FOCUS NOTE

GRANTING ACCESS TO REAL-TIME GROSS SETTLEMENT SYSTEMS FOR NONBANK PAYMENT SERVICE PROVIDERS: IMPLICATIONS FOR FAST PAYMENTS

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WORLD BANK GROUP

FINANCE, COMPETITIVENESS & INNOVATION GLOBAL PRACTICE
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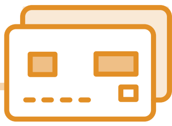


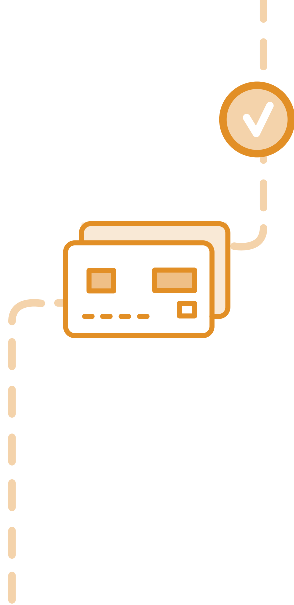
1 SETTING THE CONTEXT

The World Bank has been closely monitoring the development of fast payment systems (FPS) by central banks and private players across the globe.[1] This comprehensive study has resulted in a policy toolkit designed to guide countries and regions on the likely alternatives and models that could assist them in their policy and implementation choices when they embark on their FPS journeys. Work on the FPS Toolkit was supported by the Bill and Melinda Gates Foundation under Project FASTT (Frictionless Affordable Safe Timely Transactions). The toolkit and other relevant resources of Project FASTT can be found at fastpayments.worldbank.org and consist of the following components:

- The main report *Considerations and Lessons for the Development and Implementation of Fast Payment Systems*
- Case studies of countries that have already implemented fast payments
- A set of short focus notes on specific technical topics related to fast payments

This note is part of the third component of the toolkit. It aims to identify and discuss policy issues arising in the context of the experience and practice of central banks in granting access to real-time gross settlement (RTGS) systems, especially to nonbank institutions in the context of FPS.

The note revisits and builds on an earlier publication that explored policy issues and experiences of central banks in granting access to RTGS systems in the fintech era.[2] Noting the rapid pace of FPS adoption globally, in December 2021 the Committee on Payments and Market Infrastructures (CPMI) examined the role of central banks in FPS and discussed the implications for RTGS systems in providing settlement services for FPS.[3] In May 2022, as part of the work on improving (direct) access to payment systems by banks, nonbanks, and payment infrastructures under the G20 cross-border payment program, the CPMI issued an additional report that considers issues related to improving access to domestic payment systems that settle in central bank money and "sets out best practices for self-assessing the access policies of domestic payment systems for authorities and payment system operators considering expanding access to banks, nonbank payment service providers (PSPs) and financial market infrastructures (FMIs)."[4]



2 BACKGROUND

Central banks play a key role for the settlement of payment transactions in contemporary economies. Their deposit liabilities (also referred to as reserves or central bank money) ensure the safest settlement process possible by supplying the highest-quality settlement asset domestically available, which bears no credit or liquidity risk.[5] Also, central banks provide the infrastructure necessary to transfer reserve balances across participants and offer services to payment system participants (including, among others, liquidity lending facilities) to support the successful completion of the settlement process. Thus, both the interposition of the central bank as a default-free settlement institution and the central bank's ability to create unlimited liquidity denominated in domestic currency, if and when needed, facilitate continuity in the provision of settlement services to the national payment system.[6] Also, the use of central bank money as a risk-free settlement asset helps to reduce systemic risk where it matters most—that is, where the values transferred are very large in relation to the balance sheets and capital resources of the participants.

RTGS systems have become the predominant type of infrastructure for the settlement of large-value fund transfers and are reckoned as the backbone of a country's national payment system infrastructure. RTGS systems support the instantaneous, reliable, and secure transfer of reserve balances and provide certainty and finality of settlement in central bank money. RTGS systems also enable the settlement of delivery-versus-payment and payment-versus-payment transactions, thereby mitigating principal risk involved in the settlement of two linked obligations.

RTGS systems are also the channel through which central banks provide liquidity to the holders of reserve accounts during the operating day. Such intraday liquidity takes the form of central bank loans, repos, or current account overdrafts, the proceeds of which are credited to the account that each borrowing institution holds at the central bank. Such liquidity provision increases the capacity of (solvent but temporarily illiquid) RTGS participants to pay out funds during the operating day to settle transactions on their own behalf or on behalf of their customers. In so doing, liquidity provision reduces the potential for systemic risk—originating from settlement failures—to disrupt RTGS operation and spill over to the financial system and the economy more broadly. As such, RTGS system policy and practice strictly relate to, and strongly support, the central bank's core mandate to preserve and promote financial stability. RTGS systems are typically owned and operated by central banks.[7]

RTGS systems offer a broad range of banking-related services that provide value throughout the financial and real sectors of the economy. Bank and nonbank financial institutions, commercial and industrial firms, government agencies, and even individual agents benefit from the use of RTGS services. The terms and conditions under which access is granted to RTGS services have important bearings on how effectively and efficiently an RTGS system supports the financial and real sectors of the economy. Moreover, those same terms and conditions affect the ability of PSPs and service users to manage their payment system risks and the central bank's capacity to preserve and promote financial system stability.

This article frames the issue into the broader context of whether, and to what extent, access to RTGS systems should be extended to institutions other than commercial banks (also referred to as "nonbanks," to be defined more precisely below). The article outlines the benefits that have accrued over several decades to countries at different stages of financial sector development, and in an increasingly globalized marketplace, from their experiences with RTGS systems.

The dilemma that central banks are increasingly facing about providing or not providing direct settlement access is particularly relevant for nonbank PSPs that are direct participants to FPS when it comes to clearing services but not direct participants to the RTGS system for settlement services. However, it is not the same case when it comes to settlement in the RTGS system, as FPS nonbanks in many instances must still rely on banks (as direct RTGS participants) to settle FPS transactions in the RTGS. This reality could obscure the overall level playing field between banks and nonbank PSPs.

FMIs always need to consider the risks that actual or prospective participants pose to the infrastructures and their participants and should design their access rules accordingly. Thus, FMIs establish risk-related participation requirements aimed to ensure that participants meet appropriate operational, financial, and legal requirements, which allow them to fulfill their obligations to the FMIs, including the other participants, on a timely basis.

Access to RTGS systems is defined by the terms governing who is permitted to hold a central bank settlement account, and by the terms governing which type of account holders can obtain central bank credit. The terms governing access to settlement may contemplate two types of access: direct and indirect.

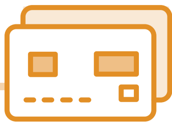
Direct access means that a participant (which would be a *direct participant*) submits its payment instructions directly to the RTGS system and is responsible vis-à-vis the system and other direct participants for the settlement of its (debit) positions. An entity may have direct access to a settlement account as well as to credit facilities, or direct access to a settlement account only, with no access to central bank credit. If the terms of access deny an entity a settlement account relationship with the central bank, or the entity chooses not to be a direct participant in the RTGS system (for instance, owing to compliance or administrative cost considerations), the entity can gain access to RTGS settlement (and attendant operational services) indirectly as a customer of another entity that holds a settlement account directly with the central bank, as discussed next.

Indirect access occurs when a firm or entity (an *indirect participant*) uses a direct participant (for example, a sponsor bank) to act on its behalf as payment and settlement agent. In this case, the indirect participant has an agency arrangement with a direct participant. This arrangement extends the range of entities that can benefit from the availability of RTGS services. In fact, in most countries, the high investment, maintenance, and compliance costs associated with direct participation in national RTGS systems might discourage small banks as well as nonbanks (which typically process relatively small volumes of transactions) from accessing the RTGS system. Indirect participants could be given direct connection to the RTGS system and instruct their own payments directly, while settlement would take place through a direct participant that would then act as a settlement agent only. It is important to note that the indirect participants are not bound by the rules (other than messaging standards) of the RTGS, since they do not have a direct relationship with the system and depend on the services provided by direct participants for access to the system.

The criteria for being granted direct participant access to an RTGS system typically include operational, financial, and legal requirements and, in some cases, also other types of requirements. Operational requirements include criteria relating to the participants' ability and readiness to use the FMI services. Financial requirements generally refer to a PSP having minimum capital and liquid resources, including for contributing to prefunded liquidity and loss-sharing arrangements (applicable in the case of other FMIs). Legal requirements may include licenses, authorizations, and approvals to conduct specific activities, as well as legal opinions addressing conflict-of-laws issues and legal ambiguities that might impede the ability of an applicant (for example, a foreign entity) to meet its FMI obligations. Also, FMIs usually require participants to have an appropriate risk-management framework and expertise, including adherence to regulations regarding anti-money laundering and combating the financing of terrorism. Other requirements may include being able to provide evidence of the good standing of the owners and managers of the PSP and of the qualifications of managers and staff (for example, for managing risks).

As traditional actors in the payments space, commercial banks have so far been the natural participants in RTGS systems. Historically, as the main providers of payment services in the economy, banks have been the primary holders of clearing and settlement accounts with central banks, and as

deposit takers and credit institutions, they have constituted the transmission belt of monetary-policy signals throughout the economy and have been given privileged access to central bank refinancing facilities to ensure smooth and stable monetary and financial conditions in the economy. In recent years, nonbanks have massively entered the retail payments space.[8] This is in addition to their existing presence in several markets (such as those for government and other securities, foreign exchange, derivative products, and so on), where they compete directly with commercial banks and account for large shares of the payment values exchanged in the system.



3 POLICY DEVELOPMENTS

In the early 1990s, the role of central banks in the payment systems and the evolution of markets for payment services started being subjected to systematic analysis. This was due to improved understanding of the risks involved in payment systems, the recognition of the key role of central bank money as a settlement asset, and growing international cooperative efforts in the design and development of modern payment systems. The issues of access to payment systems and central bank settlement services soon took prominence in this new context, and a policy of wide access for entities offering deposit money accounts was deemed to be beneficial to the overall efficiency and safety of the payment systems. As regards efficiency, potential frictions were noted in the correspondent banking system. For example, the bundling of services and resulting restrictions on respondent bank choice in the use of settlement services, and conflicting correspondent bank objectives related to the time value of money, which could inhibit the speedy clearing and settlement of payments, argued for broad access to central bank accounts. In addition, a broad access policy was seen as promoting a more competitive banking system by reducing concentration in the top tier of access to central bank services. While adhering to the model wherein central banks provide access only to deposit-taking institutions (banks), this analysis also challenged correspondent banking practices that result in a concentration of settlement accounts with the central bank.[9] As regards safety, the central bank decision to change to RTGS was a response to growing concern over ***receiver*** risk—the possibility that the final settlement of payments between banks (relating to transactions already done) could be frustrated, at least in part, if one member of the system failed during the day and so was unable to meet its obligations at the end of the day.[10] RTGS was regarded as providing the best means of eliminating this type of risk from interbank payment systems, and a number of countries started developing systems based on RTGS at the central bank. The recognition that, by eliminating receiver risk, RTGS can reduce the scope for systemic risk in payment systems also led central banks in the European Union to support the wider use of RTGS for settling large-value payments.[11] In this context, RTGS access was also seen as a way to enable troubled financial institutions whose creditworthiness was questioned by their counterparties to make payments and settle them with finality, thereby preserving system safety and financial stability. In addition, safety is assured when settlement happens in central bank money, as the same mitigates credit and liquidity risk to the participants and the system as a whole, since central bank money is the safest settlement asset. Finally, reducing concentration in the top tier of access to central bank services, by granting broader access, was a way to limit the concentration of risks in few institutions.

During the 1990s, the international community of central banks (through the Bank for International Settlements) thus focused policy attention on the operation of large-value transfer systems. Their efforts resulted in the issuance of the Core Principles for Systemically Important Payment Systems (CPSIPS) in 2001.[12] Principle IX, in particular, addressed access to large-value transfer systems, stating that systems "should have objective and publicly disclosed criteria for

participation, which permit fair and open access." Besides fairness, openness, and policy transparency, however, the principle provided little concrete policy guidance about the nature and structure of access to central bank settlement accounts and credit. The Principles for Financial Market Infrastructures (PFMI) pay more attention to access policy than CPSIPS.[13] Reaffirming the importance of conducting settlements in central bank money whenever this is practical and feasible (Principle 9), the new international standards for FMIs recommend fair and open access to FMIs and highlight that limiting access to an FMI may significantly affect the competitive balance among market participants; disadvantage some market participants, service providers, and their customers; and increase the concentration of risk that may result from highly tiered arrangements for payment, clearing, and settlement. According to the PFMI, fair and open access should be tempered with reasonable risk-based criteria.

Starting in the early 2000s, central banks in a few advanced economies undertook to open RTGS access to banks other than commercial banks and to select categories of nonbank financial intermediaries. These included savings banks and building societies, investment firms, securities dealers, providers of clearing and settlement services, and government agencies. From 2011 onward, as a result of the growing relevance of nonbanks, and as the globalization of markets increased payment volumes and led to stronger competition among financial centers and mergers between providers, some central banks took further steps. The Netherlands opened access to brokerage houses, fund managers, and insurance companies, and Switzerland included, in addition, international joint ventures and foreign clearing and settlement companies. Notably, Singapore required systemically important nonbanks to have direct access and left to small nonbanks to choose not to be direct participants. Increasingly, RTGS access was granted to other FMIs.

According to the World Bank's most recent Global Payment Systems Survey (2021), system rules are explicit about which entities are allowed access, and access is granted based on objective criteria, rather than institutional standing. Thus, the majority of RTGS systems comply with the main thrust of Principle 18 of the PFMI, which stresses the importance of explicit and objective access criteria. The survey results further show that such compliance is high across all world regions and income levels. Specifically, 13 percent of the surveyed jurisdictions grant supervised nonbanks direct access to both settlement account and central bank credit facilities of RTGS, while 21 percent grant nonbanks access only to a settlement account. In 23 percent of the low- and middle-income countries, there is direct access to a settlement account but not credit, while the figure for high-income countries is 17 percent. For countries that offer both settlement accounts and credit, there is a discrepancy between high-income and low- and middle-income countries: 21 percent of central banks fall in the former category, and 9 percent of the central banks fall in the latter category.

According to the 2022 CPMI report, cited at the outset, no widespread changes to access policies have taken place

FIGURE 1 **RTGS Access for Nonbank Financial Institutions, by Geography and Income Level**

c. Supervised NBFIs	GLOBAL	BY REGION							BY INCOME LEVEL	
		East Asia and Pacific	Europe and Central Asia	High Income OECD	Latin America and Caribbean	Middle East and North Africa	South Asia	Sub-Saharan Africa	LMIC	High Income
No access allowed	34% (27/80)	27% (3/11)	50% (8/16)	40% (6/15)	21% (3/14)	40% (2/5)	25% (1/4)	27% (4/15)	38% (21/56)	25% (6/24)
Direct access to a settlement account and central bank	13% (10/80)		6% (1/16)	27% (4/15)	36% (5/14)				9% (5/56)	21% (5/24)
Direct access to a settlement account but not to credit	21% (17/80)	27% (3/11)	19% (3/16)	29% (3/15)	21% (3/14)		25% (1/4)	27% (4/15)	23% (13/56)	17% (4/24)
Can send transactions directly to the system, without having a settlement accoount	1% (1/80)				7% (1/14)				2% (1/56)	
Indirect access to RTGA services through a customer relationship with a direct RTGS system participant	31% (25/80)	45% (5/11)	25% (4/16)	13% (2/15)	14% (2/14)	60% (3/5)	50% (2/4)	47% (7/15)	29% (16/56)	38% (9/24)

recently or are expected in the short run. Only 28 percent of the surveyed payment systems reported having amended their access policies. The report indicates increasing demand for direct access to payment systems; almost half of the surveyed payment systems reported an interest from nonbank PSPs in gaining direct access, especially in CPMI jurisdictions. At the same time, discussions held with nonbank PSPs also showed that, in some jurisdictions, the appetite for indirect access was either relatively high or viewed as a viable option in parallel to direct access, depending on the cost and complexities of direct access.

Among the central banks surveyed for this study, two cases are of interest from the access policy standpoint. One is Thailand, where RTGS access is currently open to banks and nonbanks, including government agencies, securities companies, and clearinghouses, but the central bank has created a category, called "other legal entities," that would include any nonbank entity providing payment services. The other case of interest is Mexico, where any regulated financial institution can become a direct participant in the *Sistema de Pagos Electrónicos Interbancarios* (SPEI), Mexico's RTGS system, which also serves as the fast payment system of the country for retail payments.[14,15] Here access requirements are essentially the same for all participants, thus ensuring equal treatment for entry to the system. To limit the risks that participants generate, only financial institutions regulated and supervised by the Mexican financial authorities may become SPEI direct participants. By implication, the fintech companies that are regulated and supervised by the relevant authorities under the 2018 Fintech Law, are eligible to be granted access to SPEI as direct participants.[16]

Other central banks have also expanded (or are considering expanding) RTGS participation to nonbank PSPs. Relevant examples include the Bank of England, Reserve Bank of Australia, Reserve Bank of India (RBI), and Swiss National Bank.

Bank of England. In July 2017, the bank announced that nonbank PSPs were eligible to apply for a settlement account in RTGS. Opening up direct access would enable nonbank PSPs to compete on a more level playing field with banks and would stem the risks arising from tiered arrangements. The Bank of England thus encouraged moving to direct access and is actively engaging payment system operators to reduce tiering by identifying indirect participants that can move to direct access.

Reserve Bank of Australia. In Australia, the guiding principle on access to clearing systems is that participation should be widened to include all institutions fulfilling objective criteria set by the regulator.[17] The reserve bank promotes fair and open competition in the provision of payment services by allowing access to all providers of third-party payment services, irrespective of their institutional status.[18] Direct participation in the Reserve Bank Information and Transfer System (RITS), Australia's RTGS system, is allowed by default to all authorized deposit-taking institutions, as they are assumed to provide third-party payment services as part of their business, and has been extended to Australian-licensed central counterparties and securities settlement facilities. The reserve bank's access policy to RTGS settlement accounts aims to reduce the scope for material risks to arise from tiered participation arrangements. The policy thus limits to below a certain threshold the value of RTGS transactions that participants may settle indirectly, so that no individual indirect member would be expected to pose a material risk to either its sponsor bank or the system more broadly. Furthermore, to reduce dependence on direct participants, members that participate indirectly are required to maintain a settlement account for contingency purposes. Finally, to ensure that the RTGS system has sufficient information on indirect participation, indirect participants are required to report periodically to the reserve bank the value and volume of their outgoing RTGS payments. This information is also used to monitor compliance with the payment threshold.

Reserve Bank of India. In 2008, the RBI established a working group and initiated a national consultation process to prepare new guidelines for access to payment systems. Based on the recommendations made by the working group and the feedback received, the criteria were finalized for participation in the national payment systems: RTGS and National Electronic Funds Transfer. The access criteria guidelines of 2008 provided for financially sound entities to be direct participants in the national payment systems, comprising commercial banks, cooperative banks, primary dealers, clearing organizations, and special institutions (at the discretion of the RBI). The access criteria guidelines were revised in 2011, wherein, in addition to the entity fulfilling the revised financial strength indicators, it also had to provide a recommendation of the regulatory/supervisory department concerned for direct access to the RTGS system. A further update of the access criteria took place in 2017.[19] In addition to the existing parameters, the update also emphasized the

entity having requisite technological capabilities in the form of a core banking/centralized processing solution. More importantly, recognizing the entry of new players in the payments space in India, the 2017 guidelines also provided for the possibility for such entities to have direct access to RTGS. The access criteria are supplemented by the specific requirements laid down in the RBI's RTGS System Regulations of 2013 (updated in 2019),[20] which include (i) membership to the Indian Financial Network/Structured Financial Messaging Solution/domestic SWIFT network; (ii) maintaining a current account and a settlement account with the RBI; (iii) maintaining a subsidiary general ledger (SGL government securities) account with the RBI; and (iv) fulfilling any other additional requirements that may be specified by the RBI. The entities that have direct access to the RTGS system now include commercial banks and cooperative banks (such as the state cooperative banks, local areas banks, urban cooperative banks, district central cooperative banks, and so on); payment banks, small finance banks, and primary dealers; and clearing corporations, central counterparties, retail payment system organizations, and select financial institutions at the discretion of the RBI, such as the National Bank for Agriculture and Rural Development, Export-Import Bank of India, and Deposit Insurance and Credit Guarantee Corporation. The RBI's progressive revisitation of the access policy (revised financial strength parameters, specific approval of the regulatory department concerned, and technological capability) exemplifies the case of central banks supporting the evolution of the payment ecosystem (entry of nonbank PSPs) and the broader financial system, by adapting the access policy regime to intervening changes as needed. The RBI accordingly provides four membership categories to the RTGS system (table 1), in addition to the central bank (exclusively for the RBI).[21]

Swiss National Bank. In Switzerland, payments in Swiss francs are settled in the domestic RTGS systems called SIC. Originally, participation in SIC was limited to banks domiciled in Switzerland and subject to supervision by the Federal Banking Commission. The only exceptions to this rule were domestic clearing organizations. Over the years, this policy was increasingly challenged by developments in domestic and international financial markets. Nonbank intermediaries had gained ground in financial markets, thus raising questions about the dominant role of banks in this area, and globalization of markets had brought about not only ever-growing payment volumes but also stronger competition among financial centers and associated cooperation and mergers between providers of FMI. In the wake of these developments, conventional access policies became outdated and made cross-border projects (such as the continuous linked settlement system) virtually impossible—indeed, a very consequential impediment for the Swiss financial system. Against this background, the national bank in 1998 decided to liberalize its SIC access policy substantially, and it allowed for nonbanks to become SIC participants.[22] The SIC system permits only direct participation,[23] and participants in the SIC system are banks and other financial Institutions, comprising securities firms, cash processing operators, licensed fintech companies, insurance companies, and FMIs. Some participants are domiciled abroad.

TABLE 1 RBI Categories of Membership to the RTGS

Membership Type	Broad Category	Facilities Available
Type A	Regular participant	Intraday liquidity (IDL), interbank, customer transactions, own account transfer
Type B	Restricted participant	IDL, interbank, own account transfer
Type C	Clearinghouse	Gross transaction, multilateral net settlement batch, any other transactions/ facilities approved by the bank
Type D	Regular or restricted participant or clearinghouse	Customer transactions, interbank, IDL/no IDL, own account transfer, any other conditions applied by the RBI

4 ACCESS TO CENTRAL BANK SETTLEMENT SERVICES

Central bank policies limiting the range of eligible participants with direct access to central bank settlement services may be traced back to the strong link between RTGS system access policies and the traditional correspondent banking model, where settlement and credit relations tend to be concentrated in a relatively narrow group of financial institutions. Obviously, direct access to payment systems confers significant advantages, including speeding up payments, reducing their costs, and maintaining a more competitive market for payment services. Furthermore, direct access gives providers better control over the payment services they offer to their end users; it allows them to manage any associated risks (such as system failures) more effectively; and it gives them involvement in the governance of payment systems. Also, direct access provides central banks, in their capacity as payment system oversight authorities, with an efficient and effective information channel regarding the operational and financial performance of important RTGS participants. Indirect participants, on the other hand, necessarily rely on the services of competitors to access the RTGS system and may be required to provide competitors with sensitive business information. Principle 19 of the PFMI spells out the dependencies and risk exposures (including credit, liquidity, and operational risks) of tiered (indirect participant) arrangements, which could pose risks to the system as well as to the participants themselves.

In fact, indirect access raises several concerns.[24] First, indirect participants may have an insufficiently wide choice of sponsor banks, which would cause them to negotiate for indirect access on unfavorable terms. Second, indirect participants may find difficulties in accessing and assessing information about the indirect access services offered by sponsor banks, and in making meaningful comparisons between sponsor banks' service offerings. Third, as noted, sponsor banks are frequently downstream competitors to the indirect participants to which they provide indirect access, and cases are known of sponsor banks requesting that indirect participants provide information about their payment services and business models that the indirect participants view as commercially sensitive. Fourth, fees for securing indirect access might be too high and not consistent with an open and competitive market. Fifth, indirect participants may have difficulty communicating with the sponsor bank—for example, regarding operational incidents or planned future developments at the payment-system level, or regarding the ability of the sponsor bank to give the indirect participant technical support or to respond to its queries. Sixth, indirect participants face the risk that sponsor banks may discontinue the supply of indirect access at their own discretion, regardless of whether the indirect participants continue to comply with all relevant regulatory requirements. Seventh, indirect participants face uncertainties about the contractual arrangements that govern the supply of indirect access from their sponsor banks.[25] Eighth, the technical access capabilities that indirect participants receive from their sponsor banks (for example, near-real-time service availability) often may not be as good as those available to direct participants. Finally, indirect access raises credit risk in the system, as indirect participants incur credit and liquidity risk when receipts of funds are held with

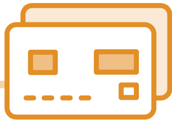
the direct participants, and direct participants concentrate settlement and credit relationships and are themselves vulnerable to risk of failure.[26] In turn, direct participants incur risks on their customer PSPs (indirect participants), as well acknowledged under the existing international standards for systemically important payment infrastructures,[27] and especially when they provide indirect participants with any form of credit as part of the payment (and/or other) services provided.

A recent cross-country study from the Bank of Canada observes that jurisdictions are opening up their core payment systems to greater numbers of direct participants.[28] A number of reasons contribute to this change in attitude.

The lessons from the global financial crisis. The severity of the crisis has impelled central banks to privilege policy measures that reduce systemic risks and to strengthen their role in support of FMIs in times of market stress or crisis. A relevant lesson from the crisis is that payment system participants see value in originating outgoing and receiving incoming payments directly in their own accounts, especially at times of large information asymmetries and when counterparties' creditworthiness is uncertain. Direct (and risk-based) access to RTGS systems is instrumental to achieving both objectives.

The growing relevance of retail financial services. Strong supply and demand factors are pushing for the delivery of more efficient and safe retail financial services to businesses and individuals. There has been increased focus on financial inclusion as a national strategic objective, and better appreciation of the benefits deriving from technological innovation as applied to the design and provision of financial products (fintech). All these factors have further enhanced the policy attention of central banks toward open and fair competition among PSPs, including, among others, by extending (and facilitating) RTGS participation to nontraditional actors. Competition requires freedom of access for both PSPs and users, and the absence of restrictive practices that might limit or distort competition among providers. Moreover, several countries have modified their RTGS systems to incorporate fast payment capabilities.[29] This has also come with adjustments to the RTGS access policies, by also allowing nonbanks that offer fast payment services to have direct access (at least to a settlement account) to the RTGS (for example, Zengin System Japan).

The emergence of the "functional" approach to financial regulation.[30] The adoption of functional regulation for the provision of payment services in several jurisdictions has led policy authorities to adopt a more open attitude toward FMI access, since what matters under the functional approach is the ability of service providers to perform a given function safely and efficiently, rather than the specific institutional or legal nature of the providers (that is, banks versus nonbanks).[31] The underlying logic holds that, to the extent that different types of PSPs supply the same typology of services and products, they should be bound by the same rules and standards, so as to level the playing field where they compete and to make rules and standards more effective and incentive compatible for all competing entities. Rules and standards may in fact differ under a functional approach, yet their differences should reflect (and be proportional to) the differences in the risk profile of individual PSPs: Tighter (softer) rules should apply to PSPs whose business activity is characterized by higher (lower) risk.



5 ACCESS TO CENTRAL BANK CREDIT SERVICES

The effective functioning of RTGS systems depends critically on the adequacy of the liquidity they use. This specifically refers to the immediately usable balances on the accounts held by participants with the settlement authority, which is available within the day to each RTGS member and enables it to fund its payment obligations and those of its customers. Principles 4 through 7 of the PFMI (with Principle 6, "Margin," being applicable only to central counterparties) discuss the understanding and management of credit and liquidity risk, and Principle 12 shows how links between two FMIs, such as a large-value transfer system and a central securities depository, can create cross-system intraday liquidity risk, with potentially systemic implications. A common mechanism that most central banks use to smooth the RTGS process is liquidity provision. This consists of central banks injecting money into payment systems by supplying reserves to participants through credit, repos, or overdraft facilities on an intraday basis. The World Bank's 2021 Global Payment Systems Survey reports that 85 percent of the respondent RTGS operators worldwide allow participants to access credit facilities but require suitable collateral.

In providing liquidity, central banks are confronted with a dilemma: On the one hand, they need to satisfy the large daytime demand for reserves driven by payment activities. On the other hand, they need to ensure overall consistency of the supply of reserves with other central bank objectives. These objectives typically include preventing moral hazard in risk taking from market participants, limiting credit risk in central bank lending, and pursuing monetary-policy objectives. Central banks have historically preferred restricting the provision of liquidity (including intraday) to commercial banks.

This preference is supported by a number of arguments: First, a significant number of central banks were established at the time when commercial banks provided much of the capital in the economy. Second, only commercial banks were exposed to massive liquidity risk. Third, large banks were considered too big to fail and thus deserved to be covered by the public safety net. Finally, granting central bank liquidity assistance to commercial banks, when market circumstances so required, was seen as a benefit that balanced the high cost of regulation and supervision to which commercial banks are subject due to their special role in maturity and liquidity transformation. Consequently, broadening central bank liquidity access to nonbanks would distort the banks' cost-benefit balance.

However, the deep structural changes that have transformed financial markets across the world have given prominence to nonbank financial institutions. In fact, this trend is all but increasing. In addition, the 2008 global financial crisis illustrated well the potentially distressing consequences of money markets becoming unable to ensure the timely transfer of funds among payment system participants. As a result, central banks felt compelled to fund short banks in a situation where other banks and market intermediaries had become unwilling or unable to lend. These developments also led central banks to consider expanding the range of eligible counterparties for intraday credit to include nonbanks. The essential question, then, is which nonbanks should be given access to central bank intraday liquidity.

In the context of highly complex and diversified financial markets, the functional approach to regulation recalled earlier offers a useful guiding principle for the design of an

optimal access policy to central bank liquidity. Accordingly, access should be granted based on the function(s) of the entities to be considered for eligibility, rather than their legal nature. On this ground, access should be considered for entities that engage in maturity and liquidity transformation activities and operate on a highly leveraged basis or fractional reserve basis, which may expose them to the risk of running short of liquid resources in the course of their operation, thus possibly affecting the normal completion of the RTGS process. Their access to liquidity would enable the central bank to intervene in support of the system or the market when circumstances might so require.

As a corollary to this principle, ancillary conditions for considering granting access to central bank intraday liquidity should include the systemic relevance of the entities under consideration, based on indicators such as their relative share of the total payment activity in the system and/or their degree of interconnectedness with other entities in the payment system and financial market. Also, depending on local circumstances to be evaluated by the central bank, the concept of "systemic relevance" should be articulated flexibly and include also "prominent" (or "critical" or "important") entities whose failures would not have system-wide significance but might still be large enough to affect relevant segments of the economy or regions.

The aforementioned guiding principle would exclude from access to central bank intraday liquidity those PSPs that operate on a fully funded basis. This would be the case, for instance, for the entities issuing stored-value-facility (SVF) instruments, such as prepaid cards, mobile money, and e-money in general, which, by regulation, may not run short of funds and, by construction, should never find themselves in need of financing short positions—much as would be the case with commercial banks operating under 100 percent reserves or liquidity requirements ("narrow banks"). Yet a central bank should also give consideration to circumstances in which even prefunded entities might need extra liquidity during their daily payment activity, due to failures of the banks where they hold the funds received in exchange for the SVF instruments issued.

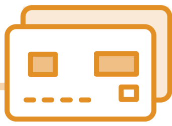
These circumstances would be especially critical in the event of entities that have reached systemic relevance or prominence, as discussed in the preceding paragraph. To prevent those circumstances from happening, central banks might consider requiring systemically important or prominent SVF issuers to hold the funds received from their customers in special accounts with the central banks themselves. As an alternative, central banks could require SVF issuers to hold the funds in trust accounts with banks and require the latter to block the funds in their central bank accounts.[32] In both cases, the prefunded position of the PSPs would be fully safe. Notice, however, that where banks hold only a fraction of reserves against their deposit liabilities, the requirements for SVF issuers might bear effects on bank funding and lending. The extent of these effects would obviously depend on the size of the substitution of SVF instruments for bank deposits.[33]

This issue might be especially important for bigtechs. These are large technology companies with extensive established customer networks that use their platforms to facilitate the provision of digital financial and nonfinancial services. Nonfinancial services typically include e-commerce, social communication, and search engines, while financial services may include payments, credit, asset management, and the provision of insurance products.[34] In the payment service market, for example, mobile platforms, including those that are integrated into social networking platforms, have seen rapid uptake by hundreds of millions of users across many jurisdictions worldwide. Participation of bigtechs in FPS should be expected as a natural evolution of a market where these companies may want to provide customers with better (more efficient and convenient) services.

Considering the size and potential risk implications of bigtechs for FPS, which may run even deeper than those of many banks, central banks might want to explore granting them direct access to RTGS systems, monitoring their performance directly, and subjecting their operators to adequate oversight expectations, possibly in cooperation with the agency responsible for regulating and supervising their financial activities (especially credit provision).

TABLE 2 RTGS Access: Central Bank Policy Options

Type of Access \ Type of PSP	Small PSP	Large PSP
Settlement account	PSP's own decision (based on business strategy)	Compulsory
Liquidity facility	Central bank's decision (based on evaluation of risk profile)	Compulsory (especially if PSP provides credit)



6 EMERGING TRENDS

IMPLICATIONS OF 24/7 RTGS OPERATION ON ACCESS FOR NONBANK PSPS

A stocktaking exercise undertaken by the CPMI Cross-border Payments Expansion Workstream as part of the overall G20 cross-border payment program looked at the operating hours of RTGS systems.[35] It found that among the 62 jurisdictions that responded to the survey, the RTGS systems are currently open for almost 11 hours per day on average, while noting that substantial variation exists in daily operating hours across jurisdictions. It found that jurisdictions in 40 emerging markets and developing economies have below-average operating hours; 21 operate eight or fewer hours per day. Twenty-two jurisdictions have above-average operating hours, with eight jurisdictions operating more than 16 hours per day. Four jurisdictions (India, Mexico, South Africa, and Switzerland) operate 24 or nearly 24 hours per day.

The direct implication of the extension of RTGS operating hours is that the time window for final settlement in central bank money becomes wider and thereby contributes to systemic and financial stability by mitigating credit and liquidity risks. With FPS settling in central bank money, this would potentially result in greater liquidity savings and avoid any liquidity mismatches (which could result during the non-operating hours of the RTGS system).

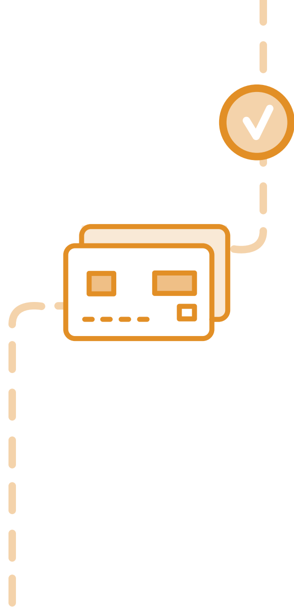
Of specific relevance is whether the extension of RTGS operating hours to a 24/7 basis could have a bearing on the access of nonbank PSPs to the RTGS system, given the likely greater demand for liquidity. The demand for greater liquidity would surely arise whether the nonbank PSP is a direct or an indirect participant in the RTGS system, as greater demand for liquidity is the benefit of full and final settlement in central bank money. Notwithstanding this benefit, the issue that needs to be examined in greater detail is whether central banks could also provide credit support to nonbank PSPs (where these are direct participants), as they do in the case of banks. A deeper analysis is required to understand whether such credit facility from the central bank would be extended to entities issuing SVF instruments and even to bigtechs. It should be noted, however, that nonbank PSPs have in general become adept at managing their liquidity needs, having gained considerable experience in doing so as direct participants in FPS. Thus, managing their liquidity for a 24/7 cycle of RTGS operations potentially may not be a difficult proposition for nonbank PSPs, even in the absence of any credit facility being extended by the central bank. As indicated, these aspects need to be analyzed in depth for addressing the above issues, taking into account the economy's development and applying a functional and jurisdictional approach.

EXTENDED RTGS ACCESS AND CENTRAL BANK DIGITAL CURRENCY

Many central banks today are considering issuing a digital currency. One of the many choices involved in this regard is whether the central bank digital currency (CBDC) would be available only for a selected group of agents, including, importantly, nonbank PSPs, which typically deal with pay-

ments of large volume and value (that is, wholesale CBDC, or wCBDC), or whether the new instrument would be available for use by the general public, comprising, in principle, all persons and entities (that is, retail CBDC, or rCBDC) and for payments of small volume and value.[36]

Where a central bank decided to issue rCBDC, then, the question would be how to integrate the new rCBDC system with the existing RTGS system, and, for the specific purpose of this article, what the implications would be for RTGS access. It should be noted that, to the extent that centralized infrastructures can be redesigned to interface with innovative payment systems and providers, including those operating on distributed ledger technology, an adapted RTGS system with extended access to nonbank PSPs could well support rCBDC.[37] The use of omnibus accounts could conveniently enable nonbank PSPs to participate directly in the system, thereby allowing for a greater range of innovative payment services to benefit from settling in central bank money.



7 ISSUES FOR CONSIDERATION BY CENTRAL BANKS: Benefits, Risks, and Challenges of Extending RTGS Access

Participation in RTGS systems is governed by central bank regulations. Most such regulations today restrict access to banks and select financial intermediaries and do not contemplate direct participation from nonbank PSPs. As the significant evolution and transformation of the payment activity worldwide and the stronger interest on financial stability are pressing central banks to reconsider their RTGS access policies, the following indications can be drawn from the analysis developed in this article.

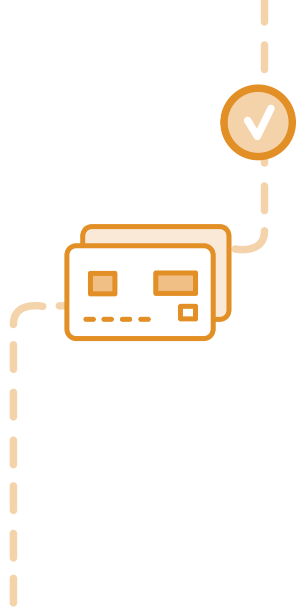
Take a holistic approach to RTGS access policy. Central banks should recognize the importance of settling payments in central bank money whenever practicable and feasible, and consider adopting a direct access policy that is as wide and open as possible—a way to make FMIs safer and more efficient. In that spirit, central banks could take a liberal stance by opening to the possibility of giving nonbank PSPs direct access to RTGS systems (subject, of course, to satisfactory compliance with attendant regulations) but letting them ultimately decide whether to apply for direct or indirect participation based on their own cost-benefit assessment. This assessment would trade the higher (financial and compliance) costs associated with direct participation for the advantages of not having to go through (potentially competing) banks acting as settlement sponsors. In the event that a nonbank PSP's payment activity were to achieve levels comparable to those of direct participants, the relevant central bank might require it to become a direct participant in the system. Moreover, in the presumption that, due to the nonbank PSP's size and/or interconnectedness, its failure to settle might have significant consequences, the central bank should also consider extending liquidity access to it.[38]

Take the opportunity and revisit the entire RTGS access policy. As central banks undertake to evaluate the pros and cons of the direct participation of nonbank PSPs in the RTGS systems, the opportunity could be taken to carry out an overall review of RTGS access policy, which would consider opening up direct access to nonbanks when circumstance so suggest. The review should be guided by the principles of functionality and proportionality. According to functionality, access criteria should be the same for all entities providing payment services, irrespective of the specific legal and institutional nature of each entity. According to proportionality, such criteria could differ only to reflect the specific risk profile characterizing each entity. Furthermore, the review of access policy should aim at increasing the safety and efficiency of FMIs. In this context, special attention should be paid to the need to manage effectively the risk of wholesale payment fraud related to endpoint security.[39] A wider and more open access policy, supported by strong and proportional oversight requirements, would promote competition among PSPs while preserving financial stability. Where justified by transaction volumes and values, direct participation would support the objectives of both efficiency and stability by eliminating the barriers to competition potentially raised by indirect participation and by giving the central bank greater leeway in oversight.

Pay close attention to competition and fairness. In the context of an expanded FMI access policy, accreditation rules for technical access and access fees should be reconsidered to make sure that they would not unduly hinder direct participation. In particular, introducing a more risk-based approach (for example, requirements that are more commensurate with the size of nonbank PSPs and/or the systemic risks posed by nonbank PSPs to the payment system) should be given due consideration. This may result in changes to technical and operating requirements (including how such requirements apply to different nonbank PSPs), which could reduce up-front and ongoing technical connection costs. Also, the concerns relating to indirect participation, discussed earlier, should receive special consideration. With regard to protecting the interest of indirect participants (especially those that would not have a business case for becoming direct participants even under new access rules), accreditation arrangements with sponsor banks and fees required by sponsor banks to provide indirect participation services should be assessed to keep them from being used by sponsor banks to inhibit competition from indirect participants.

Consider the broader implications of the decision. Extending direct RTGS access to nonbank PSPs may offer an opportunity to evaluate the broader implications of the decision. For instance, would the decision require amending relevant laws and regulations, especially concerning the payment system and the banking sector?[40] Would central banks have the legal power to oversee nonbank PSPs as payment system participants? Also, in view of the role that nonbank PSPs could play through the application of modern technologies both to deliver new payment services to populations across the country and to facilitate financial inclusion, the opportunity could be ripe for reconsidering and broadening the business activities that nonbank PSPs are authorized to perform under current regulation. Finally, where relevant, risk considerations relating to payment systems that use commercial bank money as the settlement instrument should lead central banks to encourage (if not require) the use of central bank money for settlement purposes and, hence, direct participation in the RTGS.

Consider risks. Finally, consideration will have to be given to the risks that extending direct RTGS access to nonbank PSPs could bring into the system. These risks would not differ substantially from those posed by the types of entities that usually participate in existing RTGS systems. What would be critical, however, is that all new participants be subject to consistent risk-based access rules and requirements and that they comply with the requirements on an ongoing basis. Specifically, they would need to demonstrate that they have the operational and financial capacity to settle transactions in RTGS efficiently. This would require that they be adequately overseen by the central bank or other relevant authority. This would also contemplate a "trust and verify" approach, whereby (i) direct participants would self-attest to their compliance with the system rules and requirements and declare instances of noncompliance, and (ii) the authority would have the power to verify compliance at any point in time. In addition, for nonbank PSPs that would be participants in payment schemes—say, FPS, which eventually settle in the RTGS system—they could be asked to join prefunded arrangements. This would in turn require that the nonbank PSPs be granted access to a prefunding account at the central bank. The prefunding account would be used to hold balances to cover the participants' largest net debit position in the payment scheme and so ensure that their obligations would be settled in the event of default. In fact, the prefunding account would be used only in contingency scenarios.[41] Finally, nonbank PSPs that issued liabilities to users in the form of e-money should be required to safeguard the funds received from customers by placing these funds in an account with an authorized credit institution or the central bank.[42] The funds thus safeguarded should be segregated from any "own funds" of the nonbank PSPs.[43]

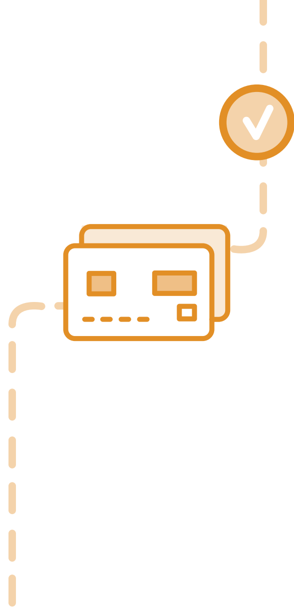


8 CONCLUSION

Central banks, in their capacity as settlement agencies and operators of their national RTGS systems, are considering the merits of extending RTGS access to retail PSPs other than commercial banks, especially in the context of FPS proliferation across the globe. While nonbank PSPs have direct access to FPS clearing services, this is not always the case when it comes to settlement in RTGS systems. In many instances, nonbank PSPs still must rely on banks (as direct RTGS participants) to settle FPS transactions in an RTGS system. This may disrupt the level playing field between banks and nonbank PSPs.

In several jurisdictions, establishing risk-related access criteria and implementing functional and proportional regulations for the provision of payment services has led policy authorities to adopt a more holistic approach toward access criteria for RTGS systems. Under a functional approach, the access criteria could be the same for all entities providing payment services (irrespective of their specific legal and institutional nature), with such criteria being applied proportionately to reflect the risk profile characterizing each entity.

Central banks should consider both the benefits and challenges they would encounter in broadening their access criteria for RTGS systems. Direct access would provide a level playing field, lower barriers to entry, improve competition, and promote innovation, and it could help in lowering costs. These measures could also facilitate greater financial inclusion. From a financial stability perspective, direct access to central bank liquidity facilities would lead to reduced settlement, credit, and liquidity risks and lower the risks related to indirect participation though tiering arrangements. The challenges could stem from the legal and regulatory framework, which determines what entities are eligible for direct access, and from the operational, technical, and financial requirements, which could be demanding for nonbank PSPs. Central banks could also face reputational risk if a problem were to arise with an entity that became a direct participant through the revised access rules. Central banks should ensure that their access policy is transparent and consistently applied, and that the procedures underpinning the application process are robust. The guidance provided by the PFMI should be applied in such decision making.



9 ACKNOWLEDGMENTS

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ENDNOTES

1. According to the Committee on Payments and Market Infrastructures (CPMI), a fast payment is defined as a payment in which the "transmission of the payment message and the availability of 'final' funds to the payee occur in real-time or near-real-time on as near to a 24-hour and seven-day (24/7) basis as possible."
2. See B. Bossone, G. Srinivas, and H. Banka, "Granting Access to Real-Time Gross Settlement Systems in the Fintech Era," *Journal of Payments Strategy & Systems* 14, no. 4 (October 2020).
3. See CPMI, *Developments in Retail Fast Payments and Implications for RTGS Systems* (Bank for International Settlements, December 2021).
4. CPMI, *Improving Access to Payment Systems for Cross-Border Payments: Best Practices for Self-Assessments* (Bank for International Settlements, May 2022).
5. As the deputy governor of the Bank of Japan recently put it, "In each country, the central bank is the only entity able to provide money with 'finality,' which is free of credit risks and 'unwinding' of settlements. The settlements through central bank money play a critical role in the economy since they relieve economic entities from the risks regarding payments and settlements stemming from past transactions and thereby enable them to allocate their resources to promising economic activities for the future" (H. Nakaso, "Future of Central Bank Payment and Settlement Systems under Economic Globalization and Technological Innovation," Remarks at the Forum "Towards Making Effective Use of the BOJ-NET").
6. See CPSS (Committee on Payment and Settlement Systems), *The Use of Central Bank Money in Payment Systems* (Bank for International Settlements, 2003).
7. The World Bank's *Global Payment System Survey 2018* reported that, of the 91 respondents, 89 RTGS systems are owned by the central bank and 81 are operated by the central bank.
8. For the purposes of this study, a nonbank is defined as any entity involved in the provision of retail payment services whose main business is not related to taking deposits from the public and extending loans to economic entities. This definition draws from CPMI, *Non-Banks in Retail Payments* (Bank for International Settlements, September 2014).
9. See J. Marquardt, "Payment System Policy Issues and Analysis," in *The Payment System: Design, Management, and Supervision*, ed. B. Summers (International Monetary Fund, 1994).
10. See Bank of England, "The Development of a UK Real-Time Gross Settlement System," *Bank of England Quarterly Bulletin* (May 1994).
11. Their recommendation is contained in Working Group on EC Payment Systems, *Report to the Committee of Governors of the Central Banks of the Member States of the European Economic Community on Minimum Common Features for Domestic Payment Systems* (November 1993).
12. See CPSS, *Core Principles for Systemically Important Payment Systems* (Bank for International Settlements, January 2001).
13. The *Principles for Financial Market Infrastructures (PFMI)* are the international standards for FMIs—that is, payment systems, central securities depositories, securities settlement systems, central counterparties, and trade repositories. Issued by the CPSS and the International Organization of Securities Commissions in 2012, the PFMI are part of a set of 12 key standards that the international community considers essential to strengthening and preserving financial stability. Notice that, in light of its standard-setting activities and the associated greater public scrutiny, in September 2013 the CPSS reviewed its mandate and was renamed as the Committee on Payments and Market Infrastructures (CPMI). Both changes became effective as of September 1, 2014.
14. Banco de México reserves the right to grant access to the system to any other entity, provided that this is regulated and supervised by Banco de México itself, the *Comisión Nacional Bancaria y de Valores*, the *Comisión Nacional del Sistema de Ahorro para el Retiro*, or the *Comisión Nacional de Seguros y Fianzas*. The prospective participant must demonstrate that it complies with the technical requirements to operate in SPEI. Access rules are proportional, in that certain more stringent requirements on service availability to the final customer are waived for smaller participants.
15. In 2010, Telecomm, a public telecommunication firm that provides remittance and bank-agent services mostly in remote villages, was granted direct access to SPEI. By January 2014, 43 nonbanks participated directly in SPEI. They comprised 17 broker-dealers, four foreign exchange firms, seven insurance companies, 11 microfinance and financial services firms, two pension fund managers, and two investment fund managers. Mobile payment clearinghouses are required to participate in SPEI to ensure the interoperability of those payments. Participants must comply with technical, information security, and operational risk-management requirements prior to joining the system.
16. In particular, in Mexico there are two types of regulated fintech institutions. The first type includes the *Instituciones de Tecnología Financiera* (ITFs) and *Instituciones de Fondos de Pago Electrónico* (IFPEs), which are e-money issuers. The second type includes the *Instituciones de Financiamiento Colectivo* (IFCs), which are crowdfunding entities. As the ITFs are both regulated and supervised by the central bank and the banking supervisor, they are eligible for participation in SPEI. The regulation for IFPEs require them to participate in a payment system regulated or operated by the central bank (such as SPEI), when they reach certain level of transactions, accounts, or cumulative balances.
17. See RBA (Reserve Bank of Australia), *Reform of Australia's Payments System: Conclusions of* the 2007/08 Review (Reserve Bank of Australia, September 2008).
18. See RBA, *Assessment of the Reserve Bank Information and Transfer System* (Reserve Bank of Australia, May 2017).
19. See RBI (Reserve Bank of India), "Master Directions on Access Criteria for Payment Systems" (Reserve Bank of India, January 17, 2017, updated July 28, 2021).
20. See RBI, *Real Time Gross Settlement (RTGS) System Regulations, 2013* (Reserve Bank of India, October 2013, updated 2019).
21. See RBI, *Real Time Gross Settlement (RTGS) System Regulations, 2013*.
22. See CPSS, *Payment Systems in Switzerland*, CPSS Red Book (Bank for International Settlements, 2003).
23. The only exception is the (FINMA-recognized) clearinghouse that serves as an interface to the SIC system for its member banks. FINMA is the Swiss Financial Market Supervisory Authority.
24. See Payment System Regulator, "Access to Payment Systems," Supporting Paper 4, PSR CP14/1.4 (Financial Conduct Authority, November 2014), Part D.
25. Examples include cases where indirect participants were unable to secure a written copy of their contractual arrangements with their sponsor bank, and where sponsor banks have been reluctant to provide what indirect participants viewed as suitable contracts in support of the provision of indirect access,

in particular as these contracts did not include protections that are typical of critical outsourcing agreements (for example, business continuity, exit management, detailed service levels, and redress in the event of failure by the supplier).

26. This type of risk is illustrated by the 1984 failure of Continental Illinois National Bank in the United States: Continental served as a large correspondent bank and gateway to the interbank payment system, and a major financial stability consideration at the time of its failure was the concern about the financial standing of the large network of respondent banks.
27. See the PFMI, specifically Principle 19, "Tiered Participation Arrangements."
28. See M. Tompkins, "Clearing and Settlement Systems from around the World: A Qualitative Analysis," Payments Canada Staff Discussion Paper No. 5 (Payments Canada, June 2016).
29. A fast payment is a payment in which the transmission of the payment message and the availability of "final" funds to the payee occur in real time or near-real time on as near to a 24-hour-a-day, seven-day-a-week basis (24/7) as possible. See CPMI, *Fast Payments—Enhancing the Speed and Availability of Retail Payments* (Bank for International Settlements, November 2016).
30. The functional approach to financial regulation focuses on functions rather than institutions (as is the case for the traditional—institution-based—approach to financial regulation). The word *functional* means that all entities that offer the same financial services are governed by the same rules, irrespective of their legal or institutional nature (for example, banks versus other types of nonbank financial institutions). See Group of Thirty, *The Structure of Financial Supervision: Approaches and Challenges in a Global Marketplace* (Washington, DC: Group of Thirty, 2008).
31. A major example of functional regulation as applied to the provision of payment service systems is the European Union's Payment Services Directive (PSD 2), Directive (EU) 2015/2366.
32. Colombia allows e-money issuers (banks and nonbanks) to hold funds at the central bank, and El Salvador requires them to hold 100 percent of funds at the central bank. In Brazil, nonbank issuers are required to keep part of the funds at the central bank in cash, and they are also allowed to keep part of the value in government bonds, while banks are required to keep the full amount in cash at the central bank. Turkey requires issuers to hold funds with banks, and these in turn are required to hold 100 percent of the funds with the central bank. Introducing such regulatory requirements, however, should require giving prior consideration to the impact it would have on banks' credit creation.
33. Both requirements would cause banks to lose retail funding and demand that they make up for the difference between their (fractional) reserve holdings against their deposit liabilities and the reserves necessary to fully back the stored-value facility liabilities issued to customers. All else being equal, the cost of bank funding would rise, and bank lending would be constrained and/or extended at more expensive terms. An example would clarify the funding aspect. Assume that a bank carries 100 units of customer deposits, against which it holds 20 units of central bank reserves (as fractional coverage). Take now the limit case where the bank's customers use their deposits to purchase 100 units of e-money balances issued by a nonbank e-money institution. The latter is required to hold the funds received from the customers in a dedicated account at the central bank. To settle the deposit transfer to the e-money institution, the bank would have to use its 20 units of reserves and would still have to come up with additional 80 units of reserves. The same would happen under the alternative type of requirement, whereby the e-money institution must hold the funds in a trust account with the bank, and the latter in turn must fully back with reserves the funds held in the trust account. In both cases, the bank needs to cover the 80 reserve unit difference.
34. For an initial comprehensive discussion of the role of bigtech in financial sector, see FSB (Financial Stability Board), *BigTech in Finance: Market Developments and Potential Financial Stability Implications* (December 9, 2019). More recent analytical and policy work on bigtechs includes J. C. Crisanto, J. Ehrentraud, A. Lawson, and F. Restoy, *Big Tech Regulation: What Is Going On?*, FSI Insights on Policy Implementation No. 36 (September 2021); J. Ehrentraud, J. L. Evans, A. Monteil, and F. Restoy, *Big Tech Regulation: In Search of a New Framework*, Financial Stability Institute Occasional Paper No. 20 (October 2022); P. Bains, N. Sugimoto, and C. Wilson, *BigTech in Financial Services: Regulatory Approaches and Architecture*, Fintech Note (January 2022); J. C. Crisanto, J. Ehrentraud, M. Fabian, and A. Monteil, *Big Tech Interdependencies—A Key Policy Blind Spot*, FSI Insights on Policy Implementation No. 44 (July 2022); and E. Feyen, H. Natarajan, and M. Saal, *Fintech and the Future of Finance: Market and Policy Implications* (World Bank, 2023).
35. See CPMI, *Extending and Aligning Payment System Operating Hours for Cross-Border Payments* (Bank for International Settlements, May 2022).
36. For an updated report on the status of central banks on CBDC, see "Central Bank Digital Currency (CBDC) Tracker" (web page), Atlantic Council, https://www.atlanticcouncil.org/cbdctracker/.
37. See, for instance, Bank of England, "RTGS Renewal Programme Proof of Concept: Supporting DLT Settlement Models" (Bank of England, July 23, 2018).
38. Settlement failure of an indirect participant could be of two types: first, the failure to settle of the indirect participant itself, with potential consequences for the direct participant acting as settlement agent and for other linked participants; and second, the failure to settle of the direct participant acting as settlement bank, which could reverberate on all the indirect participants that settle through it.
39. See CPMI, *Reducing the Risk of Wholesale Payments Fraud Related to Endpoint Security* (Bank for International Settlements, May 2018).
40. This would be the case, for instance, if existing laws limit access to central bank accounts to specific categories of institutions, such as commercial banks.
41. The funds in the prefunding accounts would not be used in the normal course of settlement, which must be provided separately in the settlement accounts ahead of payment scheme settlement. This solution would prove to be very costly to nonbank PSPs; not only would they have to fund their settlement account in the payment scheme, they would also have to hold a separate pool of funds in the RTGS. A possible alternative solution, in the case of, say, an FPS, would be for the FPS to have a "pool" account in the RTGS system where the funds of nonbank and bank PSPs are used for FPS settlement. This solution is adopted by CHIPS. (See https://www.theclearinghouse.org/payment-systems/CHIPS.)
42. On the nature of these funds, which are not customer owned, see B. Bossone, "Money and Customer Funds in the World of Digital Finance: Who Really Owns What?," *Journal of Payment Strategy & Systems* 15, no. 1 (spring 2021): 37–53.
43. These services are provided by the United Kingdom's CHAPS system. See *Access to UK Payment Schemes for Non-Bank Payment Service Providers* (Bank of England, Financial Conduct Authority, and Pay.UK, December 2019).

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