Christos V. Gortsos /
Rolf Sethe (eds.)

Central Bank Digital Currencies

Proceedings of a Colloquium

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Global Financial Architecture and Decentralized CBDC Regimes

Rolf H. Weber

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I. CBDC as New Element of the Global Financial Architecture

1. Principles of the Global Financial Architecture

After each financial crisis, regulators express their opinion that international rules should be better coordinated and/or harmonized to avoid spillover or contagion effects. Due to their nature, both data and financial assets flow around the globe and have a cross-border nature. Therefore, the voices ad-

vocating for a global financial architecture (GFA)[1] became stronger during the last decades and many harmonized regulations have been implemented in the course of this time.

According to the prevailing academic research, a new GFA should encompass the following substantive topics:[2]

- *Viable legal infrastructure*: Clear and defined rights and adequate regulations, i.e., a stable normative framework, lead to an appropriate governance structure.
- *Coherence*: Uncoordinated piecemeal regulations will not establish a coherent institutional and legal framework;
- *Sequencing*: The adaptation of a national system to international standards must be done in several steps allowing the market participants to get accustomed to new rules over time;
- *Evaluation*: There is a need for appropriate and ongoing monitoring of a changing regulatory framework;
- *Interconnection*: Legal reforms in different segments of the financial markets should be executed in an interrelated way;
- *Standards*: The consistency of the accounting and other relevant standards is an important pre-condition for a sound legal framework;
- *Transparency*: Better informed markets are likely to make better decisions;
- *Avoidance of corruption, money laundering and other criminal activities*: Undesired behavior undermines public confidence.

Cryptocurrencies in general and Central Bank Digital Currencies (CBDC) in particular which have been developed during the last ten years cause new challenges for the abovementioned substantive topics of a new GFA; the following article attempts to shed light on the specific problems imposed by the decentralized infrastructure of digital currencies on the centralized global architecture in financial markets from an information technology[3] and model-theoretical perspective.[4]

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1 For a good early discussion on the GFA, see Norton, 891 et seq.
2 See Weber, 2001, 241, 265.
3 See below ch. II.
4 See below ch. III.

2. CBDC as Driver of New Regulatory Complexities

Private cryptocurrencies (e.g. Bitcoin, Ethereum, Stablecoins like DAI, Liquity)[5] and the upcoming CBDC lead to greater currency competition, however, equally to increased regulatory complexities.[6] Since cryptocurrencies are a part of the GFA and also require a global financial network infrastructure, interoperability becomes a major issue.[7] Whereas private cryptocurrencies are designed for global use on decentralized infrastructures, CBDC, issued by a (national) Central Bank (or a regional Central Bank as in case of the European Central Bank), have a state-oriented character by definition.[8]

In addition, and apart from aspects of financial stability, CBDC represent a liability of a Central Bank.[9] Furthermore, there are important legal issues that are not decisive for private cryptocurrencies, such as the qualification of legal tender, but are to be tackled in the context of CBDC.[10] These issues will not be discussed hereinafter, rather, the question as to how CBDC can be integrated into and form a part of the GFA will be the main topic, both from a theoretical and a practical perspective.

CBDC can be designed in different technological ways; insofar, at least in principle, the existing GFA does not provide for any specific option or model. The following differentiations for the issuance of CBDC must be considered:

(i) *Technological basis of CBDC issuance*: Two principal designs are possible, namely

- An account-based CBDC, i.e., an account is established at the issuing bank for the public for (in principle) daily use; as follow-up question it must be decided whether the account is interest-bearing or not.[11]

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5 For a general overview, see Zellweger-Gutknecht/Weber, G 1, G 9/10 with further references.

6 Wang/Gao, 1 <https://doi.org/10.1111/rego.12520>.

7 See below ch. IV.3 and Auer, 1.

8 Zellweger-Gutknecht/Weber, G 5 et seq.

9 See Bossu, 7; see also Dionysopoulos et al., 20.

10 For cryptocurrencies in general, see Zellweger-Gutknecht/Weber, G 27/28; for a detailed analysis of the problem in case of a digital Euro coin, see Geva/Grünewald/Zellweger, 1127 et seq., and in case of crypto-based demand deposits of Central Banks, see Zellweger-Gutknecht, 228.

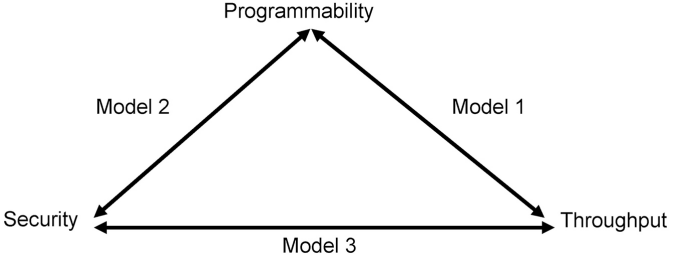
11 Wang/Gao, 3 with further references.

- A token-based CBDC, i.e., "digital cash" is issued by the Central Bank, being the more "modern" option since a (contractual) relation to the account-provider is not necessary and, therefore, an improvement in payment systems becomes possible[12] and anonymity can be secured.[13]

(ii) *Addressees of CBDC*: The Central Bank has to decide whether "only" wholesale CBDC should be issued to participants such as clearing banks and public bodies (as presently foreseen in Switzerland)[14] or whether retail accounts for day-to-day use are to be developed (causing constitutional challenges in Switzerland).[15]

(iii) *Existence of intermediaries*: Finally, the CBDC can be single-tiered, i.e., the Central Bank directly issues CBDC to the public and operates all aspects of the system, or two-tiered, i.e., the Central Bank relies on intermediaries (commercial banks) for the issuance of CBDC and for the interactions with the customers.[16]

A further complexity level concerns the programmability of payments and money which can be done with three possible approaches, namely (i) integrating the functionality into the fundamental ledger, (ii) providing the capability through an additional "module", or (iii) "outsourcing" it to payment service providers. Thereby, the following trilemma occurs:[17]



12 Dionysopoulos et al., 8/9.

13 Wang/Gao, 3 with further references; to the privacy issues in particular, see Dionysopoulos et al., 13/14.

14 See Thomas Moser in this volume (p. 93).

15 In academic literature it is debated whether Article 99 of the Swiss Constitution allows the Swiss National Bank to be engaged in retail business. Furthermore, the fundamental question occurs as to whether the issuance of retail CBDC by the Swiss National Bank would not contradict the economic liberty principle as enshrined in Art. 94 of the Constitution.

16 Wang/Gao, 3.

17 Dionysopoulos et al., 14 et seq.

Model 1 can achieve programmability and high throughput to the detriment of security, in model 2 throughput is jeoparded and model 3 abandons programmability.

II. Technical Design of CBDC Networks

1. Network Decentralization

Traditional payment systems, expressed in national or regional currencies, do have a technically centralized structure and the settlement between different currencies is done by central institutions such as clearing banks or SWIFT. In contrast, CBDC, technically issued on the distributed ledger technology (DLT) infrastructure, are based on a decentralized infrastructure having a large number of so-called nodes which are likely to increase over time.[18]

The DLT architectures consist of the mentioned technical nodes which are interconnected to form a network; the nodes are run independently and represent the participants on the platform. In other words, the nodes that include interests, values, perceptions, knowledge, and legal sources interact with each other and form those ties that shape the network structure.[19]

According to economic theory, centralized networks are arguably the most efficient structures; centralization leads to positive network externalities.[20] Nevertheless, it cannot be overlooked that centralized networks are also vulnerable if the hub fails (for example in case of a heavy cyberattack).[21] Therefore, decentralized networks based on the DLT infrastructure do have some operative advantages; however, the decentralized access structure also offers potential access points for any kind of cyberattack.

For technical reasons the CBDC network is suitable to be divided into clusters (sub-networks). The different types of networks can be expressed in the form of the following charts:[22]

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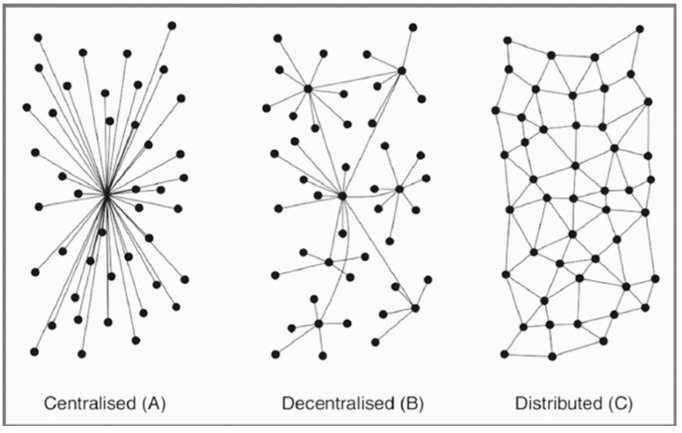
18 Wang/Gao, 4 with further references.
19 See also Eberlein et al., 1 et seq., <https://doi.org/10.1111/rego.12030>.
20 Sheng, 4.
21 See in general Weber/Yildiz, 7 et seq.
22 Sheng, 4.



The most appropriate form would likely be a decentralized network; this structure, even if less efficient, has the advantage of enhanced resilience since the network does not depend on a single network or node.[23] But theoretically, the form of the distributed network would also be an option even if it is less probable that such a network will be implemented. At any rate, however, the network structure will be flat or multipolar.[24]

For the time being, it appears to be uncertain how exactly the different decentralized CBDC networks will be linked to each other on a cross-border scale, i.e., how the interoperability is to be globally established.[25] This aspect depends on the number of nodes, on how often those nodes interact, and on the network structure (i.e., the network "density"); in addition, clusters (subgroups) may not necessarily be based on a model of hubs if interoperability can be guaranteed otherwise.[26]

2. Network Forms

Irrespective of the degree of structural decentralization, networks can be designed in two different forms, namely in the form of networks-as-actors or in the form of networks-as-structures.[27] In the first case, international governance among key actors is given, in the second case, the behavior of the actors remains uncoordinated. The CBDC networks are likely to have elements of

23 Wang/Gao, 5, also include the notion of ties into their description of networks.
24 See Oatly et al., 135-137.
25 See below ch. IV.3.
26 For additional details, see Wang/Gao, 6.
27 For a detailed discussion of the network forms, see Wang/Gao, 7 with further references.

both forms even if a higher proximity to the networks-as-structures is probable[28] since a coordination as foreseen in the Bretton Woods Agreements is unlikely occurring.

III. Theoretical Approach: Competition or Coordination?

1. Introduction

After the description of the CBDC networks' technical design, the following section analyzes the possible regulatory approaches from a model-theoretical point of view. Traditionally, academics distinguish between two models, namely the concept of regulatory competition and the concept of regulatory coordination.[29]

Regulatory competition, partly also called "concept of conflict", follows the assumption that it has advantages to implement a preferable regulatory environment for the national businesses. Subsequently, private enterprises evaluate which regulatory regime would offer the best commercial environment.[30] The regulatory competition model is premised on regulatory arbitrage and on the effective discovering of the different features of regulatory regimes; this approach can ease the informational asymmetry and improve the quality of regulatory interventions.[31] According to a general academic assessment, different forms of regulatory competition and possible typologies can be designed from manifold perspectives (for example competition among jurisdictions or among legal actors).

In contrast, the approach of regulatory coordination attempts to create internationally harmonized norms; the coordination model, partly also called "concept of cooperation", is based on the standardization principle, i.e., coordination avoids the risk that similar activities are treated differently due to geographical borders.[32] As a consequence, the concept of coordination leads to substantive convergence. Coordination as the alternative approach can occur between standard-setters or standardization organizations attempting to introduce harmonized provisions in certain markets.[33] Coordination by harmonized norms has the potential to restrict regulatory innovations but leads to a standardization of rules and, thereby, facilitates market behavior.

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28 For a general overview to network structures, see Sikkink, 229, 232, 245.
29 For a general discussion, see Weber, 2015, 605 et seq.
30 Weber, 2015, 605.
31 See Wang/Gao, 10 with further references.
32 Weber, 2015, 605.
33 Wang/Gao, 10.

2. Chances and Risks of Regulatory Competition

Regulatory competition (or the model of "conflict") between CBDC standards can lead to incompatibility of different technical standards, the uncoordinated networks-as-structure form might give rise to potential conflicts due to lack of interoperability.[34] At least to a certain extent, the implementation of "genuine standards" for example related to smart contracts and algorithms would facilitate cross-border transactions in different CBDC.[35] Divergence of standards causes conflicts, particularly in respect of cross-border interoperability; only the interconnection between national CBDC systems, ideally with common or homogenous standards, increases the interoperability and improves network efficiency.

Regulatory competition includes the risk that lower regulatory standards might be introduced to achieve a competitive cross-border advantage. Incongruent regulations can develop from differing regulatory objectives, tools, and thresholds (for example from differing minimum standards in respect of privacy protection).[36] Another aspect concerns the question as to whether the CBDC should have different capacities domestically and in international transfers. Such a situation is likely to occur if the interests of national end-users in retail businesses are prioritized. In contrast, efficiency and the interoperability of data are more important in cross-border payments.[37]

The leading nations issuing CBDC (such as China with the digital Renminbi) are well placed to export their technology to other countries and thereby impact their standard setting. Regulatory competition is also possible regarding other relevant factors of payment systems, for example in connection with the implementation of a CBDC-related digital identity system or cybersecurity provisions. Further topics are the rectification of erroneous CBDC-payments based on smart contracts and/or algorithms as well as the warranty for data quality.[38]

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34 For further details to the competition model, see Weber, 2015, 606/7.

35 Wang/Gao, 11/12, referring to "conflict" instead of "competition", the latter giving a more negative touch to the regulatory model.

36 For further details, see Kitt et. al., 1 et seq. <https://www.imf.org/en/Publications/WP/Issues/2020/06/26/A-Survey-of-Research-on-Retail-Central-Bank-Digital-Currency-49517>.

37 See below ch. IV.3.

38 For a more detailed analysis, see Wang/Gao, 12.

Regulatory competition can also concern constitutional issues such as monetary sovereignty and CBDC issuance powers;[39] in respect of these challenges, interoperability is more difficult to achieve than regarding technical requirements.

3. Chances and Risks of Regulatory Coordination

Cooperation usually leads to regulatory coordination. Undesirable outcomes such as a race to the bottom and regulatory arbitrage can be avoided. Regulatory cooperation is likely occurring within clusters and improving cross-border interoperability.[40]

The cooperation approach substantially promotes financial stability and integrity. From a technical perspective, the interoperability based on common standards might support transparency and efficiency of payments' execution and reduce transaction costs by limiting the complexity arising from regulatory compliance.[41] Particularly international organizations such as the Committee on Payments and Market Infrastructures and the International Monetary Fund advocate for standardization of the IT-related aspects of CBDC and for harmonized regulatory frameworks (for example also in view of adjacent legal topics such as privacy and AML/CTF regulations);[42] the coordination approach could also pool rather than duplicate resources.

Cross-border interoperability requires cooperation and regulatory coordination at least within clusters by groups of Central Banks attempting to achieve similar objectives such as to reduce transaction costs or to improve regulatory compliance. For example, the G7 has developed public policy principles for retail CBDC.[43] The promotion of interlinkages should look at the type of formats and messages in foreign exchange transactions and attempt at integrating CBDC into the GFA structure.[44]

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39 The respective challenges are not addressed in this article; for a detailed discussion, see Zellweger-Gutknecht/Geva/Grünewald, 284 et seq.

40 Weber, 2015, 607.

41 Wang/Gao, 10.

42 See International Monetary Fund Inter-Departmental Staff Team, Digital Money Across Borders: Macro-Financial Implications, Policy Paper No. 2020/050, 8.

43 G7, Public Policy Principles for Retail Central Bank Digital Currencies, 2021, <https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1025235/G7_Public_Policy_Principles_for_Retail_CBDC_FINAL.pdf>.

44 Wang/Gao, 11.

Regulatory cooperation and coordination could help to develop joint resources that share problems, promote interactions, and build consensus in areas of common interest; thereby, the building of trust between the actors is strengthened.[45] A CBDC network containing sufficient trust between actors could be "a repository of information on the availability, competences, and reliability of the respective partners".[46]

4. Model of Co-opetiton

A relatively recent conceptual alternative to regulatory competition and coordination is the model of regulatory co-opetition.[47] The term is used to show the dynamics of the competition and coordination models taking place among governments and private actors both in horizontal and vertical dimensions. The main purpose of this model is to acknowledge that legal actors should not only compete but also cooperate. Optimal governance requires a flexible mix of competition and coordination between governmental actors as well as between governmental and non-governmental actors.

Three forms of regulatory co-opetition can be distinguished, namely intergovernmental (horizontal or vertical efforts among governments), intra-governmental (efforts among different branches of governments) and extra-governmental (co-opetition between governmental and non-governmental actors).[48] New CBDC projects, for example the below mentioned Jura project, are conducted in a specific setting of co-opetition.[49]

The co-opetition approach can become important if the CBDC networks lead to a disordered situation within the GFA because a flat decentralized structure does not work, for instance due to regulatory challenges, unreasonably high operation costs or not resilient infrastructures. A further problem concerns the tensions between the decentralized CBDC networks and the need for a standardized governance regarding interchange mechanisms[50] and digital identity frameworks. These issues call for joint efforts in a co-opetitive manner.

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45 On the aspects of consequences and trust, see also Silvers, 1278/9.
46 Van der Heijden, 729, <https://doi.org/10.1111/rego.12295>.
47 For more details, see Weber, 2015, 608 with further references.
48 Weber, 2015, 608.
49 See below ch. IV.1.
50 See also Wang/Gao, 11.

IV. Practical Implementation: Designs of Ongoing Projects

1. Increased Activities of Central Banks

Private cryptocurrencies exist since more than ten years and have gained acceptance in society. A disadvantage of private cryptocurrencies is certainly that they are quite volatile and less trustworthy than CBDC. The Central Banks did not react spontaneously subsequent to the "invention" of private cryptocurrencies, however, in the meantime the increasing wish of having a stable digital currency has induced many Central Banks to invest into CBDC projects (Sweden, Estonia, China). The efforts were intensified during the last four years; most projects do have an involvement of several institutions across borders.

The Report "Options for access to and interoperability of CBDCs for cross-border payments", submitted to the G20 in July 2022 by different units of the BIS,[51] lists thirteen completed and ongoing CBDC projects, inter alia Prosperus, MAS, Helvetia, mBridge, HSBC, Jura, Dunbar. The BIS Innovation Hub (BISIH) Report "Using CBDCs across borders: lessons from practical experiments" of June 2022[52] discusses four particular projects, namely *Inthanon-LionRock2* (encompassing BISIH Hongkong Centre, Hong Kong Monetary Authority, Bank of Thailand), *Jura* (composed of Banque de France, Swiss National Bank and a private sector consortium, incl. SIX Digital Exchange), *Dunbar* (executed by Reserve Bank of Australia, Bank Negara Malaysia, Monetary Authority of Singapore, South African Reserve Bank) and *mBridge* (including People's Bank of China, Central Bank of the United Arab Emirates, working on a third face of the Inthanon-LionRock2 project under the umbrella of the BISIH).

In Switzerland, following the "internal" (CHF-related) project "*Helvetia*" that encompasses several phases so far, the more recent project "*Jura*" is most relevant: The latter project explored the direct transfer of Euro and Swiss Francs wholesale CBDC between French and Swiss commercial banks on a single DLT platform operated by a third party. Tokenized assets and foreign exchange (FX) trades were settled using payment versus payment and delivery versus payment mechanisms. The successful "Jura" project was conducted as co-opetitive model in a near-real setting, complying with current regulatory requirements; "Jura" also explored a new approach including subnetworks and dual-notary signing.[53]

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51 BIS Innovation Hub, July 2022, Annex 6, 42 et seq. <https://www.bis.org/publ/othp52.pdf>.

52 BIS Innovation Hub, June 2022, 5 et seq. <https://www.bis.org/publ/othp51.pdf>.

53 BIS Innovation Hub, June 2022, 6/7.

2. Common Key Features

The aforementioned ongoing projects attempting to allow the exchange of multiple currencies by mitigating frictions in cross-border payments within a single system have dealt with the following common key features:[54]

- *Platform design*: Digital ledger technologies allow to build platforms on a common infrastructure offering efficiency gains in comparison to the existing payment systems; it is not necessary anymore to interlink discrete centralized systems; however, challenges of operational and technical interoperability cannot be overlooked.
- *Access to wholesale CBDC by non-resident financial institutions*: Compared to the existing payment systems making access often conditional on local supervision or licensing, the DLT systems broaden direct access to Central Bank money. This means that direct access to CBDC from abroad enables the execution of cross-border payments without intermediaries on a single system.
- *Teams*: Experience has shown that all experiments included regional partners involving public-private sector cooperation; thereby, a co-regulatory approach is realized. This approach has been taken irrespectively of the fact that the ongoing projects are differing as far as technical designs, currencies and use cases are concerned.

The ongoing projects had to consider several aspects when designing a cross-border CBDC arrangement as well as different ways in which these could be accommodated. At the forefront, five evaluation criteria were decisive:[55]

- The *do not harm* principle in the context of CBDC refers to designing CBDC ecosystems that support public policy objectives and do not impede Central Banks' ability to carry out their mandates. Positive aspects are currency substitution and increased capital flows.
- The objective of *enhancing efficiency*, both wholesale and retail, is characterized by low cost and high speed, without compromising other relevant aspects, such as ease of use, accessibility, availability, and safety.
- The principle of *resilience* encompasses the ability to identify, to protect against and to recover from adverse shocks and from other disruptive

54 For further details, see BIS Innovation Hub, June 2022, 9/10.

55 For a detailed discussion of these evaluation criteria, see BIS Innovation Hub, July 2022, 7-10 and 19-23.

events; an ecosystem is resilient at system level if weaknesses of its individual participants do not undermine the resilience of the entire ecosystem.
- The assurance of *coexistence and interoperability* with non-CBDC systems means that different types of Central Bank money (i.e., new CBDC and existing banknotes or balances in reserve or settlement accounts) should complement each other and coexist in a wider payment landscape that supports public policy objectives.
- The principle of *financial inclusion* attempts to enhance the access of individuals and businesses to affordable financial products and to services that meet their needs (transactions, payments, savings, credit and insurance) and aredelivered in a responsible and sustainable way.

In conclusion, the ongoing projects have proven (i) the technical feasibility of the interoperability mechanisms allowing multiple currencies to be settled and (ii) the achievement of the described evaluation criteria.[56]

3. Options for Interoperability

As mentioned,[57] the success of CBDC for cross-border transactions depends on the access and interoperability choices made by Central Banks when designing their CBDC. Thereby, two issues play a role, namely the making available of CBDC to non-residents (for retail CBDC) and to foreign payment services providers (for both retail and wholesale CBDC) for direct use as well as the facilitation of transactions' execution through interoperability mechanisms between different countries' CBDC systems.[58]

As far as the access to wholesale CBDC systems by foreign payment services providers is concerned, three options do exist,[59] namely closed access (domestic payment services providers only), indirect access (possibility of foreign payment services providers to access the wholesale CBDC network via an intermediary) or direct access (opportunity for foreign payment services providers to directly transact in wholesale CBDC issued by a Central Bank without an intermediary participant).[60]

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56 BIS Innovation Hub, July 2022 28/29; BIS Innovation Hub, June 2022 12/13.

57 See above ch. II.1.

58 See also BIS Innovation Hub, July 2022, 18; to the convertibility issue, see Dionysopoulos et al., 30/31.

59 BIS Innovation Hub, July 2022, 12/13.

60 On the access issue, see also MIT Media Lab/Maiden, 28 et seq.; Dionysopoulos et al., 22 et seq.

Furthermore, in case of a retail CBDC regime, Central Banks have to decide on two issues,[61] impacting the flow of cross-border CBDC transfers: (i) Who will be able to hold and transfer retail CBDC and under what conditions? (ii) If access to retail CBDC is allowed for non-residents, how will they be able to access it?

The ongoing projects have also explored different types of interoperability between different CBDC systems as well as between CBDC and non-CBDC systems. Thereby, three models of multiple CBDC arrangements achieving interoperability have been tested:[62]

- *Compatibility model*: This approach refers to individual CBDC systems that use common standards (such as message formats, cryptographic techniques and data requirements). Although the compatibility model does not link different CBDC systems, it has the potential to improve current cross-border payments by enhancing efficiency of payment processing and compliance protocols as well as by facilitating participation in different systems and different jurisdictions.
- *Interlinkage model*: This system links different CBDC systems with a set of technical and contractual arrangements that not only facilitate communication and exchange of data but could also facilitate compliance, foreign currency provision and settlement. Technical designs are (i) a single access point, (ii) a bilateral link or (iii) a hub and spoke solution.
- *Single system model*: This design refers to CBDC that use a single common technical infrastructure and potentially also a common rulebook. The single system model has some similarities with the interlinkage model, in particular regarding the question of which entities provide the common services.

Experiences made in the execution of the different projects coordinated by the BIS Innovation Hub have shown (as also acknowledged by the World Bank Group) that all types of applied interoperability models do work and that policy considerations are relevant for concrete choices.[63]

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61 BIS Innovation Hub, July 2022, 13/14.

62 For further details, see BIS Innovation Hub, July 2022, 14-17.

63 See BIS Innovation Hub, July 2022, 18 and 19-23; see also World Bank Group, Central Bank Digital Currencies for Cross-Border Payments, A Review of Current Experiments and Ideas, November 2021 <https://documents1.worldbank.org/curated/en/369001638871862939/pdf/Central-Bank-Digital-Currencies-for-Cross-border-Payments-A-Review-of-Current-Experiments-and-Ideas.pdf>.

4. Legal and Regulatory Issues

As mentioned at the beginning,[64] a robust and viable legal framework is required for the establishment of a stable financial market infrastructure; the rights need to be clearly defined in order to reach an adequate normative environment and to realize an appropriate governance structure. However, legal topics related to the issuance and transfer of CBDC as well as to the finality and validity of the settlement may lead to challenges depending on the currencies and jurisdictions involved.[65] By their very nature payment flows have a cross-border character and cannot be kept within a single legal regime.

In the given reality, for example payment, data-sharing, privacy and tax laws differ across jurisdictions. Therefore, interlinkages between infrastructures located in different countries may be regulated by divergent normative frameworks which could result in legal uncertainties. In particular, data protection regulations being an important element for a viable CBDC framework substantially differ around the world. Consequently, technical measures assuming a legal function must be established.

In addition, difficulties increase if a multitude of links is implemented; further complexities are caused by the potential hub and spoke models since the participants must adhere to manifold regulatory policies.[66] Technological and legal interoperability becomes key if a CBDC regime should be successful.

In an ideal world it would be desirable to develop common rulebooks and contingency procedures as well as to monitor the respective capabilities. However, payments are a key element of national interests (mainly based on the sovereignty concept) and directly related to national policies. Therefore, far-reaching harmonization by way of common rulebooks is not likely to be realized in the near future.

Furthermore, multiple CBDC arrangements should be embedded into a commonly agreed governance framework that determines the rules, rights and obligations of all parties.[67] The respective standards could partly draw on the rulebooks of SWIFT for payments and the Continuous Link Settlement (CLS) for foreign exchange transactions; nevertheless, the development of new provisions is unavoidable and requires a common understanding of cross-border digital payment systems.

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64 See above ch. I.1.

65 BIS Innovation Hub, June 2022, 13, and BIS Innovation Hub, July 2022, 24/25.

66 BIS Innovation Hub, July 2022, 24.

67 See also BIS Innovation Hub, July 2022, 25.

V. Outlook: Adaptation of the Global Financial Architecture

Due to the decentralized structure and form, the (different) CBDC networks will very likely profoundly change the GFA. Indeed, the role of the governmental actors in the development of CBDC scenarios as well as in the design of the GFA CBDC has relevant implications for the international financial system, particularly in the segment of payments, i.e., a substantive impact is unavoidable.[68] The technologically decentralized structure of CBDC networks might lead to sub-networks and clusters of the GFA. Thereby, the CBDC network will add an additional and complex layer to the existing relations between the manifold actors in the GFA.

In addition, competition between currency blocks might occur[69] and potential power imbalances of existing payment schemes due to the strong position of the US Dollar might erode which US policymakers want to obviously avoid.[70] Since the conclusion of the Bretton Woods Agreements, the US Dollar has operated as primary currency of the most important markets and the US currency system was the core of the centralized system of payments. This situation is possibly going to change: CBDC denominated in another currency, for example in Chinese Renminbi (RNB), are likely to play an increasingly important role.[71]

To the extent that CBDC might potentially replace traditional currencies,[72] the previously centralized structure will also have to encompass decentralized CBDC networks. Along with private cryptocurrencies, CBDC networks could create increased currency competition. But if several CBDC networks operate in parallel, it might become difficult to maintain an incumbent global reserve currency system.[73] In other words, the decentralization of currency transac-

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68 Wang/Gao, 13.

69 See Didenko et al., 5.

70 For this reason US authorities are now more intensively looking into the development of a digital US dollar, see for example Board of Governors of the Federal Reserve System, Money and Payments: The U.S. Dollar in the Age of Digital Transformation, January 2022, 13 et seq., <https://www.federalreserve.gov/publications/files/money-and-payments-20220120.pdf>.

71 Wang/Gao, 14.

72 The replacement of traditional currencies by CBDC is not going to happen within a short time; recently, The Economist (May 20th 2023, Special report Digital finance, 11) correctly assessed the following: "The roll-out of central-bank digital currencies is proving slower than expected".

73 See Zang, <https://www.imf.org/en/News/Articles/2020/10/30/sp103020-new-forms-of-digital-money>.

tions has the (potentially negative) consequence that a global reserve currency such as the US Dollar is not available anymore; this disadvantage might become important if a country is confronted with liquidity constraints.[74]

In principle, cross-border CBDC transactions could be executed through new alternative digital platforms, at least if such platforms are capable of handling multi-CBDC exchanges. These platforms are usually of centralized nature. The growth of alternative international payment "rails" might shift CBDC-denominated trade invoicing and financial intermediation. Again, the development of interoperability standards is essential.[75]

Furthermore, CBDC networks potentially cause the risk of increased uncertainties.[76] The decentralized structures make it difficult to implement strong governance measures in order to stabilize the interchange mechanisms and the digital identity frameworks. However, CBDC networks could also improve financial inclusion (being particularly important for countries in Africa and Asia)[77] if broad public access to safe digital money and interoperability with other currencies is ensured.

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74 See Didenko, 39, and Zhang.

75 See Wang/Gao, 14.

76 See also Kitt et al., 12/13 and 18; for a general discussion of uncertainties and trust, see Brummer, 134.

77 For an overview to the financial inclusion challenges, see Arner et al., 1 et seq.

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