF is structured as a high membership, high cost of borrowing institution. For example, from the beginning, despite not appearing in the Articles of Agreement, members implicitly understood that terms and conditions would be attached to IMF loans if their borrowing exceeded their reserve tranche.[41] This quid pro quo remained in place after the breakdown of the Bretton Woods system and the IMF increasingly focused

[40]Bordo (1993).

[41]Diz (1984). States "borrow" (i.e. purchase foreign currency with their own currency with an agreement to repurchase it at a future date) from the IMF unconditionally up to their reserve tranche, which is typically no more than 25% of their quota. A state's reserve trance represents that state's contribution of foreign currency to the IMF's resource pool. Conditions are applied on loans greater than a state's reserve tranche. At this stage loans are disbursed from a state's credit tranche.

on assisting states in crisis.[42] Typical loan conditions include restrictions on new domestic and foreign credit, the privatization of state-owned assets, tax reforms, the setting of public spending targets, and setting a target for foreign currency reserves. Given that states in crisis typically find these terms and conditions demanding, they are highly unpopular.[43]

The characteristics of a multilateral segment of a dual regime are also evident in the IMF's more recent lending facilities, which have been designed to be more flexible and precautionary in nature. Consider the advent of the Flexible Credit Line (FCL) and the Precautionary and Liquidity Line (PLL). While these new facilities were central to the IMF's response to the global financial crisis and signalled the IMF's shift towards precautionary lending facilities, qualification requires that states meet fairly stringent macroeconomic criteria that are subject to regular review.[44] Conditionality was therefore not eliminated with these facilities, but front-loaded, which explains why to date only Mexico, Columbia, and Poland have accessed the FCL while only Macedonia and Morocco have accessed the PLL.[45]

Moreover, IMF Board members recently rejected a proposed new facility, the Short-Term Liquidity Swap (SLS), which would have created a facility that more closely resembles the liquidity provision mechanism used by contemporary central banks. This facility was proposed to grant qualifying states revolving access to 145 percent of its quota, subject to a 12 month repurchase requirement.[46] And while the proposal was ultimately rejected, Board members were prepared to mandate that access to the SLS be subject to the same stringent set of conditions needed to qualify for the FCL.

[42] Boughton (2001).

[43] Gould (2003, 2006).

[44] The experience of Macedonia, to date the only state to draw on either the FCL or the PLL, is illustrative of the hurdles and pitfalls states face when accessing these credit facilities. Macedonia was granted a PLL in January 2011 and drew on it shortly after. But when undergoing a periodic review one year later IMF officials concluded that Macedonia was no longer meeting its benchmark regarding the sustainability of government spending and recommended that Macedonia be denied a renewal of their PLL (Birdsall et al., 2017).

[45] Presbitero and Zazzaro (2012).

[46] International Monetary Fund (2017).

While IMF officials have sought to reform its lending framework to be more generous and less stigmatizing for borrower states, the persistent preference for setting relatively challenging terms and conditions on all lending facilities appears to be a core priority. In this regard, the IMF's contribution to the global financial safety net occupies the multilateral segment of a dual regime as the disappointing experiences of the FCL, PLL, and SLS are indicative of how difficult the IMF has found it to break out of its high cost, and relatively restricted, lending structure.

III.II The Federal Reserve

The Federal Reserve's use of its swap-line network during the global financial crisis has been held up by many as an exemplary instance of the provision of a global public good.[47] After first arranging swap-lines with the European Central Bank (ECB) and the Swiss National Bank in December 2007, the Federal Reserve would go on to extend swap-lines with central banks in Japan, the United Kingdom, Canada, Australia, Sweden, Norway, Denmark, New Zealand, Mexico, Brazil, South Korea, and Singapore. At their peak usage in December 2008, swap-line lending topped $583 billion, and there is a widespread consensus that these operations were crucial in containing the crisis by minimizing disruptions to global dollar funding markets.

Many of the characteristics predicted to exist in the bilateral segment of a dual regime are found in the Federal Reserve's swap-line network. For example, it is now well-known that the Federal Reserve sought to limit the reach of its swap-line network, and in particular by prioritizing states hosting large American financial institutions.[48] Favoring high Ω states was also evident given the list of states who approached the Federal Reserve for a swap-line

[47] Goldberg et al. (2011); Baker (2013); McDowell (2012, 2016). Swap-lines are used by the Federal Reserve to supply dollar liquidity abroad. At initiation, a swap transaction sees the Federal Reserve swapping dollars for foreign currency from a foreign central bank. The swap is eventually unwound when the foreign central bank remits its borrowed dollars back to the Federal Reserve in exchange for its own currency.

[48] Broz (2015).

but were subsequently denied.[49] The reach of the swap-line network was further curtailed in February 2010 as all swap-lines were allowed to expire on schedule. However, by May the crisis in the Eurozone was becoming apparent and the Federal Reserve reopened swap-lines with the ECB, the Bank of Canada, the Bank of England, the Swiss National Bank, and the Bank of Japan. These swap-lines were subsequently transitioned to permanent standing facilities in 2013.

A second feature of the swap-lines consistent with the bilateral segment of a dual regime were their minimal costs and conditions. Unlike the IMF's imposition of policy conditionalities, the Federal Reserve's primary concern was minimizing its exposure to foreign currency and credit risk. For example, while the borrowing central bank could disburse its borrowed dollars however it saw fit, it was made liable for the repayment of its swap-line transactions irrespective of the solvency of the ultimate borrowing institutions. Moreover, when swap transactions were initiated, the borrowing central bank agreed to close out the swap at the same exchange rate, which ensured that the credit and foreign exchange rate risk would be borne by the borrowing central bank and not the Federal Reserve.[50] While these risks were in all likelihood economically immaterial for central banks, for the purposes of the club model developed here the relevant fact is that while the Federal Reserve could have imposed more stringent terms and conditions on its swap-lines, it chose not to.

The limited reach and minimal cost of the swap-lines were again seen in March 2020 as the financial consequences from the COVID-19 crisis were becoming apparent. To encourage uptake, the Federal Reserve lowered the interest charged to borrowers and extended the maximum maturity from 7 days to 84 days. However, the Federal Reserve also limited swap-lines to the fourteen central banks that received one during the global financial crisis. As in 2008, these facilities quickly stabilized dollar funding markets globally and at their peak

[49]There is evidence that policymakers from Peru, Chile, Indonesia, the Dominican Republic, India, and Turkey are on such a list (Harris, 2015; Vaughn, 2019).

[50]Fleming and Klagge (2010).

usage in May $449 billion had been disbursed, with the Bank of Japan and the ECB being the two heaviest borrowers.

To complement the swap-line network, the Federal Reserve also established a new facility, the FIMA Repo Facility. This facility gave over 200 foreign central banks and monetary authorities access to dollars through their accounts at the Federal Reserve Bank of New York. While this facility had a very wide reach as it ostensibly gave nearly all central banks the ability to borrow dollars from the Federal Reserve, two stipulations were added to minimize uptake. These were that borrowers post US Treasuries as collateral and incur an above-market interest charge.[51] Not only would countries with low levels of foreign exchange reserves lack the collateral to borrow at scale, but even those with a large stock of US Treasuries would not see their effective access to new dollars increase because Treasuries posted as collateral raise the same amount of dollars as the sale of those same Treasuries. The result was that while the swap-lines were used to great effect, the FIMA Repo Facility proved unattractive and processed only a handful of modest transactions.[52]

III.III The Bank for International Settlements

A third institution with a history of contributing to the global financial safety net, and the one least studied, is the BIS. While the BIS was originally created to facilitate German reparations following the first world war, its ability to accept deposits and make loans has also made it, on occasion, a prominent element of the global financial safety net. The earliest example of the BIS engaging in international last resort lending came in 1976 with a loan to Britain. Credit from the BIS was structured as a bridge loan[53] and formed a key pillar in the

[51] Congressional Research Service (2020).

[52] Between March and July 2020, there was only one week where the FIMA Repo Facility saw an average amount outstanding greater than $1 billion USD, which occurred during the week of May 13, 2020.

[53] A bridge loan is a short-term loan used to "bridge" over a period of illiquidity. For example, a bridge loan could be used when an agent expects to receive funds in period $t+1$ but has obligations to meet in period t. In this case the agent could use a bridge loan to meet their period t obligations and use their funds

international assistance Britain received to help it manage its problematic sterling balances.[54] Following the British experience, the BIS greatly expanded its lending operations in the 1980s and 1990s. Between 1976 and 1998, the BIS participated in four loans each to Argentina and Mexico, three for Brazil, two each for Hungary, Romania, and Yugoslavia, and one each for Guyana, Nigeria, Poland, Portugal, Turkey, and Venezuela.[55]

While the BIS is a key international financial institution, it is remarkable how closely its bridging operations resembled the swap-line transactions of the Federal Reserve and the characteristics of the bilateral segment of a dual regime more generally. For example, the BIS used financial exposure to filter out potential borrowers and imposed minimal costs and conditions on borrower states. And like the Federal Reserve, the highest priority for the BIS was to minimize its risk exposure. This led the BIS to require the posting of solid collateral. In most cases this translated into countries reserving a portion of a future IMF payout to repay bridge loans from the BIS. This was the case for all Latin American borrowers as well as Hungary, Yugoslavia, and Nigeria.[56] In other cases, states could collateralize their loans using their gold reserves[57] or with repayment guarantees issued by advanced country central banks. An example of the latter occurred with Mexico's 1982 loan, which saw all G-10 central banks plus the Banco de Españia and the Swiss National Bank collectively guarantee the BIS repayment should Mexico default.[58]

The bridging operations of the BIS sparked significant debate on whether it would soon deepen and institutionalize its new role as a key pillar of the global financial safety net. Given that the BIS is referred to as the central bank for central banks, many wondered whether

acquired in $t+1$ to repay the bridge loan. In a very general sense, all last resort lending can be thought of as bridge financing.

[54]Bederman (1988).

[55]Bederman (1988); Toniolo (2005).

[56]Note that the content of the Stand-by Arrangement's conditionalities were of no concern to the BIS. The only requirement was that a future disbursement from the IMF would be allocated directly to the repayment of the BIS loan.

[57]Bederman (1988); Prickett and Adamović (1990).

[58]Boughton (2001).

this was not a natural step for the BIS in a world of increasingly globalized finance.[59] Yet the BIS consistently rejected this notion. Indeed, BIS bridge loans became increasingly rare as the 1990s wore on and its loan to Brazil in 1998 would be its last. Nevertheless, in the early days of contemporary financial globalization the BIS acted as a key conduit for large financial powers to channel bilateral lending to preferred states.

IV Conclusion

Conventional wisdom holds that the contemporary global financial safety net fulfills at least some of the criteria for a global public good, even if many of its constituent components need further reform. Yet a global public goods perspective has difficulty explaining why the global financial safety net is inordinately fragmented and provisioned so inequitably. This study argues that the components of the global financial safety net are not best understood as genuine global public goods simply not living up to their potential, but as global club goods. Excludability is the key feature of club goods and the main finding of the model is that would-be global financial safety net providers can exploit this excludability to their advantage by effectively dividing some states into an expensive multilateral arrangement and others into a more generous bilateral arrangement. Importantly, this finding holds even when the global financial safety net adopts some properties of public goods, such as a degree of non-excludability.

The analysis of this article suggests that if the global financial safety net is to be provided as a global public good, attention should be paid to making current arrangements non-excludable. This framing of the problem differs from many analyses found in the literature where the focus tends to be on how public goods can be created *ex nihilo*. If the goal is to create a public good when none currently exists, the binding problem is how to garner sufficient

[59] Montagnon (1982).

resources given the incentives for free-riding.[60] However, in cases where there are existing motivations to supply excludable club goods, the free-rider problem is a red herring. Indeed, as demonstrated in the case studies, policymakers in the world's leading financial powers have been more than willing to contribute resources to the financial stability of other states. What they have been unwilling to do is relinquish control over which states have access to these resources and at what cost.

Reducing incentives to exclude borrowers from accessing the global financial safety net on attractive terms is challenging and is a topic appropriate for future research. The analysis of this paper suggests a new rationale for longstanding proposals for global financial safety net reform, including giving global financial safety net providers, such as the IMF, greater political autonomy and the power to create, in principle, unlimited quantities of their own liquidity.[61] In addition to bolstering the size of the global financial safety net, autonomy and liquidity creation can also help overcome the fundamental problem of excludability that underlies the preference for a dual regime. In short, if independence and liquidity creation expand a central bank's domestic crisis management capabilities, analogous powers for international financial institutions should expand their international crisis management capabilities. However, enacting these reforms requires overcoming a well-known delegation problem. If this proves to be a bridge too far, the global financial safety net will continue to follow club governance precepts into the foreseeable future.

[60] Broz (1998); Stone et al. (2008).
[61] Eichengreen (1999).

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