THE IMPACT OF THE DIGITAL YUAN ON CHINA'S MONETARY SOVEREIGNTY AND SECURITY OF FINANCIAL DATA

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Abstract:

Since opening up in the 1980's China became a major player in the global economy. Despite its size, the country plays a marginal role in the global financial system and relies heavily on the USD to facilitate its international trade. This heavy reliance on the US-led system is a source of strategic vulnerability. PRC authorities tried tackling this problem through the internationalization of RMB, yet failed due to domestic opposition. This paper critically assesses the mechanism of dependence ingrained in the International Monetary System and explores the potential of state cryptocurrency, the Digital RMB, to achieve Chinese strategic policy objectives. So far cryptocurrencies have not been analyzed in the geopolitical context. This article closes that gap and contributes to the important debate on the impact of emerging cryptographic technologies on the global financial system. The overall analysis suggests that utilizing Digital RMB could help the country reassert its monetary sovereignty and ensure the security of domestic financial data.

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RESEARCH QUESTION:

How does embracing Digital RMB–based cross-border payments settlement influence China's monetary sovereignty and financial data security?

1. Introduction

Over the last 40 years, China has experienced revolutionary changes. The country has transformed itself from a poor, technologically backward country to the 2nd largest economy and the biggest exporter globally (Worldbank, 2020). Due to market liberalization and opening up to the world, China was in a prime position to benefit from the opportunities of the last wave of globalization, when global companies shifted their manufacturing from their home bases in advanced economies to developing countries. Factories moved along with foreign investments, experts, and the transfer of technology. The combination of these three and China's vast supply of cheap labor propelled the country to become the "factory of the world" and prosper (Chow, 2015). The rise of China perfectly depicts the difficult road towards economic development; industrialization mechanism, benefits, and challenges many developing countries experienced in their most recent history.

This shift however would not be possible without International Monetary System (IMS), "a set of internationally agreed rules, conventions and supporting institutions that facilitate international trade cross border investment and generally the reallocation of capital between states that have different currencies" (Oatley, 2018). Dominated by Western institutions, IMS certainly facilitated growing international trade by creating a mechanism for Cross-Border Payments Settlement (CBPS) for countries like China, with very few resources and poor financial systems (Chow, 2015). At the time, the benefits were clear for both sides. China could develop its manufacturing sector and export more and more goods, thus creating wealth domestically. Western financial firms in turn profited massively and spread their activity all across the world (ibid.).

As the country's profile and position on the global stage advanced, Chinese authorities started to notice however increasing difficulties and costs of integration with the rest of the world. On the economic side, authorities fear the transmission of shocks (Caporale et al., 2006) and the middle-income trap (Zhou & Hu, 2021). On the political front, it is the dependence on non-domestic actors and exposure to actions of the US government, which comes with participation in IMS. Farrel and Newman (2019) describe this phenomenon as weaponized interdependence. They explain that the heavy dependence of IMS on USD puts the US at the very core of this network. As a result, these national authorities gain hub capabilities, which allow them to monitor flows of information and control access to IMS. Chinese authorities in turn perceive this as a threat to its monetary sovereignty and security of financial data (Gaens et al., 2020).

Feeling that the current construction of IMS puts China at disadvantage against the US, PRC authorities made efforts to reform it in a way that would reassert their monetary sovereignty and ensure control over domestic financial data (Jiang, 2018). For years China made efforts to internationalize its currency, in particular, increasing the use of RMB for Cross-Border Payments Settlement (CBPS) (Zhang & Wang, 2018). Despite the long-term policy, the Chinese government failed to significantly rise settlement in RMB, both domestically and abroad. According to Lai (2021), liberalization of the financial sector as well as loosening cross-border capital transfers are prerequisites for RMB to serve as a settlement currency. Germain and

Schwartz (2017) suggest, that significant progress on this matter is not possible due to challenges of the domestic political economy. Greater RMB internationalization could shift the current power balance between private enterprises and state-owned enterprises (SOE), which naturally causes resistance.

Nevertheless, new technologies in finance show potential technology-based ways to bypass this stalemate, by reducing the reliance on any international currency. Particular attention should be given to Ripple, a cryptocurrency-based platform for CBPS. The platform offers an alternative to a correspondent banking solution. The application of Blockchain, Distributed Ledger Technology (DLT), and Smart Contracts allow the platform to control and monitor transactions in a decentralized manner. Effectively, payments are processed independent of authorities, solely through Ripple's channels. The system does not use international currency as a settlement currency but utilizes its cryptocurrency, XRP to bridge trade between various fiat currencies, thus enabling settlement in local currencies, inefficient under the SWIFT model. Furthermore, the services offered by Ripple are significantly more cost- and time-efficient. Nevertheless, as an American company Ripple Lab, just as any other financial firm located in the US, is subject to US law. Using the platform exposes Chinese subjects to US network capabilities in the same way as using conventional financial firms in IMS.

Seeing potential benefits of new technologies, the People's Bank of China (PBOC) has been involved in work on the development of the Digital Yuan (e-CNY) (数字人民币), a Central Bank Digital Currency (CBDC), which is a digital form of fiat money. Importantly, e-CNY can be enhanced for functionality enabling autonomous actions through Blockchain or DLT. This creates new technical capabilities for authorities to monitor and control currency flows with a great degree of automation (Chang et al., 2020). So far, authorities focused on the domestic application of e-CNY (Dziwok, 2021). Furthermore, no CBDC has been deployed yet at a scale comparable with conventional fiat currency. Then again, the functioning of Ripple exhibits promising results. E-CNY could create a basis for a domestic Ripple-inspired CBPS platform. This would enable authorities to maintain their capital control policies and simultaneously provide competitive solutions to facilitate trade outside the USD-dominated IMS.

The research aims to investigate whether the alternative mode of Cross-Border Payments Settlement (CBPS) for China is possible and whether the authorities should implement it to enhance the policy goal of monetary sovereignty and ensure the security of financial data from the actions of the US authorities. In the literature review, I provide an overview of research on the link between the geopolitical power of states and the status of their currency. I look into the role and state of research in the emerging field of digital currencies. Chapter 3 explains the analytical framework to answer the research question. The article derives from the theoretical framework of Weaponized Interdependence to define terms and explain the mechanism of dependence steering IMS. In the next step, I define the criteria necessary for the alternative CBPS mode based on e-CNY to help China achieve its strategic objectives. These conditions are defined based on the literature and government documents analyzed in Chapters 4 & 5. Chapter 4 delivers background information necessary to understand China's motivations; it describes the mechanism of IMS, provides the reasons for which the USD plays such an essential in the IMS; and explains why the current setup of IMS with a key role of SWIFT and USD does not suit Chinese interests. In chapter 5 I analyze government policy papers to define China's policy principles and strategic objectives regarding the non-domestic use of RMB. The analysis shows that Chinese authorities tried to internationalize the RMB as a settlement currency, with limited results. I describe these attempts to explain the challenges that held the RMB internationalization project back. Chapter 6 provides a technical explanation of conventional (SWIFT) and the alternative cryptographic (Ripple) CBPS modes; their design and the technologies they utilize. Finally, in Chapter 7, I discuss the feasibility and merits of the e-CNY-

based CBPS mode. I compare the design of e-CNY with XRP to answer whether Chinese CBDC can be used to create an efficient CBPS platform that matches PRC policy principles and strategic objectives. I assess the potential impact of the proposed CBPS platform and discuss the broader circumstances. The conclusions of this research suggest that China cannot achieve its strategic objectives of greater monetary sovereignty and security of financial data through the IMS as it is right now unless it overcomes domestic political challenges. The record of previous attempts to internationalize RMB shows however how difficult it is. For this reason, the PRC authorities should focus their attention on alternative modes of CBPS, that bypass the IMS, such as crypto-based Ripple. Emulating this model with domestic CBDC instead of commercial cryptocurrency would enable to some degree China to achieve strategic objectives, without the need to overhaul the domestic political power balance.

2. Literature Review

The overview of the literature on international monetary relations suggests a strong relationship between the status of a currency and the power of the state. Eichengreen (2012) provides an account of the special status of the USD in the global economy as a top currency. He links the position established in the Bretton Woods agreements with the US status as a dominant power in a post-war world. Helleiner (2002) stretches even further back in the past and analyzes the use of currencies as a tool of the imperial policy of colonial powers. He argues that the main motivation behind monetary reforms in colonies was to cement them around an imperial home country and create giant currency blocs centered around each of their respective home currencies. The author links this with a concept of monetary sovereignty, which allows for the currency to be used by government authorities as a tool of foreign policy. Mraović (2010) suggests on the other hand, that financial globalization limits the government's powers in this field. She puts particular emphasis on the role of international financial institutions such as IMF or World Bank, but also national monetary authorities as independent actors with their own agendas. She stresses the need for greater transparency, as decisions that have a great impact on citizens' lives are made without democratic legitimacy. What connects various actors is a shared view on the mechanism of currency's power. The more internationalized the currency is, the more power it provides for those emitting it. Cohen (2012) questions this logic. He agrees that more internationalized currencies can strengthen the political position of emitting states, yet in his opinion, the impact of currency internationalization on economics and consequentially politics, is not equivocally positive. The author classifies various currencies according to their international functionality and then provides the oversight of related costs and benefits.

Kirshner (2018) uses this framework to assess the economic position of China in the East and Southeast Asia. He argues that PRC's growing economy naturally pulls in neighboring countries towards greater cooperation and creates individual incentives to use RMB more wildly for transaction settlement. Such an emerging RMB Zone could help PRC achieve its strategic goals, but the success of this path depends greatly on China's style of leadership and the state of the domestic economy.

Patil and Mishra (2022) note that the emergence of new technology can be transformative for the global economic order. One such example is the emergence of blockchain technology. Chohan (2021) notes that the technology gave rise to cryptocurrencies and fueled the emergence of Decentralized Finance (DeFi), where individuals and tech companies actively participate in financial operations with fewer or without intermediaries. This potential transformation poses a serious threat to the position and role of banks and financial institutions in IMS (Chang et al., 2020). Lindgren (2018) suggests that already existing cryptocurrencies have the potential to significantly change the current architecture of global cross-border payments. The author notes that crypto-based solutions have not been tested out yet on a scale similar to conventional solutions, but a greater commitment on part of state institutions could tip the balance towards radical change in the future. Should the role of IMS actors change, so should the impact of a currency. Effectively, the mechanism linking currencies with geopolitical power requires revision.

It is no surprise then, that PBOC's plan to issue e-CNY drew attention to RMB internationalization and potential geopolitical consequences in the age of the "race for technological supremacy" between the US and China. Several publications saw e-CNY as a potential threat to the USD's top currency status (Campbel, 2021) or offered ways the digital Yuan could unsettle USD (Singh & Bansal, 2021). Among a wider group of scholars (Dziwok, 2021)

(Raud & MacKinnon, 2022) (Greene, 2021) there is more skepticism. They suggest that the goals set for the e-CNY project are primarily domestic. Authorities want to retain greater control over data and stimulate domestic technological innovation. Nevertheless, one should not undermine the potential capability of e-CNY in the CBPS domain (Singh & Bansal, 2021). Importantly, one common assumption is widely shared in the literature: RMB internationalization is a pre-condition for meeting the PRC's strategic agenda. This paper aims to challenge this assumption and focuses on cryptocurrencies as a way to bypass established models for CBPS globally. The literature provides several resources on the use of digital currencies for CBPS. Tasca (2016) examines the role of Bitcoin in international currency networks, Wang (2021) focuses on blockchain technology and suggests greater application could smoothen processes in both conventional and cryptographic CBPS. D'Agostino & Timpanaro (2018) investigate the technology behind Ripple to show potential improvements. A direct comparison with SWIFT done by Qiu et al. (2019) however, goes in favor of Ripple. So far the literature on cryptographic CBPS focused on technical aspects and economic benefits but missed the geopolitical context. The likely reason is that no major central bank so far has officially launched CBDC. By examining the potential impact of the alternative cryptographic mode of CBPS on China's monetary sovereignty and security of financial data, this paper aims to create a greater understanding of the geopolitics of cryptocurrencies and open debate about the use of non-conventional currency platforms.

3. Analytical Framework

3.1. Theoretical Framework

The matter of China's monetary sovereignty depends on the country's position in the IMS and as such is a subject of power dynamics of asymmetric network systems. The SWIFT model is a classic example of such a network, which consists of nodes and ties connecting them. Farrel & Newman (2019) characterize power relations within an asymmetric network structure by a "degree" of nodes representing the number of connected ties. High fixed costs characterize participation in the network. In other words, establishing a network can be costly, but scaling up not so much. Effectively, benefits for network participants rise with the number of users. This mechanism leads to the formation of the asymmetric structure of hub-and-spooks, where the degree of nodes varies a lot. The nodes are connected with one another, but several of the most interconnected nodes serve as hubs facilitating connections for the others. The central network position of the hub generates additional benefits since firms operating from hub countries require fewer links to connect e.g since the US operates as a chief global financial hub for trade settlement (Fichtner, 2017), transactions operated with American companies need to pass fewer countries (links) to reach its destination. Furthermore, the US companies can use their domestic financial system, thus facing lower transaction costs (Dupuy et al., 2021). It is also easier for American companies to engage in international trade. They are often the first to reach for foreign partners, which establish their position in the US ("hub") to facilitate transactions with other countries ("spooks") (Papaioannou & Portes, 2008).

Nevertheless, hub benefits are not solely economic. Based on their position, agents have certain network power. Farrel & Newman (ibid.) define two sources of power: market size and non-substitutability. At the same time, the integration of networks leads to the development of several economically efficient ways to achieve outcomes, where each agent plays its particular role, thus leading to interdependence among network users. This interdependence, however, can be weaponized by hub-operators, and authorities controlling hubs. Authors define two forms of network power: the panopticon and chokepoint effect. The first one refers to the capability of operators to monitor flows of information passing through the hub e.g US authorities collecting financial data on cross-border transactions cleared through the Fed or its domestic clearinghouses. Access to that knowledge allows for hub-operators to construct a detailed picture of foreign state policies and economy, thus exposing them to vulnerabilities. One of the ways these can be further exploited is by sanctioning "strategically critical" firms as was the case of Huawei (Farrell & Newman, 2019b). The choke point effect means hub operators can impose costs by cuttings selected ties off the access to hubs. Farrel and Newman (2019a.) explain that "hubs offer extraordinary efficiency benefits, and because it is extremely difficult to circumvent them, states that can control hubs have considerable coercive power, and states or other actors that are denied access to hubs can suffer substantial consequences".

At the same time, interdependence is a two-way street. The analysis of industrial (Contreras & Fagiolo, 2014) and financial networks (Korniyenko et al., 2018) shows that greater interconnectedness ("higher degree") comes with greater susceptibility to shocks. Albeit unequal, the hub-and-spooks relation is symbiotic. To operate at full capacity and maintain hub status, central nodes need spooks. For this reason, a big market size creates a certain level of protection against network threats. It might not make hub operators resist exercising panopticon capacity, but exercising choke-point is harder. Successful action requires coordination with key connected nodes and would diminish the efficiency of hubs. Effectively,

unless there is a wide consensus among allies and willingness to bear the costs, hub-operators would stop short of choke-point (Mastanduno, 2021)

Goddard (2021) extends the weaponized interdependence framework for how revisionist agents can undermine the dominant power structure. The author notes the persistence of network structure and points out a limited use of the military. The network position is constituted by non-coerced actions of individual agents driven in pursuit of their benefits. As an example, the use of SWIFT is not forced upon any entities, but as many 11 000 institutions around the world joined the network (SWIFT, 2022a). Furthermore, access to this network is perceived as a strategic objective even among countries openly hostile toward the West such as Iran (Batmanghelidj & Hellman, 2018), thus proving individual benefits are the primary driver of participation. For this reason, revisionists should restrain from military coercion, but build their position by exploiting holes in the network. According to Goddard (ibid.) "by bridging structural holes, brokers occupy central positions in a network structure, acting as nodes through which multiple transactions coalesce". Such brokers maintain ties with different firms, in economics or even rivaling factions, in politics; and raise their position by creating competitive solutions to those facilitated by dominant nodes. Essentially, these alternative solutions need to respond to the genuine market needs of other users, rather than try to impose the connection by military posture. According to James (2021), the network can only be built when "at first sight, each individual element is meaningless from the point of view of states thinking about coercive power, the power dynamic lies in cumulation and in initially restricted knowledge about how cumulation is managed".

3.2. Criteria

The literature as well as PRC's policy documents show that in recognition of China's dependence as a spook, the overarching goal of PRC's international monetary policy is to be less reliant on the US and western organizations. The country's current position in the network brings benefits of efficient connections but exposes it to the US leverage through panopticon and choke-point effect. At the same time, isolationism, which reduces China's exposure to these strategic vulnerabilities, creates unavoidable economic damage. Effectively, the only way for China to reassert monetary sovereignty and financial data security is to improve its network position in IMS, which is currently dominated by the USD. Furthermore, greater participation of China in IMS could diversify the network, in line with the ambitions of PRC's monetary diplomacy. To achieve this goal, China needs to create an alternative channel for CBPS.

For the system to abide by Chinese policy principles and help it achieve its strategic objective it requires meeting several criteria. First of all, the system must be fully functional independently of the US firms and institutions. This is necessary to ensure the security of financial data and the reliability of it the CBPS channel. Otherwise, the system would still create the risk of the panopticon effect. Likewise, reliance on American firms could expose the system of American sanctions, thus harming the system's credibility. Secondly, the Chinese CBPS mode should be able to insulate the domestic economy from external shocks. Exposure to shocks is a natural element of participation in global economic exchange, but any solution that could further destabilize the domestic financial market would meet resistance from PRC's establishment. Last but not least, the alternative system must be market competitive relative to the established SWIFT model. The system must address the problems of those countries that currently face higher trade barriers. By becoming a broker tying nodes in a more efficient way to the status quo, China can build up its position as a hub. Only then, PRC's system can spark up the voluntary migration from SWIFT among businesses in China and abroad; and achieve the scale of transition necessary to have a noticeable impact.

3.3. Methods

The goal of this research is to test whether a potential e-CNY-based cryptographic CBPS model could fulfill strategic objectives defined by PRC authorities. To do that I will first verify through text analysis whether potential e-CNY with already existing institutions could emulate Ripple's CBPS model. Then, I will compare the functionality of this potential e-CNY-based CBPS model with the strategic objectives of China's government as realized under the currently dominant SWIFT model. One of the challenges of this research is that e-CNY, which plays an essential role in the research is still in a developmental phase. Effectively, the research is based on "informed speculation" regarding the future design of Chinese CBDC. Nevertheless, it would be a mistake to use the present pilot-phase version of e-CNY as a reference point for the research. Such an approach fails to capture the dynamism of China's policymaking. Instead, following in steps of Bansal & Singh (2021) and Dziwok (2021), I create a portrait of potential e-CNY's design, based on PBOC's publications regarding the DCEP project as well as secondary literature. As for the cryptographic CBPS model, this research takes Ripple, a cryptographic commercial platform developed by Ripple Labs to facilitate cross-border money transfers (Ripple Lab, 2022). Although cryptocurrencies such as Bitcoin (Tasca, 2016) or a wider set of stablecoins, cryptocurrencies assuming a hard peg to fiat currency, (Bindseil & Pantelopoulos, 2022) can be used for international transfers, Ripple was designed precisely for this purpose (Bayram, 2020). It is also by far the most popular crypto-based CBPS solution (ibid.). For this reason, Ripple's technology for CBPS is more advanced than competitors (Islam et al., 2022) and offers a feasible alternative to the established SWIFT system.

Once the picture of the potential e-CNY-based CBPS model is established, it is tested for compatibility with PBOC's agenda for non-domestic use of RMB, laid in RMB Internalization Report (PBOC, 2021) and compared against the strategic objectives of the PRC government, as expressed in 14th Five Year Plan (14FYP)(NPC, 2021). FYPs are among the key policy documents issued by the PRC government. Published every five years, they offer a view of shifting policy directions and represent guiding principles behind policy initiatives. Furthermore, PRC's establishment puts great effort to create the document and frequently refers to ideas the document contains (Melton, 2015). For this reason, the document serves as a key to understanding guiding principles shared by PRC's authorities in policymaking. RMB Internalization Report (PBOC, 2021) in turn provides a practical application of these values. The document monitors the progress of the RMB Internationalization strategy and defines goals and initiatives in the domain of international monetary policy. Combined with secondary sources, the analysis of these materials creates a credible overview of strategic objectives set by PRC authorities for the currency agenda and represents the Chinese vision of IMS.

4. International Currency System

The position of USD in the IMS is one of the pillars of American political power globally. The IMS is a network of state actors, private firms, and non-governmental institutions, which together facilitate the transfer of capital around the world form. IMS integrates domestic currency systems through international currency, correspondent banks, and channels for information exchange. Most of these actors are geographically concentrated in hubs that facilitate participation for spooks-countries. The dominant mode of transferring funds globally is correspondent banking, often referred to as the SWIFT system (SWIFT, 2022a). Correspondent banking consists of two banks in various countries which exchange funds with one another through their proxy posts in the settlement hub. To coordinate this process they exchange information through the SWIFT messaging system. International currency is a fundamental element of IMS. It creates a platform to exchange various currencies with one another and ultimately move funds to settle cross-border transactions and investments.

From a theoretical perspective, an international currency should function as a unit of account, a means of exchange, and a store of value not only within the issuing country but also outside (Kenen, 1983). Such currency must be used not merely for transactions with that country's residents but first and foremost for transactions between non-residents. Cohen (2012) defines the position of currencies and the power of currencies according to the degree to which they can perform these roles. There are several "Patrician Currencies" such as Euro, GBP, or JPY, that partially fill international currency functionality, yet there is only one Top Currency, the US Dollar, which meets all of these functionalities everywhere around the world (ibid.). This makes the USD the only truly international currency. Around 90% of foreign exchange trading involves the U.S. dollar; as much as 64% of all global exchange reserves are held in USD; 40 % of the debt issued globally is denominated in USD and finally, around 40% of CBPS is conducted in USD (Davies & Kent, 2020). As a result, US firms and authorities play an essential role in global CBPS. Importantly, the global currency system exhibits a classical network mechanism: the more participants the lower the costs (Farrel & Newman, 2019a). Effectively participants voluntarily reinforce the system, further cementing the US role as a financial hub.

4.1. Foundations of the USD's position as a Top Currency in the IMS

The essence of the currency is trust. The most fundamental definition requires money to be: a unit of account; a store of value; and a medium of exchange (Kenen, 1983). At a domestic level, state authorities mandate the use of particular legal tender to perform these roles. This so-called "fiat money" do not represent their commodity value, but value guaranteed by the government (Britannica, n.d.). Outside the domestic area, however, no single actor can guarantee the value of any particular currency and enforce usage. Whether a currency fills its role depends on choices made by individual traders and financial institutions. For this reason trust in a value of a currency is a key feature setting apart hard currencies, issued by a nation that is seen as politically and economically stable, and soft currencies whose value is perceived to be uncertain (Guyer, 2012). Effectively, due to the practicalities of international trade, CBPS globally is concentrated around a few international hard currencies, with the USD's chief position among them. There are several reasons for that: it is the most cost-efficient way in terms of currency exchange (Prasad, 2019), it expands the access to various currencies (Lyddon, 2012), reduces the size of required bank infrastructure (ibid.), and reduces currency volatility by using standard price-setting currency (Bertaut et al., 2021).

In other words, it is free-market mechanisms, not state mandate, that makes the USD an attractive currency for international trade. Before funds in domestic currency can be transferred abroad, intermediating banks need to secure access to destination currency first. They can source it from central banks or exchange currency reserves commercially. While central banks provide wide access to the currency they issue, the availability of foreign currency is limited. Effectively, banks usually turn to financial markets where traders buy and sell currencies for profit, the so-called "spread" (Panayotov, 2020). Demand for currency is generally driven by its qualities and applications e.g stability or convertibility (Prasad, 2019). Along with the demand for a currency rises the supply, which in turn drives spreads down. In short, the foreign exchange (FX) market is the most competitive and efficient where currency supply and demand liquidy is the highest. As a result, less demanded currencies, often used in domestic areas, face higher fees (Carreira & Brostowicz, 2016). As the demand and supply are subject to the intensity of bilateral trade and financial integration, here is some regional variation in spread levels for particular currency e.g. liquidity of the Russian Ruble is higher in Central Asia, a region with strong economic ties to Russia, than elsewhere (Abdullaeva & Toraeva, 2021).

Importantly, the access to currency in local or regional financial markets might be limited due to capital transfer controls within regional economic areas (Campbell, 2013). Effectively, a direct swap between home and destination currency is not always possible or feasible financially. Instead, the international currency is used as a bridge currency for transactions. The domestic currency is first exchanged into an international one and then again into the currency of the destination. Since USD has the deepest liquidity among currencies globally it is naturally predisposed to the role of a global bridge currency for FX (Prasad, 2019). According to BIS (2019), the U.S. dollar was bought or sold in about 88 percent of global FX transactions in April 2019.

Another reason traders' banks prefer just a few international currencies is the smaller physical presence required to settle transactions. To transfer funds across borders banks need to have a physical presence in the settlement country. When settlement is concentrated in several locations with wide access to currency, just a few correspondent bank posts there are required to service international trade finance. This naturally translates into operational savings (Christiaanse, 2005). Furthermore, CBPS is most effective in countries with little restrictions on capital flows (ibid.), sufficient labor market to service these financial companies (Beaverstock, 2011), and an independent and trusted judiciary to solve legal arguments (Erie, 2019). Fundamentally, settlement hubs need to have sustainable access to the settlement currency for financial operations. This is most likely to be found in international currency's domestic jurisdiction or financial offshore centers, where many institutions with access to global currency reserves are located (Jarvis, 2011).

Finally, the concentration of CBPS in a few currencies is stimulated by benchmarking in global markets for commodities. Commodities are traded in global rather than local markets because it allows suppliers to reach a wider range of clients and is more cost-efficient for buyers due to greater competition among exporters. This creates a global benchmark where prices are indexed in the international currency (Ito & Rose, 2011). Since USD is a stable globally available currency, both suppliers and exporters prefer to use it to settle transactions to reduce price volatility. This in turn drives even further the demand for the currency and provides a stable USD supply to exporters, which in turn have an incentive to then use it for their imports.

In other words, the current dollar-based IMS is driven by individual incentives as all participants benefit from the financial infrastructure. At the same time, benefits are not distributed equally. Cohen (2012) names several key benefits the US derives from the international status of the Dollar: the government benefits from seignorage and has greater

macroeconomic flexibility. Furthermore, since US firms can settle transactions in domestic currency, using the domestic financial system, they are safe from FX risk and face lower transaction costs. Still, USD is a global good. It is a stable, safe, and the most cost-efficient currency for CBPS, which allowed many countries to join a global economic network and develop (Bernanke, 2016).

4.2. Why does the USD-dominated IMS not work for China?

Nevertheless, the set-up of the Dollar-dominated IMS leaves certain countries at disadvantage. Compared to hub countries, firms outside face greater trade barriers. While American CBPS can be conducted through the domestic financial system, the transaction between firms in Vietnam and China, require at least 4 intermediaries. Each step in CBPS requires processing which is necessary, but generates additional costs and extends processing time Qiu et al. (2019). BOE (2021) finds that the bigger the time zone difference the longer the processing time. This hurts firms' liquidity, as the resources are frozen for processing time, but also creates higher FX volatility risk. The average cost worldwide of sending funds stood at 6.38% but could be as high as 22% (Worldbank, 2020a). Although SWIFT-based CBPS delivers a mechanism to transfer money and reach business partners all around the world, these shortcomings create cost incentives to look for alternative solutions. Rice et al. (2020) note a particularly strong rise of IT platforms in this domain. Furthermore, one should not overlook the political vulnerabilities it poses for spook countries like China. The use of SWIFT places great political power in the hands of US authorities, which can use it for their benefit. Farrel and Newman (2019) note that due to their American role as a global hub for finance, national authorities can monitor and control data flowing through the financial hub. This exposes sensitive information about weak points of the Chinese economy, which can be later on used to target sanctions where they hurt the most. The grip of the US on IMS, through a network of institutions such as SWIFT, is so large, that it has some sort of leverage above most companies globally (ibid.).

This combination of both political and economic incentives motivates states like China, concerned with access to sensitive commercial data that western authorities have when transactions are settled in their jurisdictions, to act. Countries forcibly cut off the access to IMS, due to the US sanctions, providing examples of the most desperate actions to reduce reliance on the SWIFT network. Venezuela and Iran started to accept settlements in currencies such as the Russian Ruble or RMB (Chey, 2021). They also switched to a barter exchange mechanism (Dudley, 2021). This demand naturally required countries like China to come to aid with investment (Fassihi & Myers, 2021) and swap agreement deals (Chenoy, 2020), but China's actions are wider than sustaining sanctioned regimes. Over 15 years PBOC extended the SWAP agreements from 4 to 41 in 2022 (Atlantic Council, 2022b). Furthermore, according to Kabir & Salim (2014), significant efforts have been made also in ASEAN to create a more efficient system of CBPS based on local currencies rather than USD. One of the most significant de-dollarisation has occurred in Sino-Russian CBPS. Interestingly, local currencies took over just a small share of USD payments, with the majority being settled now in Euro (Nikoladze & Bhusari, 2022). It remains to be seen how sanctions, imposed in the aftermath of the Russian invasion of Ukraine, will impact the CBPS currency composition. Greene (2022) suggests Western sanctions will tilt it further towards the use of RMB swap-based arrangements. Nevertheless, according to the account of de-dollarisation efforts in the Iran, Russia, and China triangle by Grajewski (2022), political initiatives failed so far to create tangible economic incentives for businesses to follow state authorities in action. Likewise, despite intentions, the development of currency union in ASEAN is as distant as ever mainly due to significant differences in macro-economic policy and a lack of political determination to turn words into actions (Merło et al., 2021).

Although access to the global SWIFT network facilitated reliable and efficient infrastructure for international trade, Chinese authorities feel that the network relies too heavily on the US financial institutions and currency and thus is strongly exposed to the actions of American authorities (Jiang, 2018). Furthermore, the PRC government does not trust the US will come to aid it, should the financial crisis be transmitted to China through integrated financial markets as was the case in ASEAN during the 1997 Asian Crisis (Caporale et al., 2006). Effectively, using a USD-based IMS comes at the price of dependency and exposure to external shocks. In 2019 RMB was used in barely 15% of China's own trade in goods (PBOC, 2020) while USD served as a primary currency for China's CBPS. Authorities perceive this as a vulnerability. They also express discontent with the favored position of the US as a hub operator, which puts China in bilateral power relations at disadvantage (Greene, 2021).

5. PRC Strategic Objectives

According to Chin (2014), Chinese authorities understand the network dynamics of the global currency system and aim to change the current system setup for several reasons. First, they fear the US, perceived as a rival (Nathan & Scobell, 2012) could use these capabilities to "contain China" (Global Times, 2022). Second, they perceive such a strong position of one actor to be a potential source of volatility (Jacques, 2012). Finally, they believe the PRC's current network position does not reflect the country's economic position (ibid.). In line with these aspirations, Chinese authorities have been promoting the RMB as a pricing and trade settlement currency as well as pushing for expansion of the basket of currencies used globally as currency reserves.

Chin (2014) names two primary goals of China's currency policy: diversification of the global currency network and insulating the country from external volatility while maintaining economic exchange. In line with these policy directions, PRC authorities aimed to create new channels for cross-border capital flows. This policy direction can be found in two key official strategic documents 14th Five Year Plan (14 FYP) and PBOC's RMB Internationalization Report. The 14 FYP mentions "We will also: Coordinate development and security, and accelerate the construction of a modernized economy; accelerate the establishment of a new development pattern (新发展格局) with domestic great circulation (国内大循 环) as the mainstay and featuring mutually reinforcing domestic and international dual circulation (双循环)"(NPC, 2021). Domestic circulation represents the efforts to stimulate local innovations and domestic consumption as a motor of economic development. PBOC's RMB Internationalization Report offers a practical application of this policy direction (PBOC,2021). The document devotes substantial attention to CBPS infrastructure. The authorities aim "to make overseas RMB clearing banks fully play the role of facilitating RMB investment and financing, cultivating offshore RMB markets and offering adequate RMB liquidity". Both 14FYP and the report stress the need to "strike a balance well between development and security" and to assume greater control over data flows through domestic institutions "The PBOC will put more strength on the construction of the Cross-border Interbank Payments System (CIPS), enhancing the security and efficiency of the RMB clearing and settlement, as well as the building of the RMB Cross-border Payment and the Receipt Information Management System (RCPMIS)".
Importantly, the document downplays liberalization of financial markets or capital control, seen as essential by Lai (2021) to increase overseas use of RMB. Jiang (2018) explains that maintaining the stability of the domestic financial system has always been a primary goal of authorities. Brown et al. (2021) find confirmation of these policy priorities in the Dual Circulation Strategy (DCS). Authors claim that although the strategy represents a more protectionist self-reliable vision of the country, the goal is not to isolate China, but to redesign channels of interaction. In other words, the authorities want Chinese firms to interact with the world through designated channels rather than integrate the domestic system with the global one.

5.1. PRC's past attempts to internationalize RMB

The account of efforts by China to internationalize the RMB attracted a lot of attention and for this reason, literature provides a sound explanation of the authorities' motivations and challenges. Analyses of Chinese international monetary diplomacy by Park (2014), Jiang (2018), and Chin (2014) suggest that despite potential economic benefits, the key driver of the RMB internationalization project was to reduce dependence on the USD and loosen the leverage it gives the US over China. Although there are multiple ways to define international currencies (Cohen, 2012) authorities aimed in particular to improve RMB's position as a global reserve

currency (Jiang, 2018) and increase RMB's share as a settlement currency in both China's own and Asian CBPS (Kirshner, 2018). There have been certain achievements in the field. In a bid to improve domestic financial infrastructure for payments there was established CIPS, and a payment system for clearing and settlement services for CBPS integrated with messaging channels. The institution lags far behind SWIFT in the number of participants (CNBC, 2022), but establishment alone is a valuable channel to gain competencies for local monetary authorities and a step to develop an alternative CBPS mode. Besides, in 2016, the RMB was included by the International Monetary Fund (IMF) in the institution's elite basket of currencies that comprise Special Drawing Rights (SDR) thus becoming an official reserve currency. At the same time, by now RMB makes up just 2.79 percent of global foreign exchange reserves (IMF, 2022). Similarly, 2.20% of global transactions were settled in RMB. Although this makes the currency the fifth most traded it is far from a meaningful effect on China's reliance on USD (SWIFT, 2022). The account of China's achievement in the field of RMB internationalization provides valuable knowledge about challenges on the way to improving China's position in the global currency network.

According to Eichengreen (2012), key criteria to establish a successful international currency are FX stability, functionality, and convertibility of currency. Of these, RMB fully meets only the first condition. PBOC established a peg between RMB and a broad basket of currencies to ensure low FX volatility (The Economist, 2020). Lai (2021) shows, however, that the RMB does not offer sufficient functionality, understood as a capability of global currency-holding investors to turn their deposits into currency-denominated assets. Achieving full functionality would require a supply of RMB-denominated assets to meet global demand. According to the author, the PRC's financial market is not deep and liquid enough to produce a sufficiently wide range of assets to cater to the potential demand of offshore investors, should they want to hold reserves in RMB. In recent years PBOC promoted the creation of RMB-denominated assets in off-shore centers, but Liu et al. (2021) believe only greater liberalization of the domestic financial market could make RMB achieve a satisfactory level of functionality. Ke (2020) predicts that some liberalization might follow in the future, yet it is unlikely to match the required levels since authorities prioritize system stability over potential gains from loosened regulations.

To sustain smooth and reliable CBPS, convertibility is the most essential criterion, which RMB is missing. The currency is only partially convertible (Lo, 2021). Full convertibility means a legal tender can be sold or bought on the FX market, that is transferred into and out of the country with little to no restrictions. If the correspondent bank is to function, the mother organization must be certain that funds can be moved across borders. This is not the case with RMB due to domestic capital controls. Effectively, domestic RMB holdings cannot be easily transferred out of the country and exchanged into any other assets (Ke, 2020). Zenglein & Kärnfelt (2019) show that progress toward looser capital flows was made, yet there are significant obstacles relating to China's political economy.

First goes economic arguments that stress stability and focus on exports of goods. Based on principles of the macroeconomy, the greater demand for goods (rising export) leads to greater demand for currency, thus currency appreciation. Such appreciation however can be prevented if the FX rate is fixed, not floating. This however requires capital controls (Bakker & Chapple, 2002). Despite the recent shift in the government's narrative, which stresses the importance of domestic consumption, the Chinese economic model is still very export-dependent (Bradsher, 2022). It is no surprise then, that sound growth in exports is still one of the key policy objectives. Furthermore, officials are concerned with the potential outpouring of capital (once the currency appreciates) and destabilization of the financial system due to uncontrolled capital flows. In other words, Chinese authorities are still too wary of the risks of free capital mobility to relinquish capital controls in the onshore market any time soon

(Lai,2021). Furthermore, the mechanisms of the domestic political economy should not be underestimated. Wang (2018) notes that banks in China routinely favor SOEs through lower interest rates and easier debt forgiveness while starving private enterprises, which are the most innovative and dynamic actors in the Chinese economy. Following on the same argument, Germain & Schwartz (2017) conclude that "Party elites, state-owned enterprises, and local government elites currently dominate China's political economy. All stand to lose from any relaxation of what has been identified as a 'state-permeated market economy' and its attendant repressed financial system, which currently subsidizes the investments whose profits they harvest".

At the same time, China has been actively pursuing expansion of SWAP arrangements with partners around the world as an alternative to full RMB internationalization entailing financial liberalization, free-floating FX rate, and no capital controls. Jiang (2018) explains that such arrangements are preferable for Chinese authorities because signing them does not require reforms that could undermine the balance of interests within the Chinese political system. Furthermore, bilateral SWAP deals follow in line with the preference for bilateral relations. According to Song and Xia (2020), signing such an agreement has a positive impact on the volume of settlement in local currency, yet the account of McDowell (2019) suggests the effect is negligible, primarily because SWAP-based CBPS is complicated, financially unattractive (compared with SWIFT) and serves bilateral trade only. As a result, the take-up among both Chinese and foreign companies for this CBPS model is low. Effectively, SWAP arrangements brought limited results and failed to lift the overall status of RMB.

6. Cross-Border Payments Settlement Modes

6.1. SWIFT CBPS mode

The settlement of payments refers to processes and actions required to transfer resources between two parties in different countries. Within a country, these transactions are carried through a domestic currency system, which consists of monetary authorities, banks, and other financial institutions. They facilitate the use of currency domestically. The function of each actor is assigned due to the role in the currency system hierarchy with monetary authorities at the top of it. All participants work together to ensure coherence of payments within the domestic currency system ensuring double-spending. Double spending refers to a potential flaw when the same unit of digital money is spent more than once. In other words, when the transfer is made between two domestic banks in China, the PBOC ensures the exact sum is deducted and added to the balance sheets of the respective sides of the transaction. However, when a transaction is conducted across borders, it cannot be supervised by a single authority alone. It requires cooperation between parties. To clear transactions, the SWIFT model utilizes a whole network of actors. Alternatively, transactions can be facilitated by central banks with bilateral swap lines (BSL), yet compared with SWIFT the volume of transactions is insignificant McDowell (2019).

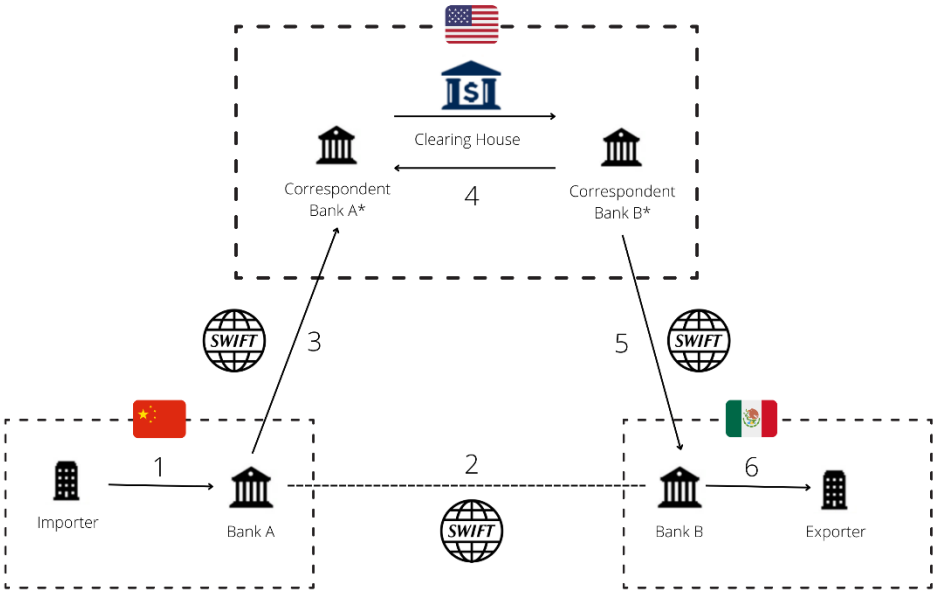

Figure 1.SWIFT model of CBPS

Source: Author of the current thesis.

1. *A Chinese company initiates the transfer of money to a Mexican partner by making a transfer request at a domestic Bank A.*
2. *Bank A contacts Bank B to agree on details of a transaction*
3. *Bank A requests Bank A's correspondent post in the settlement country (Bank A*) to transfer money to the correspondent post of Bank B (Bank B*).*
4. *Bank A* and Bank B* exchange funds ("clear") through a clearinghouse in a settlement country.*
5. *Funds are transferred to the exporter's local branch Bank B*
6. *Exporter receives funds*

The key feature of the SWIFT model is the settlement of a transaction outside the jurisdiction of at least one of the parties through the financial system of the settlement hub (See Fig.1) (Scott & Zachariadis, 2012). The transactions are cleared through its domestic clearinghouse, an institution that facilitates the exchange of funds. Central banks can clear transactions by adjusting the balances of private banks' deposits they hold. Optionally, instead of cash correspondent banks can exchange securities e.g US government bonds, through local clearinghouses. Importantly, clearinghouses process payments but do not facilitate communication. To conduct transfer, at each stage of the CBPS process sender and receiver bank send each other details essential to identify transactions in the form of standardized SWIFT codes. These messages are stored on servers and screened for correct format, compliance with Anti-Money Laundering (AML), and Counter-Terrorist Financing policies (Scott & Zachariadis, 2012). These measures are necessary to fight international crimes but give the organization insight into a wide array of financial information globally.

Importantly, CBPS can be conducted outside the settlement currency's domestic area in off-shore centers, e.g Hong Kong. Correspondent banks exchange their USD-denominated bonds or cash, settling transactions in USD, yet outside the US jurisdiction. Nevertheless, even off-shore centers are ultimately connected to the US market. To fully function as a correspondent post, a bank must have access to international currency, which effectively means being directly or indirectly present in the US market. It is the only place where USD is emitted and it is also the most liquid financial market to source USD-denominated assets.

6.2. Cryptographic CBPS Model

Rather than the authority of institutions, the alternative model of CBPS uses technology included in cryptocurrencies to transfer funds across borders and enforce no double-spending. For this reason, digital currencies allow for setting up an alternative CBPS system, which not so much takes over SWIFT, but bypasses it. The term cryptocurrency refers to a sub-group of digital currencies that are managed internally through a peer-to-peer network. They use DLT and incorruptible code (e.g Blockchain) to create trust in currency among users. By design, cryptocurrencies use DLT to store transaction data in multiple replicated databases (ledgers), thus ensuring the credibility of encrypted data (Bech & Garratt, 2017). In this decentralized structure, the role of a clearinghouse is assumed by the network of users. Through consensus mechanisms such as proof-of-work or proof-of-concept, the network ensures all those distributed databases are synchronized and stored data do not conflict with one another. To achieve this effect money's value is represented in a form of incorruptible code. This encryptability allows for the application of smart contracts, the technology which makes units of cryptocurrency autonomously execute prescribed actions once clearly defined criteria are met. Effectively, each money unit can be assigned original features such as expiry date or usage limited to authorized partners (Dziwok, 2021).

Within digital currencies, one should distinguish CBDCs that combine features of fiat money with digital currencies. CBDC is a sovereign digital currency issued by monetary authorities. It can be defined as an electronic central bank liability denominated in already existing legal tender (Bech & Garratt, 2017). Their value is guaranteed by domestic monetary authorities and as such CBDCs resemble conventional fiat money. Nevertheless, their value can be encrypted by central authorities and for this reason, CBDCs can be enhanced with the functionality of cryptocurrencies. Effectively, CBDCs could enable control and real-time monitoring of money flows to improve the adequacy of monetary policy (Bordo & Levin, 2017) or manage cross-

border currency flows (Greene, 2021). At the same time, Harwick (2016) points out that CBDCs might destabilize the financial system by undercutting agents who currently facilitate it. Furthermore, designing a fully functional CBDC is not an easy task. CBDC still has to perform various functionalities of a legal tender. Taking on any additional functions requires greater organizational capacity and effort (ibid.). Still, CBDCs should be seen as a tool for enhancing central bank capabilities.

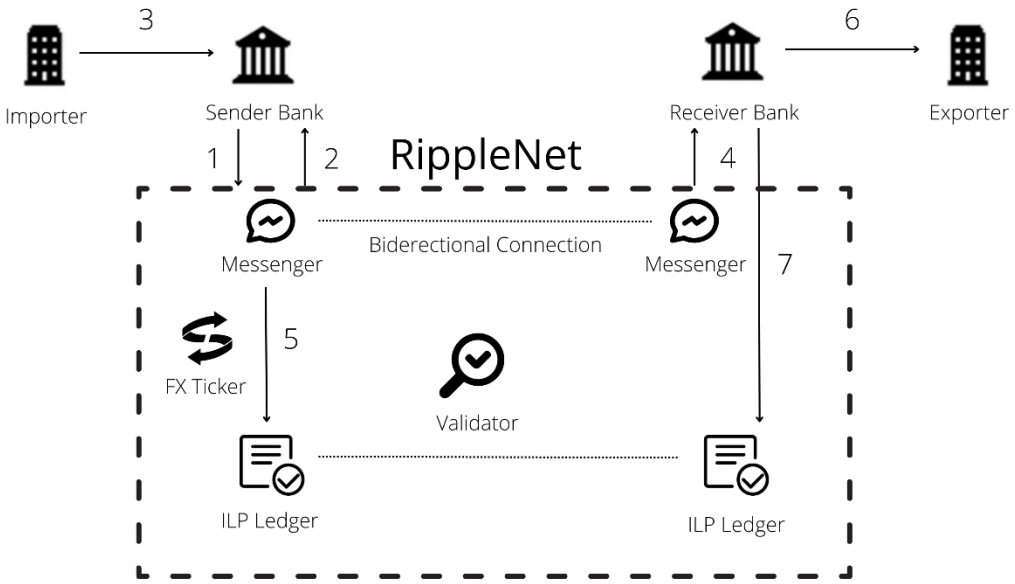

Figure 2: Ripple Payments scheme

Source: Author of the current thesis

1. *On the behalf of Importer, the sender bank offers an auction for a transfer of currency.*
2. *Through RippleNet Sender receives bids from banks in the destination country.*
3. *The sender chooses the offer.*
4. *Once the quote is accepted the sum is locked in the receiver country.*
5. *FX ticker validates the quote and encrypts the transaction details of the ILP ledger.*
6. *Immediately, funds are deposited into the receiver's account.*
7. *Finally, the receiver confirms through Validator the transfer of XRP and converts it into destination currency.*

Private cryptocurrencies however do not face these challenges and can focus on one particular role of money. One such example is RippleNet, a commercial platform for CBPS, remittances, and currency exchange. The settlement process is based on the network of financial institutions, which facilitate transactions, and XRP as a bridge currency, a platform for the exchange of various currencies. It means that the sender first exchanges deposited fiat money into XRP and then from XRP to the receiver's currency. RippleNet consists of four software tools that facilitate transactions: Messenger, FX Ticker, ILP Ledger, and Validator. Messenger creates communication between sender and receiver banks with risk details, foreign exchange rates, payment details, and the entire cost of the process. FX Ticker monitors the validity of exchange rate quotes. The Interledger Protocol (ILP) is a sub-ledger used to keep track of credit, debits, and liquidity across the transacting parties. This ensures the settlement happens instantly, either fails or succeeds. Validator encrypts the failure or success of the transaction

at the receiver bank (Islam et al., 2022). The main advantages of the Ripple CBPS system over conventional systems derive from the automation and integration of all CBPS processes into one platform (Qiu et al., 2019). The transaction is conducted in a matter of seconds. This saves time and proceeding costs. Furthermore, it reduces FX risk, since exchange between original and destination currencies occurs immediately. At the same time, while blockchain ensures transaction data are not corrupted, it requires a great deal of trust between parties (Bayram, 2020). Once they agree, the transaction cannot be canceled. To sustain the trade XRP is a hybrid currency. On one hand, it is emitted through a centralized channel directed by Ripple Lab, but on the other hand, it uses a decentralized network of users to clear transactions. This way XRP reasserts its value and maintains an efficient and reliable clearing mechanism (D'Agostino & Timpanaro, 2018).

7. Could e-CNY deliver solutions for PRC's challenges?

To judge the potential of e-CNY to provide the solutions to the challenges of China, I start by assessing whether DCEP's design enables it to emulate the role XRP plays in Ripple's CBPS model and whether China's institutions and trusted parties could fill other roles required to maintain CBPS. Only then I can move to compare the project against the criteria required for it to meet Chinese strategic objectives.

Can e-CNY emulate XRP's functionality?

As far as we know, Digital RMB is meant to be a CBDC fully convertible with fiat RMB and a closer look at PBOC's publication on e-CNY (PBOC, 2021b) suggests several fundamental similarities with the current fiat form of currency. PBOC predicts no interest rate on holdings of digital Yuan. The digital currency is supposed to be maintained through a multilayer operational structure with state banks; private banks and payments service providers. Effectively e-CNY will not resemble central bank deposits private banks hold but will be similar to e-wallets (DB, 2021). Nevertheless, two significant features distinguish it from conventional money and position it in the specter of cryptocurrencies, namely: the application of DLT and programmability through Smart Contracts.

The analysis of potential e-CNY design suggests the currency greatly resembles XRP and could perform its role in CBPS. Essentially, both e-CNY and XRP have a hybrid structure combining a centralized creation process with the application ledger for internal transactions. This structure allows PBOC to control supply and maintain monetary sovereignty. According to Germain & Schwartz (2017), relinquishing that would mean crossing a red line and would meet great resistance. Furthermore, Härdle et al. (2020) suggest centrally-emitted currencies are significantly more stable, a necessary condition for efficient CBPS. At the same time, since both currencies' clearing mechanisms are based on DLT, there is a reason to believe e-CNY could match XRP's clearing capability. This would set e-CNY's based CBPS ahead of SWIFT (Qiu et al., 2019), but also provide a reliable and safe system, that could appeal to businesses to utilize it rather than SWIFT. Then again, the most essential element of e-CNY is programmability. According to PBOC's report (2021b) e-CNY "obtains programmability from deploying smart contracts that don't impair its monetary functions. Under the premise of security and compliance, this feature enables self-executing payments according to predefined conditions or terms agreed between two sides, to facilitate business model innovation". Programmability is a feature necessary for e-CNY to match XRP's functionality. It would enable Digital Yuan to encrypt on a ledger and verify contracts, as Ripple does through ILP and Validator. Furthermore, it would allow e-CNY to be fully automated and act upon predetermined conditions, thus gaining an advantage over the SWIFT system where each decision needs to be confirmed by the institution.

To provide a comprehensive clearing service e-CNY will require additional institutions. In the case of Ripple, Messenger functions as a necessary channel for communication between transacting parties, while FX ticker is a software plug-in ensuring the adequacy of FX rates. Equivalents of these elements would still have to be developed, yet the legacy of efforts to internationalize RMB leaves China with institutions, which could facilitate these operations. One such is CIPS, yet in a separate but simultaneous to the e-CNY track, authorities have been developing a Blockchain-based Service Network (BSN,区块链服务网络) defined as a "common infrastructure for deployment and operation of blockchain applications globally" (BSN Global, 2022). The development of encrypted and safe messaging platforms is among several goals set for BSN by the authorities (ibid.). Although independent of one another, progress on the

development of BSN would enable full deployment of DLT in e-CNY and fuel it to achieve the full potential of CBDC capability (Raud & MacKinnon, 2022).

Meeting Strategic Objectives

Even if technically possible, the success of the e-CNY-based CBPS system depends on whether the system provides benefits both for China and its partners. That means, it must: be fully functional and independent of the US firms and institutions; be able to insulate the Chinese financial market from the global one; and be market competitive against SWIFT.

First of all, since the core of the e-CNY CBPS model is based on entirely Chinese-controlled institutions and technology, the system should be able to function well no matter the actions of US firms and policymakers. Likewise any other subjects, the US firms could function as sender or receiver. This participation however does not undermine the core. Furthermore, even in the case of Sino-American trade, US authorities would have no access to information other than those regarding US subjects since the transactions are encrypted on the internal ledger. Moreover, the design of e-CNY suggests a strong emphasis on the security of information. The white paper (PBOC, 2021b) notes "e-CNY adopts a variety of technologies, including digital certificate system, digital signature, and encrypted storage to make double-spending, illegal duplication and counterfeit, transaction falsification, and repudiation unfeasible. A multi-layer security system has been initially established to guarantee that e-CNY has a safe life cycle and risks are manageable". These features would increase the security of the currency by reducing exposure to hacker breaches and data leakage (Kumari & Farheen, 2020). Furthermore, adopting these technologies allows for greater monitoring of capital flows, in line with PBOC's policy goals.

Second, due to its hybrid structure, the e-CNY-based CBPS has the potential to create a tool, which facilitates international payments, but insulates the Chinese domestic financial market. Due to the encryptability of e-CNY, a certain pool of digital Yuan could be designated for non-domestic use within a restricted timeframe, as in the case of BLS. E-CNY from this designated pool need not be held to purchase goods but serves as a platform for settlement and conversion into local currencies only. For this reason, e-CNY does not have to fill in the functionality of international currency as a standard fiat RMB would. Although e-CNY serves as a bridge currency, it is used for such a short time, that there is no need for settlement currency to carry the value between various currencies. Effectively, the capital used for settlement does have to flow through the Chinese financial market. This allows the PRC authorities to keep in place current account controls, which protect the market from external shocks (McDonald, 2017). Additionally, this move minimizes the amount of overseas RMBs in circulation. Historically, China has been very cautious with allowing for a greater amount of the currency to be outside of the supervisory scope of domestic institutions as it could undermine the goal of upholding the government's official RMB exchange rate (Germain & Schwartz, 2017)

Finally, the application of Smart Contracts in e-CNY is decisive to make this CBPS system competitive against SWIFT or BLS and attract voluntary participation. Due to the self-execution of Smart Contracts, the process requires fewer intermediaries to process transactions. This translates into shorter transaction times and significantly reduced trade costs. As Farrel & Newman (2019) mention, voluntary participation is an essential feature of the network mechanism. By providing a system, which is more efficient than alternatives, China can lower bilateral transaction costs and attract more trading partners as well as allow them to use local currencies rather than USD as a settlement currency. While for countries well integrated with the US financial network such as Japan or Australia (Panagiotopoulos, 2016), a shift to Chinese CBPS mode could bring only marginal value-added, the benefits could be particularly appealing

for countries on peripheries of IMS such as Cambodia or Pakistan. They commonly face higher transaction costs, but also struggle to access the currency (IMF, 2022). Besides, conducting business using the local currency is one of the main objectives set by the PRC for CBPS development. It allows for maintaining the country's current account policy as well as reducing the use of USD in trade (Germain & Schwartz, 2017). Nevertheless, the case of BLS shows that the utilization is correlated to the intensity of trade. Even though South Korean or Indonesian traders can access USD, they might opt for separate solutions in trade with China (Song & Xia, 2020). In other words, should the system be competitive vs SWIFT, China could attract a sufficient number of trade partners to conduct a high volume of its own CBPS outside of USD-based IMS and reduce its own strategic vulnerabilities.

The Impact and Challenges

Although the e-CNY has a high potential to drive the development of the Chinese economy and level up the country's position globally, the DC/EP project is still in development and requires time and effort to have the impact authorities aspire for. To reach the goals set for the system, Chinese Authorities need to overcome several main challenges: increase the technical capabilities of CBDC; break over lock-in state of technology; convince potential users China is a credible partner and the system poses no threat to their national security.

Currently, e-CNY's clearing capacity is far lower than commercial payments platforms such AliPay or WeChat Pay (Kumar, 2022). It will take time before the currency will become widespread domestically, which authorities define as a priority (Dziwok, 2021). The success of e-CNY-based CBPS is dependent on operational capacity and reliability. The system would need to be tested at a large scale to verify whether the platform can reach the operational level sufficient to sustain international trade and match the benefits offered by Ripple. Although both domestic and international use of e-CNY, could be launched simultaneously, domestic use of e-CNY provides a valuable testing ground for the technology. As the currency is promoted by PBOC, it is the state authorities' reputation at stake. If implemented well, once the technology matures e-CNY has the potential to revolutionize China's financial landscape (Kumar, 2022). For this reason, it should not be assessed on the current basis. In China's long-term plan for the economy through 2035, authorities have emphasized the role of e-CNY as one of the key elements of China's digital economy, thus showing a long-term commitment to this project (Wong, 2020).

To achieve its goals, China should prioritize system take-up over short-term impact. The expectations set for the DC/EP need to match its capability and reality of systemic shifts. Barnes et al. (2004) show competitive systems often fail to take over the established ones, because of the lock-in mechanism whereas sub-optimal or inefficient technologies can become "locked in" as industry standards or consumer preferences. With significant network effects, these inefficiencies may persist for extended periods. In practical terms, even if the Chinese e-CNY CBPS platform is competitive against the system of correspondent banking it is unlikely main companies trading around the world with China will suddenly shift their operations from established modes of settlement. For this reason, rather than its top trade partners such as South Korea or Japan (WITS, 2022) China should target first the countries for whom it offers the greatest quality difference. The switch from SWIFT is most likely among countries with restrained access to global financial markets, often positioned on the lower specter of development level (Dabla-Norris et al., 2015). Under such a strategy, however, only a limited share of China's trade would be covered by the proposed CBPS, thus bringing limited immediate benefits for China's standing in terms of strategic objectives. Nevertheless, a smaller scale allows the system mature and gain credibility as a reliable tool for CBPS. Goddard (2021) notes that building one's position within a network begins with becoming a broker for participants

with limited access to the central nodes. As the main sponsor of the Belt and Road Initiative (BRI), China is well-positioned as a technology provider for low-income countries (Li & Schmerer, 2017).PRC should use this channel for the transfer of loans and grants. This would allow for greater oversight over money, but more importantly, having established Chinese financial channels in the first place, the Chinese CBPS system might become a default option once the infrastructure is ready and trade intensifies. As the network grows, it will attract more participants, thus scaling it up and increasing efficiency gains. In other words, the benefits of this project should be expected in the long term

The success of China's proposed CBPS model depends heavily on cooperation and trust among its partners. What seems to be the biggest benefit of the platform, a possibility to reassert control over financial data might be deterring other states. Discontent among countries in the region with US practices and abuse of network power does not translate straight into trust in PRC (Kampfner, 2022). Conversation on the geopolitical tensions and global finance often focuses on two dominant players, the US and China, but other trading blocs and countries pursue their own agenda (ibid.) To popularize its own solutions China needs to build trust among potential partners to demonstrate the behavioral quality difference. This might require strong provisions over data protection or ceding direct control over the CBPS system, but first and foremost more partner-like attitude. Using economic intimidation, as was the case in the recent spat with Australia over coronavirus investigation (Beattie, 2022), certainly does not help PRC's cause.

The alternatives

Overcoming challenges certainly will not be easy, yet the review of previous attempts to internationalize RMB shows no better alternatives. Promoting Hong Kong, the off-shore center under Chinese supervision could limit the direct exposure to geopolitical vulnerabilities, yet the case of Huawei's sanctions and the arrest of the company's CFO Meng Wanzhou (Williams, 2021) show the impact of US authorities reaches wherever the USD is used. After all the currency is ultimately sourced from the US market, which means direct presence or participation through intermediaries.

As for other cryptographic CBPS solutions, PBOC has been working with several countries on mBridge, a multi-CBDC platform for CBPS (BIS Innovation Hub, 2021). The project is in an early stage of development but presents interesting technological solutions. Rather than using any currency as a bridge for FX, it utilizes a single ledger. Although the early tests show improvement in clearing capability (Ledger Insights, 2021), the main limitation of this project is scalability. While e-CNY is relatively advanced, CBDC projects elsewhere are mostly in the research phase (Atlantic Council, 2022). Developing CBDC is a very challenging process and for many countries, it might seem too difficult or costly (ibid.).

8. Conclusions

The market liberalization of China more than 30 years ago has been one of the most decisive moments in the country's modern history. Ever since that time China turned has transformed into a prosperous state with a private-driven market offering technologically sophisticated solutions. This shift has been driven by the entrepreneurship of the Chinese population and certainly, the government played an important role in directing investments into areas, which spurred economic development. Nevertheless, this radical change would not happen without opening up to the world. Since 90's China received all the necessary ingredients for rapid industrialization. The foreign investment provided the capital for physical infrastructure; the expertise came along with international staff and finally the advancement in technology and trade liberalization significantly reduced the trade barriers for the country, which all together allowed it to become the global top exporter (Worldbank, 2020).

Nevertheless, as Farrel & Newman (2019) point out, with participation in the global economic exchange comes interdependence with trade partners and the agents of IMS, in particular American firms. As the authors showed, this interdependence can be weaponized and used against China by the US authorities. It is important to mention, that the setup of the IMS was not intentionally created for geopolitical purposes, but spontaneous decisions driven by individual incentives led to the state where US firms and institutions occupy a central position. The US authorities did not create this state but simply spot that as an opportunity. For years China tolerated it, adopted a low-profile foreign policy, and engaged with international institutions with great caution (Jiang, 2018). Nevertheless, as China's global presence rose the issue is more pressing on the agenda. This has been demonstrated when China's top technological company Huawei suffered great pain as a result of the US sanctions (Williams, 2021). In other words, China's role in a global economy is too large for it to play such a marginal role in global finance. For the country to develop and reassert its sovereignty it needs to move forward from a spook in the IMS to a provider of technologies and financial hub for its trade partners.

The transformation might be difficult, but it is necessary. Given the domestic opposition to internationalizing RMB, authorities should not give up, but be innovative about the means to achieve strategic goals instead. One such opportunity is the e-CNY. Although the domestic market application is the priority, the invested effort should be utilized for multiple purposes. The case of Ripple shows that cryptocurrencies have the potential to revolutionize the CBPS. Given that PBOC has already invested many efforts in the DC/EP project, authorities should seize the opportunities it creates for China to establish a CBPS mode that suits Chinese needs better. The task will require a great deal of patience and consequence in action to achieve, but also self-restraint. By recreating the type of dependence trade partners have with the US, PRC will not make inroads into areas perceived as strategic such as financial data security. On the other hand, if China manages to create a more efficient CBPS system based on partner-like relations, it will improve its global standing and ultimately reassert domestic monetary sovereignty and financial data security.

Nevertheless, it is important to acknowledge that the discussion on the impact of e-CNY has speculative nature. No CBDC in a major economy has been emitted so far. As explained earlier, there is a difference in nature and expectations between private currencies and state-backed CBDCs. The practical application and impact of these two might effectively differ. However imperfect, Ripple is still the best reference point for future e-CNY-based CBPS. It enables exploration of potential impact and contributes to the important debate on the role of

technology and finance in international relations. As the role of cryptocurrencies and DeFi in IMS rises, their impact needs to be evaluated in a comprehensive manner including geopolitical implications. Likewise, analysis of other potential CBDCs such as e-EURO or e-USD would open the conversation about compatibility between digital currencies and the consequences of more decentralized CBPS and IMS. Future research should also focus on ways to stimulate the inclusion of peripheral and spook countries in IMS. While alternatives to SWIFT systems can serve several countries, they could also undermine the system that connects the whole world and stimulate the closing of economies within regional trade blocs. While this article focuses on the Chinese perspective, it demonstrates the current setup of IMS is not optimal for all of the participants. This research demonstrates cryptographic technology has the potential to transform financial networks. It should be harnessed to create a more inclusive and diverse IMS, which facilitates efficient CBPS, also for peripheral countries. Greater inclusion in the international economic exchange could eventually bring about economic prospects there lifting millions of people out of poverty, as was the case in China. Again, a more diverse system would reduce incentives to split from established financial networks, thus preserving the global character of IMS, which has proved to deliver prosperity for people all around the world.

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