



RESEARCH ARTICLE

Negotiating currency internationalization: An infrastructural analysis of the digital RMB

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Abstract

In what ways might the digital renminbi (RMB), also known as e-CNY, bolster China's efforts to internationalize its currency? Utilizing Susan Strange's concept of currency negotiation and borrowing the concept of infrastructures from science, technology, and society studies, this article argues that RMB internationalization is a gradual process that relies heavily on negotiation involving both state and non-state actors (i.e., private financial authorities). It further argues that while e-CNY may create new opportunities for RMB internationalization, it also raises new challenges. First, the e-CNY's lack of coordination with other central banks represents a challenge for future evolution and standardization with other digital currency platforms, thus rendering first-mover status a potential disadvantage. Second, as a result of China's divergent data governance direction from both the US and the EU, the e-CNY is disadvantaged when it comes to interoperability, trust of users, and diversity of data. The purpose of this study is not to predict the future of RMB internationalization once the e-CNY rolls out but rather to highlight various ways in which the latter may influence the former in order to widen analyses of the topic.

Keywords: Financial networks; digital currency; infrastructures; currency internationalization; Renminbi

Introduction

Since 2009, China has been increasingly trying to internationalize the *renminbi* (RMB) and has succeeded in securing its addition to the IMF's Special Drawing Rights (SDR). However, to many, the RMB and the Chinese financial system are still considered to be immature and ill-equipped, and confidence in Chinese institutions remains limited (Gao and Yu, 2009; Lyratzakis, 2014; Subacchi, 2017). The Chinese economy is dominated by exporting firms and state-owned enterprises (SOE) and their privileged access to cheap loans create market distortions and financial repression (Gruin, 2013: 81). The current architecture of the Chinese financial system makes it vulnerable to financial liberalization, which could encourage Chinese investors to invest in foreign markets for higher returns and greater safety. As such, the RMB is still an 'immature currency' because its international use, exchange, and circulation, along with its payment facilities, are limited. Moreover, allowing large amounts of RMB to circulate outside of China requires shifting Chinese demand from investment for export production to domestic consumption, which would then also increase the global demand for consumer goods and services (Germain and Schwartz, 2017: 768). Such a shift threatens the status quo in China where it would reduce the power and control of state elites and SOEs within the Chinese financial system.

China nevertheless maintains an advantage in one key area: financial technology. RMB internationalization could be synonymous with RMB digitization. The digital RMB (or e-CNY) is a central bank digital currency (CBDC) project China has been working on since 2014, starting with a series of working papers, before completing its first blockchain trials in 2017. More recently, in January 2021, the Digital Currency Research Institute, Cross-Border Interbank Payment System (CIPS), and the China National Clearing Centre within the People's Bank of China (PBOC) established a joint venture with the Society for Worldwide Interbank Financial Telecommunications (SWIFT), the world's largest electronic payment messaging system, called the Financial Gateway Information Services, for the development of systems integration and data processing as well as technical consulting (China Banking News, 2021).

In light of these developments, this article explores the potential of the e-CNY for internationalizing the RMB to rival the American dollar as the leading global currency. It asks: in what ways might e-CNY bolster China's efforts to internationalize the RMB? I argue that RMB internationalization is a gradual process that relies heavily on negotiation among both state and non-state actors (i.e., private financial actors). I further argue that while e-CNY may create new opportunities for RMB internationalization, it also raises novel challenges.

The article is divided into three main sections. I begin with a review of existing literature on RMB internationalization as well as e-CNY. In the second section, I explore two ways in which e-CNY may bolster RMB internationalization. First, I argue that e-CNY attempts to create the socio-political and qualitative foundations of a top international currency. As such, it is important to recognize e-CNY as both a technological and social system and network, rather than just digital money. Second, I argue that because digital currency competition depends heavily on the platforms and networks they rest on, e-CNY should bolster China's growing influence in international financial standard setting. In that context, I examine e-CNY's relationship with SWIFT and the role of CIPS as well as China's increasing role in the 'Basel Process' of international financial standard-setting.

In the third section, I examine two novel challenges e-CNY creates for RMB internationalization. First, I argue that within the realm of CBDCs, first-mover status does not necessarily bestow e-CNY first-mover advantage. Relatedly, I maintain that the e-CNY's level of interoperability with other potential CBDC systems represents a challenge to e-CNY for future evolution and standardization with other CBDCs. These points take into account the inertia of financial infrastructures and examine China's motivations for a CBDC, and its implications for international interoperability. Second, I argue that data governance takes on a new importance in digital currency governance. As a result of China's divergent stance on cross-border data flows and data privacy/protection from both the US and the EU, I suggest that e-CNY suffers a disadvantage when it comes to interoperability, trust of users, and diversity of data.

The current state of RMB internationalization

The literature on China's efforts to internationalize the RMB is typically located within the larger topic of China as a 'rising' nation. Most literature on the rise of China is skeptical of the legitimacy and potential of the RMB to become an international reserve currency but does acknowledge its role as an international currency with limited use (e.g., Subacchi, 2017; de Graaff, ten Brink, and Parmar, 2020). For these scholars, focus is put on the economic and institutional determinants of RMB internationalization. Economic determinants include capital account openness, interest rate/exchange rate liberalization, the ability of the Chinese economy to withstand large FDI inflows and outflows, and its ability to sustain global demand, while institutional determinants include the rule of law,

security, corruption severity, development of financial markets, and domestic politics of distribution. When examined within these confines, it is only rational for one to be pessimistic about the potential of the RMB as an international reserve currency.

Existing studies also suggest that the internationalization of the RMB so far is based on the concept of a *negotiated currency* (Strange, 1971), that is, an international currency where political and financial inducements, rather than political coercion, create agreement on its use. For China, the usage of the RMB in global financial markets is dependent on its own characteristics as issuer of the currency, as well as prospective destination countries. He et al. (2016) found that the expansion of bilateral trade and increased FDI flows between the issuing country and the destination country likely increase the use of the issuing country's currency within the destination country's financial markets. When the PBOC established a clearing centre in London, it offered a package consisting of a swap line worth a maximum of RMB 200 billion (Bank of England, 2013) as well as appointing the China Construction Bank as the official clearing bank in London in order to provide a greater link to RMB liquidity (Bank of England, 2014). More importantly, it offered greater RMB Qualified Foreign Institutional Investor (RQFII) quotas of RMB 80 billion and the development of a market in London for RMB denominated investment products and commodities (HM Treasury, 2013). The Chinese Securities Regulatory Commission (CSRC) also agreed to allow foreign firms to increase their stake in Chinese securities firms from 33% to 49%. He et al. (2016) further argue that as the RMB is increasingly used in overseas markets, global financial centres are competing with each other for larger slices of RMB business. Similarly, Pardo et al. (2019) suggest that the most important reason the UK established London as a global RMB centre was to keep the city at the forefront of RMB internationalization, which reflects the political goal of safeguarding London's status as a world-leading financial centre.

While the existing literature on both economic and institutional determinants are foundational to our understanding of RMB internationalization, it does not incorporate an important step in the internationalizing process of the RMB: the digital RMB, otherwise known as the e-CNY. Academic literature on the e-CNY is quite sparse, and most analyses are centered on the architecture and design of e-CNY and the economic implications on the current arrangements of the Chinese domestic economy, particularly as it relates to commercial banks and existing online payment systems (Tong and Chen, 2021; Qian, 2019; Li and Huang, 2021).

On the other hand, scant literature examining e-CNY within the context of RMB internationalization does not offer a thorough understanding of the variables that could either bolster or inhibit it. For example, Joel Slawotsky (2020) discusses e-CNY in relation to dissatisfaction among US allies, as well as other states, with the current international monetary system, particularly with the frequent exercise of extraterritorial power by the US. However, dissatisfaction with the US government and the international monetary system alone is unlikely to lead to the mass adoption of the RMB as an international currency, especially where other national security concerns (e.g., data privacy) and the fundamental weaknesses of the Chinese economy still exists. Nevertheless, Slawotsky's analysis provides an important framework to understand RMB internationalization. In another example, Juan Duque (2020) uses Marxist Monetary Theory to understand e-CNY's role in RMB internationalization. However, similar to the work of other scholars (Tong and Chen, 2021; Peters, Green, and Wang, 2020; Slawotsky 2020), Duque assumes that a lead in CBDC development necessarily bestows upon China hefty power in setting the 'rules of the game' over how a CBDC should be designed and integrated within the global economy without evidence to support the claim.

One exception is Martin Chorzempa (2021), who critiques the common framing of CBDC development as a race and examines the implications of China becoming the first country to issue a CBDC. Chorzempa argues that any first-mover advantage e-CNY may obtain,

such as international standard-setting, is short lived and that durable advantages depend on the speed with which technologies and the market are evolving. He further argues that, in the short term, it may be more difficult to internationalize the digital RMB than the current non-digital RMB because there is no existing CBDC network to plug into. While Chorzempa's primary objective was to provide an overview of the motivations behind CBDCs and the divergence in CBDC development between China and the US, rather than a holistic evaluation of whether or not e-CNY actually bolsters or inhibits RMB internationalization, he does provide a good foundation for further examination on the topic. Clearly, research on e-CNY within the context of RMB internationalization is quite thin and fragmented. The role of e-CNY within the process of RMB internationalization remains undertheorized and under-researched. As such, the goal of this article is to contribute to this emerging topic by highlighting the various considerations that need to be taken into account to widen the analysis of the topic.

How e-CNY bolsters RMB internationalization

This section makes two arguments. First, I argue that e-CNY attempts to create the socio-political and qualitative foundations of a top international currency. These include political sentiments and international arrangements, such as transnational monetary linkages and expansive financial networks. China tries to create these foundations by facilitating convergence between China's Sino-capitalism and the neoliberal foundations of the global economy. As noted by Helleiner (2008: 358), a currency's international status is related to the extensiveness of the issuing country's transactional networks in the global economy. The more extensive the networks, the more likely foreigners are to use the issuing country's currency in their international trade and investment activities. The RMB is currently limited in its ability to create both a physical, technological network, as well as a social network, limits which e-CNY is capable of overcoming. As such, it is important to recognize e-CNY as both a physical and social system and network, rather than just digital money. Currency internationalization within a platform-based monetary system hinges on more than just the usage of a currency. It also depends on the dispersal and adoption of technologies. This leads to my second argument that standard setting plays an important role in the digital RMB project and that CIPS is a key tool for expanding the transnational linkages of the e-CNY. By encouraging the financial inclusion of emerging economies, who have traditionally been relegated to the peripheries of the SWIFT network, and the internationalization of their financial sectors, China is able to afford an elevated level of collective power for emerging economies within the Basel Process of international financial standard setting.

Qualitative foundations: Symbiotic relationships and global networks

In the field of science, technology, and society studies (STS), infrastructures refer to the notion that agency, reflecting the ability of individuals to deliberately act and impact the world, can also be extended to nonhuman actors (Genito, 2019). Bruno Latour (2005) notes that agency is any 'thing' that modifies a state of affairs by making a difference. So, infrastructures retain agency because they can independently impact the world by modifying a state of affairs, despite being shaped by regulatory processes. In addition, Opitz and Tellmann (2015) have suggested that infrastructural connections and disconnections underpin the ways in which political life and social formations take shape. Infrastructural authority refers to those socio-technical arrangements where, if those nonhuman actors cease to exist, other actors relying upon them also cease to be able to perform their functions. In this sense, they are durable and central, and their ability

to persist over time (even if they maintain sub-par performance or have a history of repeated failures) establishes specific criteria in which new arrangements are thereafter integrated. As such, new technologies scarcely ever replace complex socio-technical systems wholesale (Bernards and Campbell-Verduyn, 2019: 778).

As an infrastructure, private financial communities have played a critical role in RMB internationalization by negotiating with both the market and public authorities. Specifically, through its networked business elites, China has been able to disseminate CBDC technology abroad. The parameters of negotiations change under a CBDC arrangement, as the e-CNY is able to provide efficiencies that may change the calculus for private entities who are not so interested in the monetary policies of their governments (Chey, 2019: 510). Digital monetary networks are built on top of the infrastructure that supports the internet (Brunnermeier, James, and Landau, 2021: 10). Once those networks have been built, information can be diffused across them cheaply and near-instantaneously. These characteristics of digital networks weaken the rigidities that impeded competition in traditional settings. It is, thus, important to understand the e-CNY as a technological and social system and network, not just digitalized money.

Green and Gruin (2020) have demonstrated that public authorities in international financial centres are willing to conform to policies espoused by private financial communities, as it is also in the state's interest to ensure that their own geopolitical soft power is maximized. They, therefore, prefer to use the term transnationalization, rather than internationalization, in an effort to capture the broader process of expanding the significance of currency beyond the territorial jurisdiction of a currency-issuing nation state. In other words, currency internationalization cannot be accounted for purely through quantitative measures, such as share of global reserves. We must also consider the spatial dispersal of the qualitative institutional infrastructure, which supports the expansion of monetary linkages and financial networks. Moreover, the priorities and policies of the issuing-state are 'deprivileged', while privileging the qualitative and quantitative financial transformations across different transnational networked spaces from the myriad of micro and macro sites and routines.

While the infrastructures that make up the international monetary system (IMS) and the international financial system (IFS) are themselves durable and resistant to infrastructural change, both the IMS and IFS are rather malleable and rely on a system that is not purely liberal (McNally and Gruin, 2017: 620). In fact, China, and its state-led capitalist economy, is an indispensable part of the 'global liberal order' and maintains a symbiotic relationship with the West (Wang, 2017: 596). However, Wang (2017) suggests that China, as a rising power, is no longer a rule-taker that accepts the status quo of current international arrangements. Rather, China is 'better regarded as some combination of a rule-maker (promoting global reforms of existing arrangements) and a rule-breaker (creating its own arrangements)' (Wang, 2017: 598). Similarly, McNally and Gruin suggest that there has been a weakening of the theoretical foundations on which the IMS rests in the aftermath of the 2008 Global Financial Crisis where new forms of coordination and arrangements have been encouraged.

Yet, the question arises of where the e-CNY fits within this weakening of the neoliberal foundation upon which the IMS and IFS operates. I argue that the e-CNY is an instrument to facilitate convergence of China's Sino-capitalism and the neoliberal world of the IFS. This facilitated convergence then allows China to introduce new dimensions in its strategy and negotiation of RMB internationalization, which, thus far, has relied on two primary sources: competition of global financial centres and as a by-product of increased trade and FDI flows with China. These two sources of RMB internationalization based on non-digital RMB has its limits and RMB internationalization has stalled since 2016, the year it was added to the IMF SDR. However, with the introduction of the e-CNY, networked Chinese business elites and SOEs are able to facilitate technological dissemination, technological efficiencies, and economic efficiencies of CBDC technology.

According to Christopher McNally (2020), Sino-capitalism is a multifarious force, both neo-statist and neoliberal; it combines top-down state-centric modes of governance with bottom-up networked modes of entrepreneurship. While Sino-capitalism is distinctly state-led, it incorporates principles of governance derived from the neoliberal world order, and it is deeply ingrained with the symbiotic relationship China maintains with the present phase of globalization. It recognizes the considerable benefits of market competition and international economic integration. As such, the Chinese government may use equity stake in foreign companies to attain strategic goals, such as the acquisition of cutting-edge technologies and the support of national champions extension overseas (Eaton and Ming, 2010: 482).

The logic of convergence between the state and private enterprises of Sino-capitalism is critical for our understanding of e-CNY in RMB internationalization. While states use policy related to a foreign international currency as a diplomatic means of managing their relationship with the issuing state, most market and financial actors are not greatly interested in their government's policies regarding foreign international currencies, especially those currencies that are newly internationalizing (Chey, 2019: 510). This is especially true for countries that possess financial centres with strong global competitiveness and the capacity to benefit from newly internationalizing currencies. In this case, it would be in the interest of Chinese authorities to 'infiltrate' the elite global networks that make up the core of the IFS. Nana de Graaff (2020: 209) suggests that a comprehensive understanding of China is rooted in a domestic political economy that is interlinked with an evolving global economy and crucially mediated by elite networks and elite strategies. De Graaff further argues that the extent to which Chinese business elites establish links, such as transnational networks, is a critical measure of the transnationalization of Chinese business elite and an indicator of convergence.

Given the logic of Sino-capitalism, a lack of state ownership does not imply a lack of state direction. Chinese private enterprises above a certain size always have a party secretary and party commission included in the organizational structure of the company. Within the private firms that are considered founding partners of e-CNY – Ant, Tencent, Huawei, and Alibaba – all have CCP committees as part of their governance structure (Hoffman et. al., 2020). In this sense, the CCP is part of the globalized elite network of private business people and enterprises. Private elite networks constitute a major infrastructure within the global economy and an important agent of infrastructural change. It is important for the CCP to enter these realms to facilitate infrastructural change, which they cannot accomplish at the state-to-state level.

The purpose here is not to argue that the CCP, through networked Chinese business elites, are directing western firms, but rather to demonstrate convergence between China's neo-statism and the neoliberal foundations of the global economy. Within these symbiotic relationships, networked global elites form similar practices and routines, which can influence their interaction with the state. Through a state-led model of corporate governance and leveraging Chinese business elites, the Chinese government could then allow market forces to bolster the use of RMB through the utilization of Chinese national champions. Private financial actors could decide to utilize the e-CNY and its corresponding network, if the benefits accrued are greater than utilizing 'legacy' systems of the current IFS, which is fraught with frictions, such as high costs, low speed, and limited access (Bank of International Settlements, 2021). This analysis is also consistent with the outlook of the former PBOC Deputy Governor, Fan Yifei, in that the PBOC could leverage market forces to optimize related systems through close cooperation with commercial banks and other organizations, without imposing any prescriptive technology path in advance. This, Fan (2020) argues, would facilitate integration and synergistic collaborations.

China's digital payment system is more mature than any digital payment system in the US or EU and accounts for the highest share of national GDP in the world at 16%

(Wood, 2019a). The inclusion of WeChat and Alipay within the e-CNY project indicates integration and homogenization between the largest retail payment systems in the world. In 2018, the PBOC required Alipay and WeChat to have agreements for barcode payments to be cleared by UnionPay, which is China's state-owned card issuer and settlement company. This effectively gives the PBOC oversight for transactions that do not involve bank accounts. UnionPay already maintains a global network of firms in over 160 countries that accept UnionPay cards as a form of payment. Therefore, e-CNY could take advantage of the existing global network of payment systems that are already transacting in RMB. Moreover, not only does China have particular strengths in trade finance and supply chain management, it also has been able to leverage blockchain technology within realms fraught with significant challenges, including manual paperwork, delayed payments and shipment, and a lack of common platforms for such transactions. For example, China Construction Bank has a platform called BCTrade 2.0 Blockchain Trade Finance Platform, which digitizes commodities trade and financial services, where it has settled more than RMB 360 billion in transactions (Wood, 2019b).

Considering these advancements in the Chinese fintech ecosystem, along with their collaboration with the e-CNY, the digital RMB payment system creates economic advantages that may force Western firms to re-evaluate the opportunity costs of using 'legacy systems' in international transactions. Attention should be directed towards network building, technology partnerships, and platforms that can potentially be leveraged in support of implementation. We should be asking what roles private firms and Chinese SOEs play in disseminating China's CBDC technology globally. This is especially important considering the large-scale expansion of Chinese enterprises, such as Ant and Tencent.¹ Thinking about the e-CNY requires a paradigm shift to thinking of it in terms of a technological and social system and network, not just digital money. Even if the e-CNY is not expected to alter cross-border foreign direct investment (FDI) flows or business-to-business operations in the near term, the e-CNY's long-term prospects could alter these realms, especially in high innovation areas (Ekberg and Ho, 2021).

Scrutinizing the standard-setting argument

The PBOC is not the only central bank that is developing CBDC. But the PBOC is ahead in the game, as the e-CNY has already been released in 23 Chinese cities (Huld, 2022). This lead in CBDC development is often cited as bestowing considerable power upon China to set international standards for how a CBDC should be designed and integrated within the global economy, thereby challenging the hegemony of the US dollar (Tong and Chen, 2021; Peters et al., 2020). Despite the fact that most commentary lacks critical engagement with this argument, one cannot look past it. Others have pointed out that technical standardization and benchmarking are themselves political by inscribing neoliberal values of efficiency into technical processes (de Goede, 2020; Larner and Laurie, 2010; LeBaron and Lister, 2015). Indeed, standard setting is a key aspect of the ongoing political work of infrastructures (Star, 1999).

In this section, I argue that standard setting plays an important role in the digital RMB project. I further claim that CIPS, as a key component of the larger platform of the digital RMB and as an alternative path to the clustering of the SWIFT network around advanced economies, is a critical element for the financial inclusion of emerging economies. For China, negotiating the political incentives with both SWIFT and emerging economies is essential in facilitating broad-based technological and social network building, thus, strengthening the socio-political foundations of the digital RMB as an international currency. Indeed, the network externalities that thwarted competition within the context of traditional currency competition can enhance competition in a digital setting.

China has moved from a 'copying' phase from the 1990s to early 2000s, as it undertook financial sector reform and restructuring, to a 'convergence' phase from 2004 to 2015 as reformers within the CCP used Basel standards to promote domestic regulatory reform (Walter, 2019: 14). Since 2015, China has been in the phase of 'innovation', where the CCP has been engaging with international standards in inconsistent ways in order to adapt their national circumstances (Walter, 2019: 14). This is indicative of China's increasing confidence about its capacity to shape international outcomes. The importance of achieving influence over international standard-setting processes is related to the process of globalization as well as China's future potential for the internationalization of its financial and corporate sectors (Walter, 2019). This latter point is also applicable to emerging economies that do not currently possess the same level of connectedness to the IFS, but whose financial and corporate sectors could benefit from greater connectivity. As a result of inadequate domestic resources and expertise, emerging economies have traditionally been limited to complying with international (global North-imposed) standards. But the internationalization of their financial and corporate sectors, along with the technocratic nature of the Basel Process, provides a greater degree of collective power for emerging economies to influence international standard setting. CIPS is seen as a tool not only for reducing the frictions of cross-border transactions but also for expanding the financial inclusion of emerging economies within the peripheries of the SWIFT network. Standardization collaborations requires partner coordination and technology integration, making technological convergence within the IFS a key aspect.

SWIFT was founded in 1973 to support international commerce and business in the context of the Bretton Woods breakdown. SWIFT does not send money or manage financial flows but provides a secure bank-to-bank messaging system that is required for the international transfers of funds. De Goede (2020) suggests that a key aspect of SWIFT is standard setting. It has created a secure infrastructure and standardized messaging formats that enable the transmission of more than 5 billion bank-to-bank messages per year. De Goede further argues that SWIFT's transaction 'networks and technical connectivities/disconnectivities were grafted onto and mirror earlier colonial relations and routes' (2020: 11). A 2013 SWIFT working paper investigating its global payment networks and global connectivities/disconnectivities found that nearly all Latin America and African countries are classified as periphery (Cook and Soramäki, 2014). This clustering has become a site of infrastructural authority where SWIFT hubs function as 'choke points'. Therefore, money flows have to pass through limited sets of hubs within the SWIFT network (de Goede, 2020: 11).

The PBOC's research partnership with SWIFT is thus a soft legal effort to strengthen, confront, and develop alternatives to existing liberal institutions and rules of the game. Specifically, e-CNY attempts to ensure interoperability with SWIFT and to project greater political power within existing chokepoints. At the same time, however, China is developing CIPS as an alternate path to get around the clustering of the SWIFT network and thus create an infrastructure alongside SWIFT that seeks to centralize SWIFT's periphery states. Where SWIFT is an infrastructure that represents the post-Bretton Woods era of international finance and the neoliberal values and standards inscribed within it, CIPS represents the development of the bipolar global economy and where neo-statism is converging with neoliberalism thereby recasting the standards of the IFS.

As a vehicle for the dispersal of China's digital RMB platform, the Belt and Road Initiative (BRI) seeks to promote intercontinental economic integration. Even though the BRI was initiated by China, it cannot be considered a sole effort. The BRI is better understood as an integration project between China, Europe, and partner economies in a move to create an intercontinental ecosystem of long-term symbiosis (Li, Hofman, and Geraci, 2020: 239). Within the BRI, CIPS is seen as a tool to not only to reduce the frictions of cross-border transaction but also to accelerate economic and currency integration as

well as the inclusion of countries within the peripheries of the SWIFT network into the international financial mainstream. Hence, the BRI plays an important role in creating a physical and technological network that can leverage the collective power of emerging economies within the Basel Process of international financial standard setting (Walter, 2015).

This network of emerging economies includes more than just state-to-state relations but is also reflected by the number of private entities and their growing importance within the Basel Process. Hence, the significance of the number of foreign participants within the CIPS network. According to a report by the Canadian Security Intelligence Service (CSIS), the network of banks taking part in CIPS has expanded dramatically since its launch in October 2015. The number of direct clearing banks has increased from 19 in October 2015 to 31 in February 2018, while the number of indirect clearing banks enrolled in CIPS has climbed from 198 to 681 (CSIS, 2018). The initial batch of direct clearing banks in the CIPS network included not only Chinese state-owned banks (ICBC, Bank of China, China Construction Bank, China Merchants Bank, etc.) but also foreign banks, such as HSBC, Citibank, Standard Chartered Bank, Deutsche Bank, and BNP Paribas. And within the initial batch of indirect clearing banks, 38 were Chinese while 130 were foreign.

Novel challenges created by e-CNY

While China is acquiring structural power, the US retains the dominant structural position within the global economy, particularly within the IFS and IMS. This position stems from the size and importance of US financial markets, their prominence within international institutions, their leverage and control over the global banking system, the global role of the USD, and American political power to influence other domains (Roberts, Armijo, and Katada, 2018). Actor-oriented scholarship and IPE scholarship focused on society-state relations within the realm of international finance cannot over-look the importance of enduring US structural power in shaping outcomes within the IFS (Oatley et al. 2013). Scholarship must also consider the ways in which global finance interacts with other realms of the global economy – particularly within the context of e-CNY and CBDC competition and the ways in which currency competition escapes its traditional confines. What needs more attention are the ways in which digital currency competition will depend heavily on the technological and social platforms and networks upon which they rest.

This section argues that, while the e-CNY creates new opportunities for RMB internationalization, particularly in creating convergence between Sino-capitalism and the neoliberal global economy as well as in influencing global financial standard-setting outcomes, the digitization of the RMB also creates new challenges to RMB internationalization. Here, I examine two key challenges: first, the challenges of first-mover status; and second, the rift between China's data governance model and the liberal world order.

First or second mover advantage?

The competitive advantage gained from first-mover status, and thus greater power in setting global standards, is typically assumed with CBDCs. But framing CBDC competition as a race is not an accurate reflection of the realities of CBDC development and adoption. The priorities and motivations for CBDC development are uneven across different countries and economies. There is no universal case for CBDC adoption and demand depends on country-specific characteristics (BIS, 2021). Moreover, the durability of first-mover advantage depends on the speed at which the technology and financial infrastructures evolve. IPE scholars thus need to take into account the inertia of financial

infrastructures and the actors within them before coming to the conclusion of first-mover advantage. Suarez and Lanzolla (2005) suggest that the possibility of building a durable first mover advantage depends on the speed with which the technology and the market are evolving – one cannot be ahead of the other.

First mover advantage is not only gained by being first but also needs to be consistent with the policy objectives and motivations for CBDC adoption of those jurisdictions to which a digital currency aims to be connected. Distinct objectives and motivations will, in turn, determine the types of CBDC systems countries pursue and the development pathways taken. For China, the e-CNY was initially aimed at domestic retail use and international interoperability was decidedly a long-term goal without a clear pathway for a solution. As such, even if the overall strategy for internationalization the e-CNY is based on continuous learning and experimentation, there is limited space for negotiating the terms on which CBDC systems across states are developed and adopted. This limited space then weakens the socio-political foundations of the digital RMB as a top international currency, as the opportunities for transnational monetary linkages for the e-CNY are also limited.

China's relationship with standard-setting bodies, such as the Basel Committee on Banking Supervision and the Financial Stability Board, and the limits to which China can challenge these bodies need to be taken into account (Helleiner and Wang, 2018: 576). These Western-dominated bodies play important roles in coordinating national financial supervision and regulation through the creation of various international financial standards – including the supervision and regulation of CBDCs (FSB, 2019). There is still speculation over how CBDCs will interact with both foreign banks as well as Chinese domestic banks. Foreign banks will need to consider the opportunity costs, both financial and political, of adopting the e-CNY and using CIPS in cross-border and retail payments. According to Ekberg and Ho (2021), foreign banks will need to consider launching their own wallet proposition in order to get them a foothold within their respective domestic markets and then achieving scale rapidly. In doing so, these banks will need to consider if the adoption of the e-CNY within cross-border and retail payments along with the inertia of financial infrastructures could potentially erode their competitive advantage in this space. These are some of the considerations that contribute to the inertia of global financial infrastructures.

At the moment, e-CNY is designed for domestic retail use while foreign tourists and business travelers could register for use of an entry-level e-CNY wallet with a foreign cell phone number during their stay in China. Nonetheless, if an understanding can be reached with foreign jurisdictions for interoperability and to avoid spillover effects, e-CNY could be connected to international retails and wholesale payment systems (BIS, 2021). However, this possibility is far from certain. There is no guarantee that e-CNY will be interoperable with other CBDCs or retail and payment systems, especially considering that other countries, mostly advanced market economies, have different policy objectives in mind when considering the feasibility of their own CBDC. Moreover, unlike the PBOC, other central banks are designing their CBDC with cross-border aspects as a key consideration. For example, the Eastern Caribbean Central Bank, which launched a large-scale year-long pilot project in March 2021, has been in discussions with other regional central banks regarding interoperability with other payment systems and platforms (BIS, 2021). Being first does not necessarily mean that China writes the rules of the game. Rather, if the first mover is not aligned with the different infrastructures within the IFS and the IMS, first mover status may prove to be a disadvantage. This is why financial innovations need to be coordinated with the movement of the financial infrastructures supporting it.

According to a BIS report to the G20, there are three proposed systems for interoperability. At the lowest end of cooperation, model 1 (CBDC arrangement based on compatible CBDC systems) still requires thorough adherence to common international

standards, such as message formats, cryptographic techniques, and data requirements, as well as aligned legal and regulatory standards (BIS, 2021: 9). While China has worked with international partners, such as the BIS, Hong Kong Monetary Authority, Bank of Thailand, and the Central Bank of the UAE, on a model 1 CBDC system, the mBridge Project, international interoperability is not the fundamental design philosophy of the digital RMB platform. While the efficiency gains in banking relations of a model 1 CBDC system are notable, a common clearing system, data format, and compliance checks presented by a model 2 CBDC system provide even greater efficiencies and potential for economies of scale. Competition for efficiency is particularly important when money is bundled with platforms and digital networks. Minimal frictions in the entire transaction chain means that users are able to move value in and out of a digital network without having to worry about the reliability, transparency, and costs of a network's currency (Brunnermeier et al., 2021: 16).

It takes years to coordinate participants in complex markets to realize common message standards or align legal frameworks. Legal and regulatory compatibility are cited as some of the greatest sources of friction for cross-border payments (Committee on Payment and Market Infrastructures, 2018: 15). Even for central banks that have already begun exploring technical and regulatory interoperability at the outset, legal harmonization of any kind can take years, even with central bank support and political motivation (Auer et al., 2021: 5). Other countries are therefore already coordinating at an even higher level even though they are at more elementary stages of CBDC development. For example, the interlinked system was the focus of the Jasper-Ubin project in 2019, a collaboration of the Monetary Authority of Singapore, Bank of Canada, and the financial industry (BIS, 2021: 11). In another example, Project Jura involved the Bank of France, Swiss National Bank, Bank of International Settlements, and a private sector consortium, and it explored the benefits and challenges of wholesale CBDC for settling cross-border transactions (BIS, 2021).

The competing motivations for a CBDC is reflected in the type of CBDC and development path of each country. For countries in the Asia Pacific region, finance, banking, and capital markets have evolved differently from countries in the West. Particularly, the *modus operandi* for developing countries in the Asia Pacific region has been how to balance out cross border capital flows for economic development with macroprudential regulations restricting their capital flows and financial markets (UBS, 2021: 3). Developing countries in the Asia Pacific region maintain a differentiated set of policy challenges and priorities than countries with advanced financial markets and freer capital flows. These differentiated policy motivations and CBDC development pathways limit the transnational monetary linkages and ability of the digital RMB to facilitate the socio-political foundations of a top international currency, even if there are efficiency gains to cross-border transactions. It is, thus, incorrect to characterize CBDC development as a race. There is no universal case for CBDC adoption and any durable first mover advantage requires uniformity with the infrastructures that support usage as well as with the demands of the jurisdictions to which a digital currency wishes to connect.

Data governance and its implications for e-CNY

Data takes on a new importance with the introduction of CBDCs. Digital currency platforms may be used to exploit data, as payment networks have unparalleled access to vast amounts of data. The benefits of big data are derived not only from their size but also from the diversity of data. Given that China's platform governance, cross-border data flow governance, and data privacy governance are fundamentally at odds with both the US and EU models, the e-CNY is at a disadvantage in terms of the potential for interoperability, user trust, and diversity of data. The newfound importance of data within a platform-based

monetary system thus weighs down on China's ability to negotiate the international monetary linkages required for the e-CNY to become a top international currency.

Within central banks, big data is used in various areas, including research, monetary policy, and financial stability. The vast majority of central banks already use big data; over 70% of them use big data for economic research while 40% have used big data to inform financial stability and monetary policy decisions (Doerr, Gambacorta, and Serena, 2021: 3). Within the subfield of big data, machine learning focuses on leveraging large datasets (aka. Big data) to learn trends, make predictions, and provide real-time insights about inflation and consumer spending, among others (Doerr et al., 2021: 5). However, the collection, storage, and usage of data are still an emerging realm of governance without a clear theoretical foundation or policy direction. Data quality and accuracy, the design of legal and ethical frameworks, and aspects of cyber security are major challenges for central banks.

Even though data collection-related issues have not attracted the same attention as financial stability or monetary policy considerations, some observers have expressed discomfort with the current state of legislation and regulation (Kiff et al., 2020: 45). Central banks often underemphasize the challenges of data. Using digital forms of payment requires that CBDC-related information be stored up. Even if data is stored in several locations, the durability of collected information and ownership of data may well present very daunting regulatory, political, and legislative challenges (Siklos, 2021: 11). At the moment, there is no global consensus on the management of cross-border data flows and data privacy and protection issues. In terms of the e-CNY, how will China create convergence in governance areas where there is on-going and widening divergence?

These governance issues are picking up steam in Western liberal multilateral forums. For example, the Group of Seven Digital and Technology Track recently adopted a roadmap for greater data cooperation that includes promoting commonalities in regulatory approaches to both domestic data governance and between nations (Group of Seven, 2021). The roadmap also lays out commitment standards and principles for government access to data. Therefore, the commitments of G7 countries, where the majority of the global financial communities are located (e.g., New York and London), raises not only the question of interoperability of digital infrastructures and platform governance but also more fundamental questions of trust in Chinese authorities to govern the digital sphere in a manner consistent with liberal principles, especially human rights. These raise serious questions for the e-CNY as a digital currency platform and network.

A recent report by a consortium of central banks admits that complete anonymity in using CBDCs is implausible though anonymity and privacy can, but need not, coexist (BIS, 2020: 6). This represents a unique challenge for China, specifically considering their atrocious human rights record in Xinjiang, concerns surrounding their artificial intelligence developments and usage, and their social credit system. Human rights are an area where China is not aligned with the liberal world order. Rather, it is in direct confrontation with it. As such, the expansion of digital currencies into other realms of governance means that e-CNY is forced to enter realms in which divergence, rather than convergence, occurs, thereby adding greater challenges to the internationalization of the e-CNY. Western commentators often argue that e-CNY is likely to be a 'boon for CCP surveillance in the economy and for government interference in the lives of Chinese citizens' (Fanusie and Jin, 2021: 11), and that it will allow the PBOC to mine huge troves of data on its citizen's economic activity, which dovetails with a government fintech plan to fuse financial data to 'promote the construction of a nationwide integrated bigdata centre for enhanced discipline enforcement' (Kynge and Yu, 2021: n.p.). Whether or not the e-CNY is designed for surveillance, there is skepticism over the CCP's practice of state surveillance, thereby eroding trust over not only the currency but also the platform and networks supporting it.

A lack of interoperability, whether caused by design differences or geopolitical tensions, may create excessive barriers to trade across networks. The importance of convertibility for international currencies is similar to the importance of interoperability for platforms (Brunnermeier et al., 2021: 17). The incentives to impede interoperability should therefore be a primary concern for Chinese policymakers. However, PBOC's Deputy Governor, Li Bo, recently noted that the digital RMB is aimed at domestic use. Furthermore, he noted that international 'interoperability is a very complex issue' and that the PBOC is not in a hurry to reach a solution just yet and that cross-border use is more of a long-term goal (quoted in Bloomberg News, 2021).

The BRI could potentially bridge interoperability issues or at least build a foundation for future interoperability through state-led digital infrastructure projects that could support e-CNY. Yet such moves could be jeopardized by Huawei being at the centre of international controversy. Not only is Huawei a founding partner of e-CNY, it is also an important player in global 5G digital infrastructures and other digital infrastructures. Moreover, consensus has not been reached about what the BRI is, how it may affect others, and how it may evolve (Alon, Zhang, and Latteman, 2018: 12). The essence of the BRI megaproject as an intercontinental ecosystem for long-term symbiosis has not been adequately articulated. For Europe, while strengthening trade and digital infrastructure links are important, European policymakers are concerned with the 'rules of the game' (Li et al., 2020: 241). These rules are market-based and transparent and, from their perspective, China does not strictly follow these rules. The CCP maintains tremendous control over firms and has yet to demonstrate economic or socio-political transparency.

Conclusion

The logic of Sino-capitalism, combining the neo-statist foundations of the CCP with neoliberal modes of governance, has shaped China's distinct and novel strategy of currency internationalization. While Sino-capitalism is distinctly state-led, it incorporates principles of governance derived from neoliberalism. Distinct measures of state control over the exchange rate and capital flows are retained while pressure is applied to transnational financial market actors to accept the viability of such measures (McNally and Gruin, 2017: 607). Sino-capitalism continually seeks solutions that liberalize the economy while keeping distinct elements of state control intact. RMB internationalization thus aims to garner the benefits of providing an international reserve currency while not upsetting crucial state control that assures economic and financial stability (McNally and Gruin, 2017: 603). By digitizing the RMB, the process of RMB internationalization enjoys new opportunities for creating convergence with the global economy and for establishing the qualitative foundations for widespread RMB adoption. However, in doing so, new challenges have emerged that may actually inhibit RMB internationalization. In this sense, e-CNY as a strategic mechanism for RMB internationalization is a double-edged sword.

There are, schematically, two ways in which a currency can internationalize: by becoming a global store of value as a reserve currency or by being used for international payments as a medium of exchange. Historically, these two roles have been joined, but different paths and strategies are possible in the twenty-first century (Brunnermeier et al., 2021: 21). The divergence between these two functions has opened up a path for RMB internationalization. Specifically, it allows the RMB to perform as a medium of exchange for both international payments and retail payments. This divergence also assigns international financial infrastructures and actors a greater amount of authority in promoting a newly internationalizing currency. Financial institutions with global competitiveness tend to enjoy high cross-border mobility and have a global presence. They are thus able to conduct their business involving newly internationalizing currencies

in locations offering more favourable business environments (Chey, 2019: 515). Financial institutions and firms with global competitiveness are also less concerned about their government's policies and attitudes towards newly internationalizing currencies. However, financial institutions' interest in their governments' policies related to a newly internationalizing currency will be much more limited in most other localities, which do not have leading financial centres and do not maintain a highly globalized network of elite spaces (Chey, 2019).

Helleiner and Wang (2018: 574) suggest that the BRICS' capacity to transform the global financial order is dependent on two conditions: the strength of common social purpose among its members and the degree of established authorities' structural power. But this logic can also be flipped, where the inertia and authority of existing infrastructures can be examined using the same criteria. In this case, it is important to examine the social and political cohesion among members participating within the global financial system and the degree of structural power that established infrastructures have. As demonstrated in this article, established global financial communities, having a sense of social purpose and exercising infrastructural authority, enjoy substantial structural power in new currency internationalization. Moreover, while the West continues to dominate standard-setting bodies (SSBs), the Basel process of international financial standard setting has been increasingly giving greater space for China and other emerging economies to collectively influence standard-setting outcomes, particularly within the Financial Stability Board, which plays an important role in coordinating the development of CBDCs.

However, digitizing the RMB comes with its own set of novel challenges, which China will need to overcome. CBDC priorities and motivations are unsettled and varied. There is no guarantee that e-CNY design will see mass adoption, especially considering that the speed of its development is not in unison with the speed at which global financial infrastructures are evolving. Moreover, with important regulatory questions currently left unanswered, such as interoperability and how to minimize spillover effects of CBDCs, the capacity of e-CNY to affect the inertia of financial infrastructures remains diminished. A poorly designed CBDC – one that is out of step with the larger financial system in which it is participating – could undermine both financial stability standards and the efficiency of its platform, making it unattractive to users, technical committees, and SSBs.

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Note

1. Researchers at ASPI's International Cyber Policy Centre have found that Huawei, Ant, and Tencent have over 1300 points of overseas presence and are at the forefront of digitization in places like Africa and the Middle East. See Australian Strategic Policy Institute (n.d.).

References

- Alon, I., Zhang, W., and Latteman, C. (2018) Introduction. In: Alon, I., Zhang, W. and Latteman, C. (eds.) *China's Belt and Road Initiative Changing the Rules of Globalization*. London: Palgrave MacMillan, 1–13.
- Auer, R., Boar, C., Cornelli, G., Frost, J., Holden, H., and Wehrli, A. (2021) *CBDCs Beyond Borders: Result from a Survey of Central Banks*. Bank of International Settlements Papers, 116. Available at: <https://www.bis.org/publ/bppdf/bispap116.pdf>. Accessed 6 July 2021.
- Australian Strategic Policy Institute (n.d.) *Mapping China's Tech Giants*. Available at: <https://chinatechmap.aspi.org.au/#/map/f2-Ant%20Group,f2-Huawei,f2-Tencent>. Accessed 6 July 2021.
- Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Board of Governors of the Federal Reserve System, and Bank of International Settlements (2020) *Central Bank*

- Digital Currencies: Foundational Principles and Core Features*. Available at: <https://www.bis.org/publ/othp33.pdf>. Accessed 18 July 2021.
- Bank of England (2013) People's Bank of China swap line. Available at: <https://www.bankofengland.co.uk/-/media/boe/files/news/2013/june/peoples-bank-of-china-swap-line-june-2013.pdf>. Accessed 18 July 2021.
- Bank of England (2014) Announcement of renminbi clearing bank in London. Available at: <https://www.bankofengland.co.uk/-/media/boe/files/news/2014/june/announcement-of-renminbi-clearing-bank-in-london>. Accessed 18 July 2021.
- Bank of International Settlements (2021) Central bank digital currencies for cross-border payments: Report to the G20. Available at: <https://www.bis.org/publ/othp38.pdf>. Accessed 17 July 2021.
- Bernards, N. and Campbell-Verduyn M. (2019) Understanding technological change in finance through infrastructures. *Review of International Political Economy*, 26(5): 773–89.
- Brunnermeier, M., James, H., and Landau, J-P. (2021) *The Digitization of Money*. Bank of International Settlements Working Papers, 941. Available at: <https://www.bis.org/publ/work941.htm>. Accessed 31 August 2021.
- Canadian Security Intelligence Service (2018) Beijing creates its own global financial architecture as a tool for strategic rivalry. Available at: <https://www.canada.ca/en/security-intelligence-service/corporate/publications/china-and-the-age-of-strategic-rivalry/beijing-creates-its-own-global-financial-architecture-as-a-tool-for-strategic-rivalry.html>. Accessed 14 July 2021.
- Chey, H-K. (2019) The international politics of reactive currency statecraft: Japan's reaction to the rise of the Chinese renminbi. *New Political Economy*, 24(4): 510–29.
- China Banking News (2021) SWIFT launches joint-venture in Beijing with Chinese central bank's Digital Currency Research Institute. *China Banking News*. Available at: <https://www.chinabankingnews.com/2021/02/05/swift-launches-joint-venture-in-beijing-with-chinese-central-banks-digital-research-institute/>. Accessed 24 June 2021.
- Bloomberg News (2021) China says it has no desire to replace dollar with digital yuan. *Bloomberg News*. Available at: <https://www.bloomberg.com/news/articles/2021-04-18/china-to-focus-on-domestic-use-of-digital-fx-first-zhou-says>. Accessed 15 July 2021.
- Chorzempa, M. (2021) China, the United States, and central bank digital currencies: How important is it to be first? *China Economic Journal*, 14(1): 102–15.
- Committee on Payments and Market Infrastructures. (2018) *Cross-border Retail Payments*. Available at: <https://www.bis.org/cpmi/publ/d173.pdf>. Accessed 26 July 2021.
- Cook, S. and Soramäki, K. (2014) The global network of payment flows. *SWIFT Institute Working Paper*. Available at: <https://swiftinstitute.org/newsletters/the-global-network-of-payment-flows/>. Accessed 18 July 2021.
- de Goede, M. (2020) Finance/security infrastructures. *Review of International Political Economy*, 28(2): 1–18.
- de Graaff, N. (2020) China Inc. goes global: Transnational and national networks of China's globalizing business elite. *Review of International Political Economy*, 27(2): 208–33.
- de Graaff, N., ten Brink, T., and Parmar, I. (2020) China's rise in a liberal world in transition. *Review of International Political Economy*, 21(2): 191–207.
- Doerr, S., Gambacorta, L., and Serena, J.M. (2021) Big data and machine learning in central banking. *Bank of International Settlements Working Papers*, 930. Available at: <https://www.bis.org/publ/work930.pdf>. Accessed 13 July 2021.
- Duque, J. (2020) State involvement in cryptocurrencies: A potential world money? *The Japanese Political Economy*, 46(1): 65–82.
- Eaton, S. and Ming, Z. (2010) A principal-agent analysis of China's sovereign wealth system: Byzantine by design. *Review of International Political Economy*, 17(3): 481–506.
- Ekberg, J. and Ho, M. (2021) A new dawn for digital currency: Why China's eCNY will change the way money flows forever. *Oliver Wyman*. Available at: <https://www.oliverwyman.com/content/dam/oliver-wyman/v2/publications/2021/may/a-new-dawn-for-digital-currency.pdf>. Accessed 29 June 2021.
- Fanusie, Y. and Jin, E. (2021) China's digital currency: Adding financial data to digital authoritarianism. *Center for a New American Security*. Available at <https://www.cnas.org/publications/reports/chinas-digital-currency>. Accessed 24 January 2023.
- Financial Stability Board (2019) Regulatory issues of stablecoins. Available at: <https://www.fsb.org/wp-content/uploads/P181019.pdf>. Accessed 29 June 2021.
- Gao, H. and Yu, Y. (2009) Internationalisation of the renminbi. *BIS Papers*, 61: 105–24.
- Genito, L. (2019) Mandatory clearing: The infrastructural authority of central counterparty clearing houses in the OTC derivatives market. *Review of International Political Economy*, 26(5): 938–62.
- Germain, R. and Schwartz, H-M. (2017) The political economy of currency internationalisation: The case of the RMB. *Review of International Studies*, 43(4): 765–87.
- Green, J. and Gruin, J. (2020) RMB transnationalization and the infrastructural power of international finance centres. *Review of International Political Economy*, 25(6): 1–27.

- Group of Seven (2021) Ministerial declaration of G7 digital and technology ministers' meeting. Available at: <https://www.gov.uk/government/publications/g7-digital-and-technology-ministerial-declaration>. Accessed 18 July 2021.
- Gruin, J. (2013) Asset or liability? The role of the financial system in the political economy of China's rebalancing. *Journal of Chinese Affairs*, 42(4): 73–104.
- He, Q., Korhonen, I., Guo, J., and Liu, F. (2016) The geographic distribution of international currencies and RMB internationalization. *International Review of Economics and Finance*, 42(C): 442–58.
- Helleiner, E. (2008) Political determinants of international currencies: What future for the US dollar? *Review of International Political Economy*, 15(3): 354–78.
- Helleiner, E. and Wang, H-Y. (2018) Limits to the BRICS' challenge: Credit rating reform and institutional innovation in global finance. *Review of International Political Economy*, 25(5): 573–95.
- HM Treasury (2013) Combined policy outcomes of the 5th China-UK economic and financial dialogue. Available at: <https://www.gov.uk/government/publications/uk-china-economic-financial-dialogue-puplication-of-outcomes>. Accessed 18 July 2021.
- Hoffman, S., Garnaut, J., Izenman, K., Johnson, M., Pascoe, A., Ryan, F., and Thomas, E. (2020) The flipside of China's central bank digital currency. *Australian Strategic Policy Institute*. Available at: <https://www.aspi.org.au/report/flipside-chinas-central-bank-digital-currency>. Accessed 20 June 2021.
- Huld, A. (2022) China launches digital yuan app – all you need to know. *China Briefing*. Available at: <https://www.china-briefing.com/news/china-launches-digital-yuan-app-what-you-need-to-know/>. Accessed 24 September 2022.
- Ledger Insights (2019) How China will implement its central bank digital currency. *Ledger Insights*. Available at: <https://www.ledgerinsights.com/how-china-will-implement-its-central-bank-digital-currency-cbdc/>. Accessed 24 June 2021.
- Kiff, J., Alwazir, J., Davidovic, S., Farias, A., Khan, A., Khiaonarong, T., Malaika, M., Monroe, H., Sugimoto, N., Tourpe, H., and Zhou, P. (2020) *A Survey of Research on Retail Central Bank Digital Currency*. International Monetary Fund Working Paper, WP/20/104.
- Kynge, J. and Yu, S. (2021) Virtual control: The agenda behind China's new digital currency. *Financial Times*. Available at: <https://www.ft.com/content/7511809e-827e-4526-81ad-ae83f405f623>. Accessed 24 June 2021.
- Larner, W. and Laurie, N. (2010) Travelling technocrats, embodied knowledges: Globalizing privatization in telecoms and water. *Geoforum*, 41(2): 218–26.
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network-Theory*. Oxford: Oxford University Press.
- LeBaron, G. and Lister, J. (2015) Benchmarking global supply chains: The power of the ethical audit regime. *Review of International Studies*, 41(5): 905–24.
- Li, P., Hofman, P., and Geraci, M. (2020) The belt and road initiative for an intercontinental ecosystem: Strategic implications for multinational enterprises around the world. *Thunderbird International Business Review*, 62(3): 239–48.
- Li, S. and Huang, Y. (2021) The genesis, design, and implications of China's central bank digital currency. *China Economic Journal*, 14(1): 67–77.
- Lyratzakis, D. (2014) The determinants of RMB internationalization: The political economy of a currency's rise. *American Journal of Chinese Studies*, 21(2): 163–84.
- McNally, C. (2020) Chaotic mélange: Neoliberalism and neo-statism in the age of Sino-capitalism. *Review of International Political Economy*, 27(2): 281–301.
- McNally, C. and Gruin, J. (2017) A novel pathway to power? Contestation and adaptation in China's internationalization of the RMB. *Review of International Political Economy*, 24(4): 599–628.
- Oatley, T., Winecoff, W-K., Danzman, S., and Pennock, A. (2013) The political economy of global finance: A network model. *Perspectives on Politics*, 11(1): 133–53.
- Opitz, S. and Tellmann, U. (2015) Europe as infrastructure. *South Atlantic Quarterly*, 114(1): 171–90.
- Pacheco Pardo, R., Knoerich, J., and Li, Y. (2018) The role of London and Frankfurt in supporting the internationalisation of the Chinese renminbi. *New Political Economy*, 24(4): 530–45.
- Peters, M., Green, B., and Wang, H. (2020) Cryptocurrencies, China's sovereign digital currency (DCEP) and the US dollar system. *Educational Philosophy and Theory*, 54(11): 1713–19.
- Qian, Y. (2019) Central bank digital currency: Optimization of the currency system and its issuance design. *China Economic Journal*, 12(1): 1–15.
- Roberts, C., Armijo, L., and Katada, S. (2018) *The BRICS and Collective Financial Statecraft*. Oxford: Oxford University Press.
- Siklos, P. (2021) Central bank digital currency and governance: Fit for purpose? *Centre for International Governance Innovation Papers*, 250. Available at: <https://www.cigionline.org/publications/central-bank-digital-currency-and-governance-fit-purpose/>. Accessed 21 May 2021.

- Slawotsky, J. (2020) US financial hegemony: The digital yuan and risks of dollar de-weaponization. *Fordham International Law Journal*, 44(1): 39–100.
- Suarez, F. and Lanzolla, G. (2005) The half-truth of first mover advantage. *Harvard Business Review*. Available at: <https://hbr.org/2005/04/the-half-truth-of-first-mover-advantage>. Accessed 8 July 2021.
- Subacchi, P. (2017) *The People's Money: How China is Building a Global Currency*. New York: Columbia University Press.
- Strange, S. (1971) The politics of international currencies. *World Politics*, 23(2): 215–31.
- Star, S-L. (1999) The ethnography of infrastructure. *American Behavioural Scientist*, 43(3): 377–91.
- Tong, W. and Chen, J. (2021) A study of the economic impact of central bank digital currency under global competition. *China Economic Journal*, 14(1): 78–101.
- UBS (2021) Project mBridge: UBS submission of potential applications for project mBridge, with a focus on the Greater Bay Area. Available at: <https://www.ubs.com/content/dam/assets/ib/global/doc/m-cbdc-bridge.pdf>. Accessed 8 May 2022.
- Walter, A. (2015) Emerging countries and Basel III: Why is engagement still low? *Centre for International Governance Innovation*. Available at: <https://www.cigionline.org/publications/emerging-countries-and-basel-iii-why-engagement-still-low/>. Accessed 23 July 2021.
- Walter, A. (2019) Emerging countries in global financial standard setting: Explaining relative resilience and its implications. *Centre for International Governance Innovation Special Report*. Available at: <https://www.cigionline.org/publications/emerging-countries-global-financial-standard-setting-explaining-relative-resilience/>. Accessed 23 July 2021.
- Wang, Z. (2017) The economic rise of China: Rule-taker, rule-maker, or rule-breaker? *Asian Survey*, 57(4): 595–617.
- Wood, M. (2019a) How China's central bank digital currency will help renminbi to challenge dollar. *Ledger Insights*. Available at: <https://www.ledgerinsights.com/china-central-bank-digital-currency-cbdc-renminbi-dollar/>. Accessed 24 July 2021.
- Wood, M. (2019b) China Construction Bank launches updated trade finance blockchain. *Ledger Insights*. Available at: <https://www.ledgerinsights.com/china-construction-bank-trade-finance-blockchain/>. Accessed 24 July 2021.
- Yifei, F. (2020) Some thoughts on CBDC operations in China. *Central Banking Institute*. Available at: <https://www.centralbanking.com/fintech/cbdc/7511376/some-thoughts-on-cbdc-operations-in-china>. Accessed 24 June 2021.