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Revisiting the Monetary Sovereignty Rationale for CBDCs

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Abstract

As currently articulated, the monetary sovereignty argument for central bank digital currencies (CBDCs) rests on the idea that without them, private and foreign digital monies could displace domestic currencies (a process called currency substitution), threatening the central bank's monetary policy and lender-of-last-resort (LLR) capabilities. This rationale provides a crucial but incomplete picture of what is at stake in terms of monetary sovereignty. This paper seeks to expand and enhance this picture in three ways. The first is by looking at the consequences of currency substitution that go beyond the functions of a central bank—important considerations that have received less attention in public CBDC discussions. The second is by exploring key differences in monetary policy and LLR capabilities across currency-issuing countries or regions. More specifically, the paper highlights the variation in the degree of monetary sovereignty and the consequences that different countries face should they lose it. The third way is by assessing not only the implications but also the risks of currency substitution and showing how these are also likely to vary across countries. Contrasting the consequences and risks of substitution, the paper concludes by noting a potential inverse relationship between the impact and probability of losing monetary sovereignty.

Topics: Digital currencies and fintech; Monetary policy; Financial stability; Exchange rate regimes; Debt management
JEL codes: E41, E42, E52, E58, H12, H63

1. Introduction

Interest in central bank digital currencies (CBDCs) has spiked in recent years. In central banks around the world, CBDCs are being researched and developed, and early movers such as the People's Bank of China have begun pilot testing their digital currencies (Auer, Cornelli and Frost 2020). This surge in interest is understandable, considering the potential consequences of inaction. One reason central banks have embraced the idea of CBDCs is the view that these digital currencies could help safeguard monetary sovereignty against emerging threats (Bank of Canada 2020a; BIS 2020; Diez de los Rios and Zhu 2020; IMF 2020; King 2020; OMFIF 2019; Viñuela, Sapena and Wandosell 2020).[1]

The idea of defending monetary sovereignty has been closely connected to defending the privileged role of domestic currency. Monetary authorities have shown interest in issuing CBDCs as a way to prevent their currencies from being displaced by more attractive digital alternatives, including private digital currencies like global stablecoins (GSCs) and foreign CBDCs that could become widely used within their economies. Their broader concern is that such currency substitution could undermine a central bank's ability to effectively conduct monetary policy and act as a lender of last resort (LLR) (Bank of Canada 2020a; BIS 2020; OMFIF 2019). This, in short, is the monetary sovereignty rationale that emerges in CBDC discussions.

This rationale provides an important but incomplete picture of what is at stake—in general and for specific types of countries—with respect to monetary sovereignty and the prospect of losing it. We can expand and enhance this picture, however, in three principal ways. The first is to look beyond monetary policy and LLR functions. Historically, national currencies were created for a variety of reasons, including to foster a sense of national identity, reinforce the boundaries of the national economy as a distinctive economic sphere, and bolster the state's revenues (Helleiner 2003). It is thus worth considering how a challenge to sovereign currencies today might affect their role as a potential source of national cohesion and state revenue.

The second is to look at monetary policy and LLR capabilities through a more comparative lens that highlights the crucial differences across currency-issuing countries or regions. These differences exist because the ability to conduct monetary policy and act as an LLR rests on more than having a currency, which is necessary but insufficient. It also depends on two factors that vary significantly across countries: exchange rate regimes and the extent to which public and private actors borrow in their domestic currency. Taking this variation into account provides a basis for viewing key elements of monetary sovereignty (monetary policy and LLR functions) not as binary attributes—that countries either have or do not, depending on whether they issue

[1] For an overview of some of the other leading motivations for issuing CBDCs, see Auer et al. (2020).

their own currencies—but as a spectrum.[2] Put differently, while it is true that all countries with monetary sovereignty have their own currencies, not all countries with their own currencies are equally endowed with such sovereignty and the privileges it provides. This also implies, importantly, that some countries have relatively more to lose than others from currency substitution.

The third way to enhance our view of what is at stake is to assess not only the nature of monetary sovereignty and the consequences of losing it through currency substitution, but also the risk of substitution and whether this, too, varies across countries. Analysts have argued that the digitalization of money will increase the odds of substitution—or digital dollarization—by expanding the supply of attractive and accessible currencies to choose from (Brunnermeier, James and Landau 2019a). This paper seeks to qualify this claim. It suggests that the risk of digital dollarization will remain greatest for a certain subset of emerging-market and developing economies (EMDEs)—those in which demand for alternatives is driven by domestic monetary instability and where better access to alternatives would help satisfy this demand. By comparison, countries with stronger and more stable monetary regimes will be less susceptible to digital dollarization. The paper also shows that countries in the former group tend to have lower levels of monetary sovereignty than those in the latter. Together these points highlight an inverse relationship between the consequences and risks of currency substitution: countries with relatively more monetary sovereignty and thus more to lose from digital dollarization are also generally less susceptible to it, and vice versa.

The remainder of this paper sketches out the above points in greater detail, starting in Section 2 with an overview of why digital currencies are seen as a potential threat to monetary sovereignty. Section 3 highlights potential consequences of digital dollarization that go beyond monetary policy and LLR concerns. These are worth considering, given their broader significance, but have thus far received scant attention in the CBDC literature. Section 4 shows how those aspects of monetary sovereignty that *have* received substantial attention in CBDC discussions—monetary policy and LLR functions—rest on broader foundations than currency issuance alone. In doing so, the paper sheds light on key differences in monetary sovereignty, and the consequences of losing it, for various countries. By contrasting these differences with the unequal risk of currency substitution discussed in Section 5, the paper draws attention to the potential inverse relationship between the impact and probability of losing monetary sovereignty. Before concluding, the paper outlines some implications in Section 6, including

[2] This paper is not the first to suggest that monetary sovereignty is a spectrum, but contributes to further clarifying the concept and demonstrating its utility by showing how the consequences and risks of currency substitution differ depending on a country's position on the spectrum. For a distinct but related discussion of monetary sovereignty, see Bonizzi, Kaltenbrunner and Michell (2019) and Tcherneva (2016). For a more binary view that sees monetary sovereignty as something that belongs only to a select group of elite countries, see Kelton (2020) and Pistor (2017).

whether CBDCs are likely to help different types of countries preserve their monetary sovereignty.

2. Stablecoins and foreign CBDCs: A new source of currency substitution?

The main perceived threat to monetary sovereignty today is currency substitution, which occurs when domestic residents shift from using the official currency to an alternative denominated in a different unit of account. Such substitution—often called dollarization—is not new.[3] It has taken place, in varying degrees, in several countries, particularly in response to substantial price instability (Sachs and Larrain 1999; Levy Yeyati and Sturzenegger 2002). Yet the increasing digitalization of money could both amplify the threat of currency substitution and extend that threat to a broader range of countries than those typically affected.

The rise of digital currencies could intensify currency competition—providing new options and incentives for currency substitution—for at least three reasons.

- First, GSCs issued by big tech companies could leverage existing e-commerce and social networking platforms to rapidly scale up. Big tech issuers may look to catalyze GSC adoption through design features and incentives that make it attractive to use the new currency within and across their extensive online platforms. This, in turn, could generate self-sustaining dynamics as network externalities develop. The end result could be the emergence of what Brunnermeier, James and Landau (2019a, 2019b) call "digital currency areas" (DCAs) that correspond not to national borders but to de-territorialized digital networks that are larger than many national economies. Large, cross-border DCAs could also form around major CBDCs. For example, China's emerging digital currency—known as the Digital Currency Electronic Payment (DCEP)—could enjoy expanded international use if adopted on the growing cross-border payment and e-commerce networks created by Alipay and WeChat Pay.

- Second, switching costs, which have impeded currency competition in the past, will likely continue to decline as new mobile apps and online payment platforms make it easier to calculate prices and convert balances from one currency to another (Brunnermeier, James and Landau 2019b). As switching costs are reduced, currency substitution will presumably become cheaper and easier, making it on average more likely to occur (IMF 2020). At a general level, the globalization of finance and communication technologies has increased linkages across countries and created

[3] The term *dollarization* is used to describe substitution of a domestic currency with a foreign one, even when the latter is not the US dollar. Dollarization has often involved the US dollar (hence the name), but it can also refer to the formal or informal adoption any currency (e.g., the euro) in place of the official domestic one.

additional opportunities for more people to access and use alternative currencies (Ajide, Raheem and Asongu 2019). These opportunities will expand further as new digital monies, payment systems and exchange platforms make it easier to transact in a wider range of currencies using mobile devices.

- Third, digital currencies will likely compete across more dimensions than traditional currencies, including whether they offer smart contracts, how interoperable they are with other financial services, and how much privacy they provide (Brunnermeier, James and Landau 2019a, 2019b). They will be able to differentiate themselves and appeal to potential users by offering attractive design features not available in traditional sovereign currencies. For example, Zetzsche et al. (forthcoming) consider a scenario where China's DCEP becomes widely used for global trade invoicing and settlement partly because of its compatibility with smart contracts that can significantly reduce the costs of trade.

Highly differentiated currencies, combined with low switching costs, may lead to an unbundling of currency functions where, for example, some currencies are used as stores of value while others as mediums of exchange or units of account (Brunnermeier, James and Landau 2019a, 2019b; IMF 2020; Prasad, forthcoming). Such unbundling could further heighten competition—as currencies compete to dominate specific roles—and increase the odds of a currency being partially substituted for one or more of its core functions.

For these reasons, policy-makers have begun to consider whether traditional currencies could be at risk of losing their domestic market share to more attractive digital alternatives. In this context, CBDCs are increasingly being viewed as a defensive tool for protecting monetary sovereignty against both private stablecoins and foreign CBDCs. As the Bank of Canada (2020a) noted, "if one or more alternative digital currencies threatened to become widely used as an alternative to the Canadian dollar […] then a CBDC could be one mechanism to defend monetary sovereignty." A broader group of central banks—including the United States Federal Reserve, European Central Bank (ECB), Bank of England, Bank of Japan and others—has also invoked monetary sovereignty as a potential motivation for CBDCs (BIS 2020). So too has the People's Bank of China, whose director of digital currency research noted that a key reason to create a CBDC is "to protect or safeguard our monetary sovereignty" (The Economist 2021). Brunnermeier, James and Landau (2019a) apply this logic more generally, stating:

> The best defence against digital dollarisation may be for countries to issue their own currencies in digital form by creating central bank digital currencies (CBDCs). CBDCs are hotly debated from the perspective of monetary policy and financial stability. However, they may have a more fundamental justification: to adapt domestic currencies to the new state of technology and, in the process, to protect them from outside competition based on digital superiority.

Concerns about monetary sovereignty were amplified by the June 2019 announcement of Facebook's plan to launch Libra (now Diem). As a digital currency whose value would be tied to a basket of major reserve currencies, Libra represented its own unit of account (≋LBR), making it more of a direct challenge to sovereign money. In response to the scrutiny this generated among regulatory authorities,[4] the Libra Association (now Diem Association) announced in April 2020 that, in addition to a multi-currency GSC, it would issue single-currency stablecoins denominated respectively in US dollars, euros, pounds and Singaporean dollars. Explaining this move in an updated white paper, the association noted: "A key concern that was shared was the potential for the multi-currency Libra Coin (≋LBR) to interfere with monetary sovereignty" (Libra Association 2020, 10). In May 2021, the Diem Association changed course yet again, announcing it would shift its headquarters from Switzerland to the United States and partner with US-based Silvergate Bank, which will become the exclusive issuer of a Diem US-dollar stablecoin (Wilson and Schroeder 2021). It is unclear whether plans exist to issue single-currency coins denominated in other major currencies in the future, but for now, the focus has shifted to a US-dollar-based approach.

Issuing a stablecoin denominated in US dollars reduces any threat of "Diem-ization" for the United States. But it does little to alleviate the risk to countries that will not have Diem coins denominated in their own currencies. Because the US dollar is highly internationalized, using it as a peg for Diem should make it easier for the stablecoin to move beyond US borders. Moreover, authorities may remain concerned about growing competition from not only private digital currencies but also foreign CBDCs issued by major economic powers such as the United States, Europe and China.[5] Much discussion has taken place about whether governments could use CBDCs to expand the international role of their currencies, which in turn may increase the risk of currency substitution for others. Many have speculated, for example, that China's positioning of itself as a first mover in what has been referred to as the "digital currency arms race" is part of a broader strategy to internationalize the Yuan renminbi (CNY) and challenge the US dollar's global dominance (Bansal 2020; Campbell 2020; Desai 2020; Gaviola 2020; Zetzsche et al., forthcoming).

In reality, China's actions are likely motivated by a number of considerations, the most important of which may be domestic objectives such as promoting financial inclusion and countering the growing power of Alipay and WeChat Pay within its financial system.[6] Yet even

[4] For example, the G7 established a working group on stablecoins that produced a report outlining several concerns with GSCs (BIS 2019).

[5] Of these powers, China is the most advanced in terms of development and implementation of its CBDC. The euro area is preparing for the possible issuance of a digital euro sometime in the next several years and has published reports about what its CBDC might ultimately look like (see ECB 2020), while in the United States it appears that the Federal Reserve will be stepping up its research and activities in this area in the near future (Smith 2021).

[6] Significant currency internationalization would, in any case, require more fundamental changes than issuing even a cutting-edge CBDC, including full capital account liberalization.

domestically motivated CBDC issuance in major economies could have cross-border spillovers that trigger defensive digitalization elsewhere. It is this type of dynamic that Zetzsche et al. (forthcoming, 5)—using the term *sovereign digital currency* (SDC)—envision when they argue that "China's Digital Yuan will prove to be *the* powerful disruption that kickstarts a move from the extensive SDC-related research and piloting we have seen in Canada, England and elsewhere, to multiple instances of SDC *issuance*, particularly by major economies."

3. Implications beyond monetary policy and lender-of-last-resort functions

The monetary sovereignty rationale for CBDCs frames the impact of dollarization in terms of its effects on monetary policy and LLR capabilities. But sovereign currencies have historically served broader objectives as well, and their relative decline could have consequences beyond central bank functions. This section considers a few of these objectives and implications by looking at how currencies act as symbols, provide seigniorage and alter economic geography.

3.1. Symbolism

Beyond their economic effects, modern currencies have served as key symbols of national identity and sovereignty. As Helleiner (2003) documents, fostering a greater sense of national consciousness and unity was indeed an objective among many of the architects responsible for creating national territorial currencies in the 19th century. In their view, notes and coins circulating widely throughout a nation's territory could be an effective vehicle for portraying national images. It was also believed that, if well managed, centralized currencies could bolster trust in national institutions. Moreover, such currencies came to be seen as a quintessential expression of sovereignty—something all independent political communities possessed (ibid).

While these symbolic aspects of currency may have been more relevant during earlier eras when modern nation-states were first being built and consolidated, they have continued to resonate in important ways. When the euro was being debated in the 1990s, for example, arguments about symbolism featured prominently (Cohen 1998; Helleiner 2003). As then International Monetary Fund (IMF) research director Michael Mussa (1995, 98) argued: "Virtually all of the world's nations assert and express their sovereign authority by maintaining a distinct national money and protecting its use within their respective jurisdictions. Money is like a flag; each country has to have its own." While clearly each country does not have to have its own currency, Mussa's sentiment reflected a typical view of currencies as the rightful prerogative of sovereign states.

Today, we might not fret if digital dollarization diminished the use of notes and coins that depict national images. Physical cash already represents a small share of transactions, and issuing a retail CBDC would only further reduce its role. But the symbolic loss of sovereign authority could be more consequential, with implications for public trust in national institutions.

Dollarization can symbolize a weakening of the state's authority and control and potentially contribute to a loss of faith in the state's capacity to govern the macroeconomy (Helleiner 2005, 9). Having the official currency displaced by a foreign CBDC or private GSC would also signal an expansion of foreign or private power over crucial aspects of the domestic economy.

3.2. Seigniorage

Sovereign currencies have also been a source of state revenue via seigniorage, which refers to the difference between the face value of money and the cost to produce it. Seigniorage is effectively "an alternative source of revenue for the state, beyond what government can raise through taxation or borrowing from financial markets" (Cohen 1998, 39). At times, printing money has been an expedient way for governments to finance unexpected emergencies such as wars—a kind of fiscal option of last resort (Cohen 1998; Eichengreen 1994; Glasner 1989). Enhanced fiscal capacity was indeed one of the motivations for creating national currencies in the first place (Helleiner 2003).

How much would it matter if currency substitution undermined a state's ability to generate seigniorage? Today, seigniorage is not a major source of revenue for most states.[7] As many scholars have noted, governments that rely too heavily on printing money to finance expenses tend to produce higher inflation (Cohen 1998; Cukierman, Edwards and Tabellini 1992; Fischer 1982). To the extent that high inflation is a common driver of dollarization, seigniorage could be seen as a potentially self-extinguishing privilege—one that governments may lose if they abuse, provided that residents can access viable substitutes for the official currency.

At the same time, there has been considerable debate recently about the role of sovereign currencies in supporting greater fiscal capacity. Proponents of modern monetary theory (MMT), for example, argue that currency-issuing states face few—if any—budget constraints (Kelton 2020). It is far from clear if this idea applies as widely as MMT scholars suggest (Bonizzi, Kaltenbrunner and Michell 2019; Henwood 2019). Still, seigniorage is likely to remain an important resource that governments want to preserve, not only as a source of ongoing revenue but also, more importantly, as a flexible fiscal option in exceptional circumstances. Seigniorage is also critical to the financial autonomy of central banks. If seigniorage revenues fell so low that central bank operations had to be financed through taxes, this could raise important concerns about central bank independence and the politicization of monetary policy (Engert and Fung 2017).

3.3. Economic geography

Currencies also have an impact on economic geography—patterns of economic activity across physical and virtual spaces—through their effects on transaction costs. Shared use of a currency

[7] In Canada, the Bank of Canada (2020b) sends the federal government roughly $1 billion in seigniorage revenue each year—an amount that would presumably increase marginally with the introduction of a CBDC, which would cost less to produce than physical notes and coins.

within a particular territorial area lowers transaction costs and strengthens transactional networks within that economic space. Recognizing this, many 19th century advocates of national currencies saw them as a tool for building a more integrated national market and for reinforcing the boundaries of this market as a distinctive economic domain (Helleiner 2003).

Before the 19th century, economic life was highly localized, and integrated national markets largely did not exist. Such markets emerged as a result of new transportation and communication technologies, but also through efforts by state authorities to reduce transaction costs within their territories. "A crucial task in this respect," notes Helleiner (2003, 63), "was the building of a national currency," before which many currencies circulated side by side and actors that were "engaged in new nationwide commercial transactions encountered considerable costs in exchanging currencies and assessing their relative worth." In some cases, the goals of creating a national currency were not only to reduce transaction costs within the state's territory but also to draw a more distinct line between the domestic and international economies by increasing the relative transaction costs of foreign trade (Helleiner 2003).

Just as national currencies helped knit national economies together, the displacement of such currencies could further reshape spatial patterns of economic activity. The introduction of the euro, for example, lowered barriers to cross-border transactions within the euro area. Participating countries experienced strengthened economic ties with each other relative to connections within their borders or links with countries outside this new currency zone (Lama and Rabanal 2012; Rose 2000). The emergence of DCAs could similarly alter transactional patterns but in ways that have even less to do with physical territory. As Brunnermeier, James and Landau (2019a) note, DCAs are most likely to emerge through vast digital networks that are not only "larger than many national economies" but also "not bounded by national borders." DCAs could thus significantly reorient patterns of economic activity away from territorial currency areas and strengthen economic ties within new, non-territorial and privately governed digital currency spaces.

Some may welcome DCAs as developments that could potentially enhance efficiency and more accurately reflect optimum currency areas compared with many national economies.[8] But DCAs could also possibly reproduce some of the inefficiencies that were common before national currencies, when multiple monies circulated in fragmented, informal currency zones. DCAs could lead to simultaneous integration and fragmentation, as stronger economic ties are forged within new currency areas while barriers to operating between these DCAs are also created because of divergent regulatory and technical standards (Brunnermeier, James and Landau 2019a). New transaction costs could arise just as old ones are falling, altering the direction and intensity of transactions in ways that individual countries are unable to control. To avoid increasing fragmentation, national policy-makers will have to consider not only

[8] For a literature review of the theory of optimum currency areas, see Kunroo (2016).

whether to issue CBDCs but also how best to coordinate their approaches to digital currencies internationally, including through the development of new global standards.

4. Cross-country differences in monetary policy and lender-of-last-resort capabilities

The implications of digital dollarization explored above apply to all countries that have their own currencies. This section explores the core aspects of monetary sovereignty most commonly discussed in relation to CBDCs—monetary policy and LLR capabilities, which require more than a sovereign currency. To be sure, all countries with these capabilities have their own currencies. But not all countries with their own currencies are equally capable of utilizing monetary policy and LLR tools. Currency-issuing countries are able to exercise these capabilities *to different degrees,* depending on their exchange rate regime and the extent to which their governments and private sectors borrow in the official domestic currency.[9] Other conditions (e.g., institutional arrangements or levels of financial development) may also contribute to a country's degree of monetary sovereignty, but exchange rate and borrowing practices are crucial determinants.

4.1 The role of currencies, exchange rate regimes and borrowing practices

It is often said that the state has a monopoly over the issuance of currency within its borders. But private entities such as banks also create money in their own way, and it is important to distinguish between state-issued currency and private money to highlight the unique role of the former. A state-issued currency is "the official means of payment of a country (or monetary union), denominated in its official monetary unit" (IMF 2020, 11). In most cases, the state establishes the official unit of account and its monetary and fiscal agencies issue liabilities in that unit, including physical notes and coins, central bank reserves and treasury bonds. Private commercial banks expand the money supply through the process of lending, which generates bank deposits and other credit balances—or "book money" (Murau and Pforr 2020). Typically, this private money is denominated in the official state-issued currency and redeemable in that currency, which serves as a safe asset in times of financial stress. As Pistor (2017, 5) notes, "state-issued legal tender serves as a reference for all private moneys, which are priced in public money, and as an asset of last resort whenever the risk of holding money issued by private and thus fallible entities becomes too high."

[9] The term *capabilities* refers to the power or ability to do something but does not imply that this power or ability will be used in any particular way. Depending on policy-makers' specific objectives, additional factors beyond exchange rate and borrowing practices may help achieve these ends.

State-issued currency is thus the ultimate anchor of a monetary system. As Tcherneva (2016) points out, while all other economic actors have to deliver a third party's IOUs to settle their debt obligations (e.g., firms and households use government and commercial bank money, and banks settle debts among themselves with central bank reserves), the state is the only entity that can settle its debts by issuing more of its own liabilities. This eliminates the risk that the government will default on debt obligations denominated in its own currency, giving the state a unique capacity to produce safe assets and stabilize the financial system when crises strike.[10]

The position of sovereign currencies at the heart of their domestic monetary systems allows central banks to effectively conduct monetary policy and act as last-resort lenders. But achieving and maintaining this centrality depends not just on having a sovereign currency but also on the extent to which:

- a country has a fixed versus floating exchange rate
- its government and private sector borrow in the domestic currency[11]

Countries that fix their exchange rate to an external anchor give up monetary policy autonomy in exchange for greater macroeconomic stability, assuming a world of relatively free capital mobility. When a government promises parity or convertibility of its currency for a foreign one at a fixed price, it voluntarily subordinates its currency, which no longer sits atop the domestic monetary hierarchy or serves as the ultimate referent unit of account. To defend its policy, the central bank has to stand ready to convert its monetary liabilities into a currency it has no power to produce. Thus, by relinquishing a key policy tool for governing the domestic macroeconomy and subjecting themselves to greater dependence on external monetary decisions,[12] countries that adopt fixed exchange rates forfeit a significant part of their monetary sovereignty.[13]

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[10] This is a powerful but not unlimited tool, as excessive money creation can—depending on the circumstances—fuel rising inflation and asset prices, create moral hazard and undermine central bank credibility.

[11] Others also highlight the importance of these two factors for a country's monetary capabilities but arrive at different conclusions about what this means for monetary sovereignty. Fazi and Mitchell (2019), for example, note that monetarily sovereign states are ones that issue their own currencies, float it on international markets and issue liabilities only in that currency, but those authors reject the view that monetary sovereignty exists on a spectrum or differs for countries depending on where they fit within a hierarchical international monetary system.

[12] External dependence on foreign states may have different implications than dependence on private GSC issuers. In the latter case, countries would become exposed to "the monetary stance of a private company," raising questions about monetary policy being made by profit-oriented corporations (IMF 2020, 19).

[13] Different degrees of exchange rate fixedness do exist—from pegged floats to currency boards to monetary unions—and thus so do different degrees to which states commit to relinquishing their monetary policy autonomy.

The extent to which a country's government and private sector borrow in the official unit of account also has important implications for monetary policy. A central bank is able to effectively set interest rates by charging or paying interest on the reserve (or settlement) balances of commercial banks only if the banks and their customers predominantly use the official unit of account for settlement purposes (Diez de los Rios and Zhu 2020). Likewise, it can engage in large-scale asset purchases—quantitative easing (QE)—only if those assets are priced in the official currency, which it can produce in whatever quantity is needed (assuming it has not committed to defending a particular exchange rate).

A similar logic applies to financial crisis management. Central banks can act as effective lenders of last resort only if the currency they issue is the one in which the vast majority of assets are priced and debts are denominated. If a large amount of the currency needed to stabilize a financial institution or system is not denominated in the official unit of account, then the central bank will be limited in terms of its stabilizing capacity (unless it has a sizable stockpile of foreign exchange reserves).[14] The country in question may thus have to turn to an external actor like the IMF or US government for liquidity assistance, which could also mean giving up control over how it deals with its crisis. At the very least, this would imply a high degree of dependence on foreign actors to step in with support at critical moments.

Moreover, significant accumulation of debt denominated in a foreign currency (or private equivalent) raises a country's risk of financial instability in the first place. Dubbed the "original sin" problem by Eichengreen, Hausman and Panizza (2005), reliance on foreign-currency borrowing creates currency mismatches that make countries more susceptible to financial shocks, as sharp or sudden depreciation of their official currencies—in which wages are paid and taxes are collected—increases their real debt burden and thus default risk (see also Roubini and Setser 2004). This issue could be amplified if easily accessible digital currencies increased the prospect of more frequent or dramatic capital flight episodes (IMF 2020).[15]

4.2 The monetary sovereignty spectrum

Because exchange rate and borrowing practices vary significantly across countries, monetary sovereignty can be understood as a spectrum of capabilities rather than a binary attribute.

At one end of the spectrum are jurisdictions that issue international reserve currencies: the United States, the euro area, the United Kingdom, Japan, Switzerland, Canada, Australia and China. These entities have significant monetary policy autonomy and strong financial crisis

[14] It is for the same reason that the IMF (2020, 27) notes that "Greater currency substitution induced by CBDC or GSC […] would lead central banks to increase foreign reserves for precautionary motives," since the outcome would be an increase in liabilities denominated in an alternative currency that the central bank cannot itself create.

[15] Ferrari, Mehl and Stracca (2020) also discuss how availability of a foreign CBDC that domestic residents could easily access might lead to increased capital (out)flow volatility, undermining monetary policy autonomy for countries that choose to use interest rates to stem destabilizing outflows.

management capabilities. At the other end of the spectrum are the fully dollarized economies that have adopted a foreign currency for domestic use, such as Ecuador, El Salvador and Panama. These countries have zero monetary policy independence and extremely limited capacity to fight financial crises. Between these two extremes is a range of countries, mostly EMDEs, that have different degrees of partial monetary sovereignty.

Many EMDEs—including a large number of small economies in Africa, Asia and Latin America—issue their own currencies but maintain fixed exchange rate regimes, effectively outsourcing monetary policy. Historically, most EMDEs have also been unable to borrow from foreign creditors in their own currencies, leading governments and private companies to take on debt denominated in a foreign currency—mainly in US dollars or euros. A number of less developed EMDEs are also partially dollarized, with foreign currencies being used not only for cross-border borrowing but also as a domestic medium of exchange, unit of account or store of value (Mwase and Kumah 2015). Substantial dollarization undercuts the basic foundation of monetary sovereignty by displacing state-issued currencies within their own domestic domains.

For many EMDEs, partial dollarization, fixed exchange rates and foreign-currency borrowing remain important constraints.[16] But a number of larger, more developed emerging economies have managed to ease these constraints in recent years. Many now maintain floating exchange rates[17] and have expanded their ability to borrow—in both domestic and international markets—in their own currencies.[18] A significant portion of domestic-currency EMDE debt is held by foreign investors and is thus subject to the whims of global financial markets, which may be volatile and respond to global financial conditions rather than developments in the debtor country. But even in many countries with high levels of foreign ownership—e.g., Mexico, Indonesia, Poland and Peru, where foreign ownership of local-currency debt exceeded 35 percent at the start of 2016—the majority of local-currency government debt is held by domestic residents (Moore 2016). As Gelpern (2008, 117–118) points out, while there are distinct advantages and disadvantages of borrowing from domestic versus foreign creditors, governments tend to have a wider range of debt management tools at their disposal when debt is held by residents. The growth of domestic-currency debt, especially that owed to

[16] These constraints, as well as others, have often been described as limiting countries' macroeconomic policy autonomy or "policy space" (e.g., Chang and Grabel 2004; Grabel 2017; Ocampo and Vos 2008; Klein and Shambaugh 2015), concepts that are broader than, but closely related to, the idea of monetary sovereignty.

[17] Examples include India, Brazil, South Africa, Mexico, Turkey, Indonesia, Colombia, Peru and Philippines.

[18] As early as 2015, bonds denominated in domestic currencies accounted for 86 percent of total gross sovereign debt in Mexico, 91 percent in South Africa and 95 percent in Brazil (BIS 2017). The average for a broader group of these higher-income EMDEs was roughly 65 percent, suggesting that many countries are overcoming the "original sin" problem. This latter number is based on an average of the following countries at the end of 2014: Brazil, China, Colombia, Hungary, Indonesia, Lebanon, Malaysia, Mexico, Peru, Philippines, South Africa, Thailand and Turkey (Harwood 2015).

residents, suggests that some EMDEs have expanded the scope of their monetary sovereignty over time.[19]

For now, however, these countries remain more constrained than the top tier of reserve-currency issuers. States belonging to the latter group maintain floating exchange rates and borrow almost exclusively in their own currencies. Their private sectors also issue debt predominately in the domestic currency, reducing the risk of currency mismatches and allowing central banks to serve as credible LLRs.[20] Stronger global demand for their currencies and deeper domestic financial markets also mean greater appetite for their sovereign bonds, which lowers borrowing costs and gives authorities more macroeconomic flexibility. Reserve-issuing countries also face looser balance-of-payments constraints, as they can more often use their own currencies for international transactions or to easily access the foreign currencies needed for such transactions through highly liquid foreign exchange markets.

As with EMDEs, however, important within-group differences exist among reserve issuers. The United States is unrivalled in its monetary power due to the dominant global role of the US dollar. This allows it to run large and sustained balance-of-payments deficits with little financial constraint and gives US authorities unparalleled macroeconomic policy capacity (Eichengreen 2012; McDowell 2017; Norrlof 2014). The second-most internationalized currency, the euro, is also a special case. Euro area members have little monetary sovereignty as individual countries—especially the smaller ones—but have strong monetary policy and LLR capabilities as a collective, represented through the ECB and other supranational institutions.

China is also a unique case. Unlike other reserve-issuing countries, China carefully manages its exchange rate, despite having moved toward a more flexible regime over the past 15 years (Das 2019). What gives China a greater degree of monetary sovereignty than other countries with fixed or managed exchange rates is its extensive use of capital controls, which helps to preserve its monetary policy autonomy and prevent destabilizing capital flows. Its low levels of foreign-currency debt also enable the central bank to act as an effective LLR in the event of a domestic financial crisis. If China's capital controls become less effective or are eased to facilitate policy goals like internationalization of the renminbi, then it will likely have to embrace a freer floating exchange rate to preserve its monetary policy autonomy.

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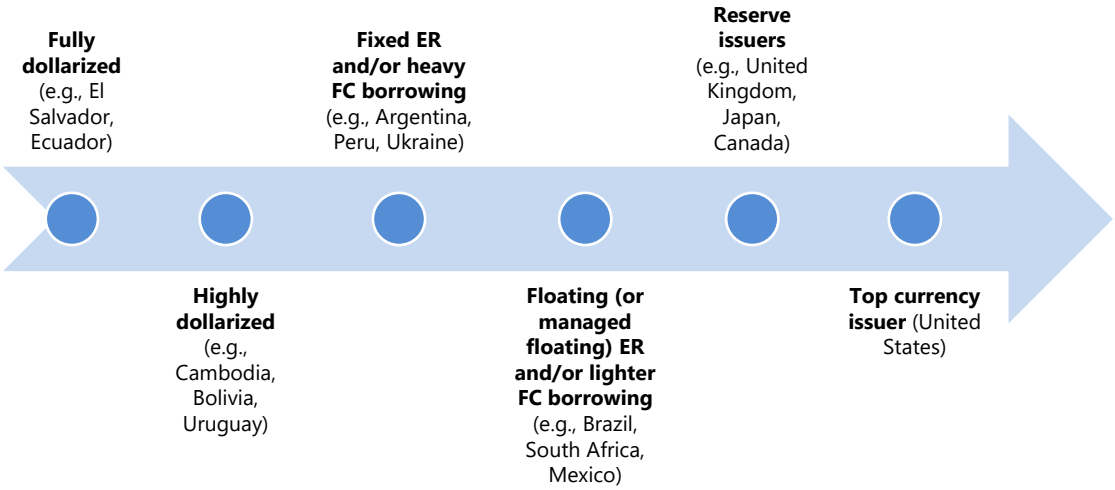
[19] A recent example that may speak to increasing monetary capabilities is the first-time use of QE policies by several EMDEs in response to COVID-19. While this experience has been broadly positive so far, there are likely greater risks and limitations to the use of QE and similar expansionary policies for EMDEs compared with their advanced economy counterparts (see Drakopoulos et al. 2020; Strohecker 2020; The Economist 2020).

[20] The exception to this may be non-US global banks that accumulate significant liabilities denominated in US dollars through international funding markets. For a discussion of the fragilities this can cause and the crisis management mechanisms that have emerged to address them, see McDowell 2017.

Figure 1: The monetary sovereignty spectrum visualized



Note: ER is exchange rate; FC is foreign currency.

In light of the above, monetary sovereignty can be seen as a spectrum of capabilities rather than something that countries either have or do not depending on whether they issue their own currency—although issuing one's own currency is a prerequisite for developing these capabilities. By eroding a domestic currency's position within its home economy, currency substitution threatens to also erode the various aspects of monetary sovereignty that depend on it, with unequal consequences for countries at different positions along the spectrum.[21] Because some countries effectively have more monetary sovereignty than others, they also have relatively more to lose from currency substitution. The next section considers how the risk of substitution varies across countries.

5. The (uneven) risk of currency substitution

Just as some countries have relatively more to lose from dollarization, the risk of it happening is also higher for certain countries. This section suggests that the relative impact and risk of currency substitution are inversely related: countries with the most monetary sovereignty and the most to lose from substitution are also generally the least susceptible to it, and vice versa.

It is important to first consider the determinants of dollarization and how they might change with the emergence of new digital currencies. Dollarization is driven by demand for superior alternatives to a domestic currency and enabled by an accessible supply of such alternatives. This demand, in turn, is determined by the performance of the domestic currency—as well as the broader monetary regime in which it exists—relative to viable alternatives (Bannister, Gardberg and Turunen 2018; De Nicolo, Honohan and Ize 2005; Ize and Levy Yeyati 2003; Levy

[21] In addition to the above analysis, discussion of how currency substitution weakens monetary policy effectiveness and lender-of-last-resort capabilities can be found in IMF (2020).

Yeyati 2006).[22] If the domestic currency suffers from high inflation or exchange rate volatility relative to alternatives, domestic residents have a strong incentive to switch. But the size of the performance gap likely matters. If the domestic currency is performing its key functions relatively well, switching to a currency that is only marginally more attractive may not make sense for residents. This is because doing so would also entail taking on foreign exchange risk if wages, taxes and other essential payments continued to be denominated in the domestic currency.

Strong demand for dollarization is thus more likely in countries that have suffered from significant or persistent price instability, which erodes the official currency's ability to function as a reliable store of value or unit of account (IMF 2020). If the currency cannot serve these purposes, residents will generally seek to hold financial assets and liabilities denominated in a foreign money, which is also likely to make the latter a more prevalent medium of exchange in the domestic economy. Today, roughly one-third of countries experience substantial dollarization, with foreign currency being used for more than 30 percent of all deposits or loans. Foreign currency accounts for more than half of total deposits in 17 percent of countries and over half of total loans in 11 percent (IMF 2020). Importantly, all of these countries are EMDEs that have struggled with monetary instability (Bannister et al. 2018).

Current dollarization figures almost certainly underestimate the actual level of demand for monetary substitutes in various societies. This is because currency substitution also requires an accessible supply of alternative currency instruments that can be used by domestic residents. And even when alternatives exist, the degree to which domestic firms and residents can access them can be constrained by government policy or deficient payment systems (Burnside, Eichenbaum and Rebelo 2001; Broda and Levy Yeyati 2006; Garcia-Escribano and Sosa 2011). For example, until recently, the Venezuelan government upheld formal restrictions on the domestic use of foreign currencies in an attempt to stem widespread dollarization (Pons and Armas 2020). Although domestic banks have now been permitted to offer US-dollar bank accounts, transactions remain "limited due to the lack of a clearing system that would allow wire transfer of funds between banks" (Vazquez and Yapur 2021). The implication is that there may, in fact, be pent-up demand that could be unleashed if attractive currency substitutes became even more accessible.

How might the emergence of new digital currencies affect the prospect of currency substitution? Generally, analysts anticipate that it will intensify currency competition and increase the risk of substitution by expanding the supply of attractive and accessible currencies to choose from (Brunnermeier, James and Landau 2019a, 2019b). As noted in Section 2, CBDCs and GSCs may offer unique design features (e.g., compatibility with smart contracts,

[22] Here, performance refers to stability and credibility. Stable currencies and regimes are characterized by low levels of inflation and exchange rate volatility. Credible regimes are those in which stability is broadly expected to persist based on a widely shared perception of sound policies and institutions.

interoperability with other financial services) and network externalities (e.g., integration with and across vast online platforms) that enhance their attractiveness relative to traditional sovereign money. Their arrival could therefore widen the performance gap between a given domestic currency—even a relatively stable one—and some new foreign or private digital alternative, increasing demand for such an alternative. The novel attributes of a private digital money like Diem may not provide a superior unit of account or store of value compared with a strong sovereign currency, but they may offer a more efficient payment instrument and system. Still, if Canadians were to use Diem coins for payments, it would also imply greater use of an alternative unit of account—namely US dollars, which will serve as the underlying anchor to which Diem is tied.

The point here is that by outperforming traditional sovereign currencies in a number of areas, new digital monies could contribute to a generalized increase in the risk of currency substitution across countries. This risk, however, is likely to remain greatest for the countries that have traditionally been most susceptible to dollarization—i.e., those with high or persistent monetary instability. Residents of these countries will still have the strongest incentive to adopt foreign or private currencies—for store of value as well as payment purposes—because the performance gap between their domestic money and the leading alternative will continue to be much larger than in countries with stable monetary regimes. In countries with stable regimes, individuals and businesses may not see as compelling a case for switching to currencies that represent a marginal improvement, especially since doing so also brings foreign exchange risks and subjects residents to the decisions of monetary authorities that are not domestically accountable. Alternatively, people may decide to embrace private or foreign digital currencies but only for narrow or select purposes that pose less of a threat to monetary sovereignty. It is not clear, for example, whether using the Diem payment system for a portion of online transactions would materially affect the central bank's monetary policy and LLR capacities if wages, debt contracts and bank deposits continued to be denominated in the official domestic currency.

Another reason why economies with weak or unstable monetary systems are likely to remain most susceptible to currency substitution relates to the accessibility of digital money. By providing monetary instruments and payment systems that can be easily accessed on mobile devices around the world, and that enable peer-to-peer transactions that circumvent traditional banking systems, CBDCs and GSCs may help to unleash digital dollarization in countries with pre-existing but unmet demand for better monetary arrangements. This type of demand is likely to exist only in countries where monetary performance has been poor, and where formal restrictions, underdeveloped banking systems or technological barriers have stifled attempts to access better currency alternatives. It is unlikely to exist in advanced open economies where money is generally stable and obstacles to accessing foreign currencies are minimal.

Overall, while new digital currencies could increase the risk of dollarization for a wide range of countries, this risk remains greatest for a certain subset of EMDEs—particularly those in which

the demand for alternatives is driven by poor domestic monetary performance and where better access to such alternatives would help to satisfy this demand. As the IMF (2020, 16) notes: "In countries struggling with less credible monetary policy regimes and poor track records of price stability, the emergence of CBDCs and GSCs may exacerbate the problem of currency substitution due to better accessibility."

The countries most susceptible to digital dollarization are also likely to have minimal monetary sovereignty. This is because the initial conditions that lead to dollarization (e.g., extreme or persistent monetary instability) tend to be present more often in countries at the weaker end of the monetary sovereignty spectrum, where instability may cause—or be caused by—foreign-currency borrowing or (failed) efforts to fix the exchange rate. Conversely, countries at the stronger end of the spectrum are also generally those with the most advanced monetary systems, making them comparatively less vulnerable to currency substitution. As noted above, while digital money may offer certain functional improvements over traditional currencies, the performance gap that drives demand for substitution will remain largest in countries where domestic currencies are unable to serve their core functions. In general, then, we could say there is an inverse relationship between the likelihood of currency substitution and its impact on monetary sovereignty, in the sense that those with the most monetary sovereignty to lose from digital dollarization are also the least susceptible to it, and vice versa.[23]

This is not meant to suggest that countries with substantial monetary sovereignty face no risk of either lasting currency substitution or increased disruption and volatility from more frequent short-term switching among digital currencies (Ferrari, Mehl and Stracca 2020). For reasons noted in Section 2, the risk of digital dollarization may increase for all countries, but because of country-specific conditions and demand-side factors, this risk is—and will likely continue to be—unevenly distributed. Still, countries for which dollarization would be a low-probability, high-impact event should take proactive steps to understand and mitigate this tail risk.

The suggestion that the countries most at risk of dollarization have the least to lose from it also does not mean that monetary sovereignty is unimportant to these countries. Even the more basic benefits of currency issuance (e.g., the symbolic, seigniorage and geographical aspects discussed in Section 3) can matter. Perhaps more importantly, issuing a sovereign currency provides a foundation upon which to develop the types of monetary policy and LLR capabilities discussed in Section 4. As that section notes, some countries—particularly a number of more developed EMDEs—have managed to expand the scope of their monetary sovereignty over time. The prospect of advancing in these ways is much slimmer for countries affected by

[23] As noted at the outset of this paper, potential motivations for issuing CBDCs can differ. Countries with minimal monetary sovereignty can issue CBDCs for reasons that have little to do with preventing currency substitution. For example, the Bahamas recently issued one of the first CBDCs—the Sand Dollar—which is intended to serve a number of objectives, from improving financial inclusion and payments modernization to reducing illicit economic activities and lowering the costs of distributing cash across many small islands.

significant currency substitution, which tends to be persistent and thus difficult to reverse even after the initial conditions that triggered it have abated (Winkelried and Castillo 2010).[24]

6. Implications and conclusion

The prospect of fiercer currency competition brought on by new digital currencies has triggered discussions about monetary sovereignty and the potential role of CBDCs in protecting it. This paper contributes to these discussions in three ways. First, it points out potential consequences of digital dollarization that go beyond monetary policy and LLR concerns, and that have thus far received little attention in the CBDC literature. Second, by exploring the basis for differences in monetary policy and LLR capabilities across countries, the paper highlights—at a conceptual level—important variation in the degree of monetary sovereignty and the consequences of losing it. Finally, by contrasting these differences with the unequal risk of currency substitution, the paper draws attention to an important inverse relationship between the impact and probability of losing monetary sovereignty.

Some of these cross-country differences also have implications for whether CBDCs are an appropriate mechanism for defending monetary sovereignty. CBDCs may be a useful defence mechanism for countries with relatively strong monetary systems if they judge the risk of digital dollarization to be high *despite* their positions of strength. In this case, substitution is likely to be driven more by the attractiveness of new digital currencies and less by fundamental economic weaknesses in the country in question, and it could therefore possibly be prevented or minimized by providing currency users with an equally or more attractive CBDC. Conversely, for countries that have deeper macroeconomic and financial issues—including high or persistent inflation—CBDC issuance is unlikely to prevent currency substitution. CBDCs are not going to fix many of the underlying problems that contribute to demand for a more reliable alternative currency. For example, Venezuela's launch of its own cryptocurrency, the Petro, in 2017 did little to stabilize the country's currency or stem widespread dollarization.

International variation in the risk of digital dollarization occurring—and its consequences—may also have implications for the strategic timing and sequencing of CBDC issuance. It may be that countries most concerned about monetary sovereignty are also most prone to dynamics akin to an arms race, since their motivation would be a defensive response to the proliferation of other digital currencies. This stands in contrast to internally oriented considerations such as financial inclusion, which are more likely to move at their own pace rather than react to, or

[24] It is important to note that dollarization is not all bad. For residents searching for more reliable ways to store and transfer wealth, the availability of better alternatives to the domestic currency can greatly improve their economic well-being. The point in this paper is that dollarization is a threat to monetary sovereignty and its foundations, and that such sovereignty is critical to the state's capacity to effectively organize and govern macroeconomic life. Existing literature also suggests that dollarization can be costly in other ways, including by hampering long-term financial development (see Bannister, Gardberg and Turunen 2018).

interact with, international developments. Authorities that are particularly concerned about the threat of dollarization may also act early to pre-empt it.

Which countries might be most concerned about threats to their monetary sovereignty? In light of the above analysis, the answer is not immediately clear because those with the most to lose are likely the least susceptible to currency substitution, while those that are most susceptible have relatively less to lose. Perhaps, then, it is the emerging markets in the middle of the monetary sovereignty spectrum—especially those that have been moving toward the stronger end—that should be most vigilant in this regard. As Jean-Pierre Landau (2020), former deputy governor of the Bank of France, recently remarked:

> …those who are most potentially destabilized by the appearance of digital currencies […] are a class of emerging economies who are large enough to cherish their monetary autonomy and refuse dollarization—even digital dollarization—and small enough not to be able to impose their own currency in international digital payments.

This is, of course, a general inference about a broad group of diverse countries. A more granular comparative analysis would help to establish a clearer picture of which countries specifically—both within the emerging-market category and at the weaker and stronger ends of the monetary sovereignty spectrum—might have most cause for concern.

It is also important to note that CBDCs are only one of many options for defending monetary sovereignty. Authorities could use other tools, such as regulations to limit the use of GSCs and foreign CBDCs in their economies.[25] Whatever their approach, authorities will have to consider not only domestic needs but also the international effects of their policies and how to coordinate with other jurisdictions to avoid arbitrage and increased fragmentation of the global monetary system. Perhaps the most ambitious form of international cooperation would be for authorities to jointly create what Mark Carney (2019, 15) called a "synthetic hegemonic currency" (SHC) made up of a basket of major CBDCs. There is a trade-off, however, between the political feasibility and the practical impact of such an arrangement. If similar to the IMF's special drawing rights but in digital form, an SHC could be feasible, but its adoption among private market participants would be hampered by its limited supply.[26] Efforts to create something closer to a genuine shared global currency are a political non-starter. Among other

[25] It is worth noting that there are limitations to the extreme version of this regulatory approach that seeks to prohibit the use of alternative currencies. First, governments will likely struggle to prevent the use of new digital currencies operating in and across their borders if strong demand for such alternatives exists. Second, if residents are switching to a new digital currency because it provides real advantages, then stifling it would likely also be harmful to economic innovation, competition and openness.

[26] One difference is that special drawing rights have always suffered from a lack of interoperability, whereas an SHC could be designed to be more compatible and convertible within the global monetary system.

issues, this kind of supranational SHC would pose new challenges to monetary sovereignty rather than dealing with the ones that helped spark interest in CBDCs in the first place.

Protecting monetary sovereignty has been an important motivation for considering CBDCs. As digital currency developments unfold, it will be crucial to monitor and analyze the relative risk and implications of currency substitution for different countries, as well as the extent to which CBDCs provide an antidote. This paper provides something of a conceptual framework for doing so from an international comparative perspective.

References

Ajide, K.B, I.D. Raheem, and S.A. Asongu. 2019. "Dollarization and the 'Unbundling' of Globalization in Sub-Saharan Africa." *Research in International Business and Finance* 47: 398–409.

Auer, R., G. Cornelli and J. Frost. 2020. "Rise of the Central Bank Digital Currencies: Drivers, Approaches and Technologies." BIS Working Papers No. 880, Monetary and Economic Department.

Bank of Canada. 2020a. "Contingency Planning for a Central Bank Digital Currency." February 25. https://www.bankofcanada.ca/2020/02/contingency-planning-central-bank-digital-currency/#:~:text=A%20retail%20CBDC%20is%20defined,interest%20and%20be%20universally%20accessible.

Bank of Canada. 2020b. "Understanding Seigniorage." May 6. https://www.bankofcanada.ca/2020/05/seigniorage/#:~:text=Seigniorage%20refers%20to%20the%20interest,becomes%20part%20of%20its%20revenue.

Bannister, G. J., M. Gardberg and J. Turunen. 2018. "Dollarization and Financial Development." IMF Working Paper No. 18/200.

Bansal, R. 2020. "China's Central Bank Unveils Digital Currency, in Challenge to U.S. Dollar," *Carnegie India* (commentary). June 4. https://carnegieindia.org/2020/06/04/china-s-central-bank-unveils-digital-currency-in-challenge-to-u.s.-dollar-pub-81969.

BIS (Bank for International Settlements). 2017. "Debt Securities Issued and Amounts Outstanding."

BIS. 2019. "Investigating the Impact of Global Stablecoins." G7 Working Group on Stablecoins. October.

BIS. 2020. "Central Bank Digital Currencies: Foundational Principles and Core Features." October 9.

Bonizzi, B., A. Kaltenbrunner and J. Michell. 2019. "Monetary Sovereignty Is a Spectrum: Modern Monetary Theory and Developing Countries." *Real-World Economics Review* 89: 46–61.

Broda, C., and E. Levy Yeyati. 2006. "Endogenous Deposit Dollarization," *Journal of Money, Credit and Banking* 38 (4): 963–988.

Brunnermeier, M., H. James and J.-P. Landau. 2019a. "Digital Currency Areas." VOXEU. July 3. https://voxeu.org/article/digital-currency-areas.

Brunnermeier, M., H. James and J.-P. Landau. 2019b. "The Digitalization of Money." National Bureau of Economic Research Working Paper 26300.

Burnside, C., M. Eichenbaum and S. Rebelo. 2001. "Hedging and Financial Fragility in Fixed Exchange Rate Regimes." *European Economic Review* 45 (7): 1151–1193.

Campbell, B. R. 2020. "The Digital Currency Arms Race: Central Banks Enter the Fray to Protect National Sovereignty." *The Globe and Mail*. October 18. https://www.theglobeandmail.com/business/commentary/article-the-digital-currency-arms-race-central-banks-enter-the-fray-to/

Carney, M. 2019. "The Growing Challenges for Monetary Policy in the current International Monetary and Financial System." Speech at Jackson Hole Economic Policy Symposium 2019, Jackson Hole, Wyoming, August 23.

Chang, H. and I. Grabel. 2004. *Reclaiming Development: An Alternative Economic Policy Manual*. Black Point: Fernwood Publishing Ltd.

Cohen, B. J. 1998. *The Geography of Money*. Ithaca and London: Cornell University Press.

Cukierman, A., S. Edwards and G. Tabellini. 1992. "Seigniorage and Political Instability," *American Economic Review* 82 (3): 537–555.

Das, S. 2019. "China's Evolving Exchange Rate Regime." IMF Working Paper No. 19/50.

De Nicolo, G., P. Honohan and A. Ize. 2005. "Dollarization of Bank Deposits: Causes and Consequences." *Journal of Banking and Finance* 29 (7): 1697–1727.

Desai, U. 2020. "China's Digital Push Could Help Internationalise the Yuan." *Asia Financial*. May 27. https://www.asiatimesfinancial.com/chinas-digital-push-could-help-internationalise-the-yuan.

Diez de los Rios, A. and Y. Zhu. 2020. "CBDC and Monetary Sovereignty." Bank of Canada Staff Analytical Note No. 2020-5.

Drakopoulos, D., R. Goel, F. Natalucci and E. Papageorgiou. 2020. "Emerging and Frontier Markets: Policy Tools in Times of Financial Stress." IMFBlog. October 23.

ECB (European Central Bank). 2020. *Report on a Digital Euro*. October.

Eichengreen, B. 1994. *International Monetary Arrangements for the 21st Century*. Washington: Brookings Institution Press.

Eichengreen, B. 2012. *Exorbitant Privilege: The Rise and Fall of the Dollar and the Future of the International Monetary System*. Oxford: Oxford University Press.

Eichengreen, B., R. Hausmann, and U. Panizza. 2005. "Chapter 1: The Pain of Original Sin." In *Other People's Money: Debt Denomination and Financial Instability in Emerging Market Economies*, edited by B. Eichengreen and R. Hausmann. Chicago: University of Chicago Press.

Engert, W. and B. S. C. Fung. 2017. "Central Bank Digital Currency: Motivations and Implications." Bank of Canada Staff Discussion Paper No. 2017-16.

Fazi, T. and B. Mitchell. 2019. "For MMT," *Tribune*. June 5. https://tribunemag.co.uk/2019/06/for-mmt

Ferrari, M., A. Mehl and L. Stracca. 2020. "The International Dimension of a Central Bank Digital Currency." VOXEU. October 12. https://voxeu.org/article/international-dimension-central-bank-digital-currency

Fischer, S. 1982. "Seigniorage and the Case for a National Money," *Journal of Political Economy* 90 (2): 295–313.

Garcia-Escribano, M. and S. Sosa. 2011. "What is Driving Financial De-Dollarization in Latin America?" IMF Working Paper No. 11/10.

Gaviola, A. 2020. "The 'Global Arms Race' of the Decade is a Rush to Create a Digital Currency." *BNN Bloomberg*. October 16. https://www.bnnbloomberg.ca/the-global-arms-race-of-the-decade-is-a-rush-to-create-a-digital-currency-1.1509206

Gelpern, A. 2008. "Domestic Bonds, Credit Derivatives, and the Next Transformation of Sovereign Debt," *Chicago-Kent Law Review* 83 (1): 147–178.

Glasner, D. 1989. *Free Banking and Monetary Reform*. Cambridge: Cambridge University Press.

Grabel, I. 2017. *When Things Don't Fall Apart: Global Financial Governance and Development Finance in an Age of Productive Incoherence*. Cambridge: MIT Press.

Harwood, A. 2015. "Developing Domestic Debt Markets: Trends, Challenges and Priority Actions." Presentation at DMF II Stakeholders' Forum, Manila, June.

Helleiner, E. 2003. *The Making of National Money: Territorial Currencies in Historical Perspective*. Ithaca and London: Cornell University Press.

Helleiner, E. 2005. "Structural Power in International Monetary Relations." European University Institute Working Paper No. 2005/10.

Henwood, D. 2019. "Modern Monetary Theory Isn't Helping." *Jacobin*. February 21. https://jacobinmag.com/2019/02/modern-monetary-theory-isnt-helping

IMF (International Monetary Fund). 2020. "Digital Money Across Borders: Macro-Financial Implications." IMF Policy Paper No. 2020/050.

Ize, A. and E. Levy Yeyati. 2003. "Financial Dollarization." *Journal of International Economics* 59 (2): 323–347.

Kelton, S. 2020. *The Deficit Myth: Modern Monetary Theory and the Birth of the People's Economy*. New York: Public Affairs.

King, R. 2020. "The Central Bank Digital Currency Survey 2020 – Debunking Some Myths." *Central Banking*. May 7.

Klein, M. W. and J. C. Shambaugh. 2015. "Rounding the Corners of the Policy Trilemma: Sources of Monetary Policy Autonomy." *American Economic Journal: Macroeconomics* 7 (4): 33–66.

Kunroo, M. H. 2016. "Theory of Optimum Currency Areas: A Literature Survey," *Review of Market Integration* 7 (2): 87–116.

Lama, R. and P. Rabanal. 2012. "Deciding to Enter a Monetary Union: The Role of Trade and Financial Linkages." IMF Working Paper No. 12/240.

Landau, J. P. 2020. "The New Digitalisation of International Finance and the Future of the International Monetary System." Virtual roundtable hosted by Reinventing Bretton Woods Committee, November 5. https://www.reinventingbrettonwoods.org/session-videos-cbdc/

Levy Yeyati, E. 2006. "Financial Dollarization: Evaluating the Consequences." *Economic Policy* 21 (45): 61–118.

Levy Yeyati, E. and F. Sturzenegger, eds. 2002. *Dollarization: Debates and Policy Alternatives*. Cambridge: The MIT Press.

Libra Association. 2020. "White Paper v2.0." https://wp.diem.com/en-US/wp-content/uploads/sites/23/2020/04/Libra_WhitePaperV2_April2020.pdf

McDowell, D. 2017. *Brother, Can You Spare a Billion? The United States, the IMF, and the International Lender of Last Resort*. New York: Oxford University Press.

Moore, E. 2016. "Emerging Market Bonds Hit as Investors Dump Debt." *Financial Times*. February 23.

Murau, S. and T. Pforr. 2020. "What Is Money in a Critical Macro-Finance Framework?" *Finance and Society* 6 (1): 56–66.

Mussa, M. 1995. "Chapter 3: Panel: One Money for How Many?" In *Understanding Interdependence: The Macroeconomics of the Open Economy*, edited by P. B. Kenen, 84–97. Princeton: Princeton University Press.

Mwase, N. and F. Y. Kumah. 2015. "Revisiting the Concept of Dollarization: The Global Financial Crisis and Dollarization in Low-Income Countries." IMF Working Paper No. 15/12.

Norrlof, C. 2014. "Dollar Hegemony: A Power Analysis." *Review of International Political Economy* 21 (5): 1042–1070.

Ocampo, J. A. and R. Vos. 2008. "Policy Space and the Changing Paradigm in Conducting Macroeconomic Policies in Developing Countries." In *New Financing Trends in Latin America: A Bumpy Road Towards Stability*, edited by Bank for International Settlements, 28–45.

OMFIF (Official Monetary and Financial Institutions Forum). 2019. "Retail CBDCs: The Next Payments Frontier."

Pistor, K. 2017. *From Territorial to Monetary Sovereignty*, 18 Theoretical Inq. L. 491 Columbia Law School Center for Law & Economic Studies Working Paper N. 591.

Pons, C. and M. Armas. 2020. "Exclusive: Venezuelan Banks Begin Storing Dollars amid Maduro's Liberalization – Sources." *Reuters*. February 4. https://www.reuters.com/article/us-venezuela-banks-exclusive-idUSKBN1ZY1IX

Prasad, E. Forthcoming. *The Future of Money: How the Digital Revolution Is Transforming Currencies and Finance*. Cambridge: Harvard University Press.

Rose, A. 2000. "One Money, One Market: Estimating the Effect of Common Currency on Trade." *Economic Policy* 15 (30): 7–33.

Roubini, N. and B. Setser. 2004. *Bailouts or Bail-Ins? Responding to Financial Crises in Emerging Economies*. Washington: Institute for International Economics.

Sachs, J. and F. Larrain. 1999. "Why Dollarization Is More Straightjacket than Salvation." *Foreign Policy* No. 116 (Autumn): 80–92.

Smith, C. 2021. "Powell Advances Fed Work on Possible 'Digital Dollar'." *Financial Times*. May 20.

Strohecker, K. 2020. "Analysis: Thumbs up for Emerging Markets' QE Experiment but Risks Loom." *Reuters*. December 29. https://www.reuters.com/article/emerging-markets-qe-yearend-analysis-int-idUSKBN2930FW

Tcherneva, P. R. 2016. "Money, Power, and Monetary Regimes." Levy Economics Institute of Bard College Working Paper No. 861.

The Economist. 2020. "Emerging Markets Launch QE, too." May 9. https://www.economist.com/finance-and-economics/2020/05/07/emerging-markets-launch-qe-too

The Economist. 2021. "Will the Dollar Stay Dominant? Digital Money May Pose a New Threat to Dollar Hegemony." May 8. https://www.economist.com/special-report/2021/05/06/will-the-dollar-stay-dominant

Vasquez, A. and N. Yapur. 2021. "Venezuela Moves Closer to Dollarization With New Bank Rules." *BNN Bloomberg*. January 13. https://www.bnnbloomberg.ca/venezuela-moves-closer-to-dollarization-with-new-bank-rules-1.1548073

Viñuela, C., J. Sapena and G. Wandosell. 2020. "The Future of Money and the Central Bank Digital Currency Dilemma." *Sustainability* 12 (22): article number 9697.

Wilson, T. and P. Schroeder. 2021. "Facebook-Backed Crypto Project Diem to Launch U.S. Stablecoin in Major Shift." *Reuters*. May 12.

https://www.reuters.com/technology/facebook-backed-crypto-project-diem-launch-us-stablecoin-major-shift-2021-05-12/

Winkelried, D. and P. Castillo. 2010. "Dollarization Persistence and Individual Heterogeneity." *Journal of International Money and Finance* 29 (8): 1596–1618.

Zetzsche, D. A., R. P. Buckley, D. W. Arner, A. Didenko and L. v. Romburg. Forthcoming. "Sovereign Digital Currencies: The Future of Money and Payments?" University of Hong Kong Faculty of Law Research Paper.