FedNow and Faster Payments in the US

Charles M. Kahn*

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Abstract

This paper compares FedNow, the US instant payments system recently introduced by the Federal Reserve, with faster payments systems in the UK and Brazil. It describes important features of FedNow, the history of its introduction, and the political economy considerations which led to some basic choices regarding its structure. For the comparison, a typology of payments rails is presented and used to distinguish the benefits of improved speed under two different basic motives for payment. Use cases for FedNow are evaluated, noting some features that will be needed to encourage growth of FedNow in the short to medium run.

JEL Codes: E42, E58

1. Introduction

Retail fast payment systems have been established around the globe. By one count, users in more than 100 jurisdictions have access to such systems [Frost et al. 2024], including recently initiated systems in the US (FedNow) and Brazil (Pix) offering instantaneous electronic transmission of payments between bank accounts. These are in addition to the national large value payments systems typically run by central banks. Some countries, such as the UK (Faster Payments System) have had near real time retail systems for many years, providing effectively immediate access to funds even while the actual payment system proceeds more slowly. In a number of countries official services co-exist with commercially-provided services that also offer rapid access to payment.

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In many countries fast payments are simply expected as the norm. In developing countries, access to improved payment services has had clearly transformative economic effects.[1] It has been argued that interlinking improved payment systems can ameliorate obvious deficiencies in cross-border payment arrangements [CPMI, 2020 and 2023]. Additionally, in the face of continuing interest in the development of central bank digital currencies (CBDCs), and the growing awareness of the difficulties inherent in their implementation, it has frequently been asked whether improved fast payment systems can meet most, if not all, of the rationales for CBDC [Patel et al. 2024].

The FedNow System has been in operation for a little more than a year. Because of the unique institutional environment in the US for financial intermediaries, and the regulatory restrictions imposed by the American legal and economic systems, implementation of FedNow was particularly challenging. In this we paper we review the arguments for the importance of retail faster payments and consider the problems and possibilities for further development faster payments in the US. We provide an overview of the FedNow system and its relation to other American payments systems. We provide a typology enabling comparison with systems in Brazil and the UK and consider the rationales for the structures chosen. In addition, we consider the policy and regulatory consequences of FedNow, and the extent to which faster payments systems do and do not meet some of the public policy goals for which CBDC has been proposed.

The US was late to adopt faster payments. The first instant payment system operating in the US, the RTP system, is just seven years old and handles a negligible fraction of US retail payment; by contrast faster payments in the UK account for on the order of 10% of retail transactions [BCG, 2024, page 20]. Meanwhile, newcomers in developing countries like India, Thailand, and Brazil have outstripped developed economies in adoption of faster payments. Klein [2023] argues that the slow rollout of FedNow and its understated performance thus far, compared, for example, with Pix, can be traced to conflicts in the multiple roles of the Federal Reserve and to undue weight placed on the stability of the payment system and protection of the overdraft fees earned by banks at the expense of the costs to the most vulnerable consumers. Our take is somewhat more muted. While questioning some of the specific decisions that went into the FedNow

[1] The M-Pesa mobile money service in Kenya provides some of the early evidence, see Jack and Suri [2014].

architecture, we argue that the program overall has marshalled the political constraints it has faced, converting them into engines for future development of the system.

The organization of this paper is as follows: In section 2 we provide background about payments systems. This includes basic definitions for types of payment systems we will investigate and the policy issues that arise regarding payments systems. We describe the steps of a payment and factors underlying demand for payment, which in turn serve as a basis for a typology that distinguishes among faster payment systems, showing how differences in fundamental motives for payments affect demand for speed in payment.

Section 3 turns to institutions, describing FedNow in detail, and comparing it with other payment systems in the US and abroad, as well as to proposed roles for CBDC. Section 4 considers various potential and actual use cases for FedNow. Brief sections at the end consider how FedNow is affected by emerging payments technologies, how it could impinge on regulatory concerns, and what problems it must address in order to grow in the short and medium term.

2. Background

The study of payments systems has come a long way from the days in which payments institutions were dismissed as mere "plumbing."[2] In this section we distinguish among some of the major types of payments systems and note some of the important policy issues regarding them.

1. Definitions

The most fundamental distinction among payment systems is the distinction between *large value systems,* which serve as the backbones for national transactions, transmitting large individual payments between financial institutions, and *retail systems* handling everything else. Among retail systems, an important subcategory is *batch processing systems* which handle recurring payments such as a company's payroll or a utility's monthly payments in batches rather than one-by-one.

[2] See Kahn and Roberds [2009] for an early survey of the field.

For traditional modes of payment, a second fundamental distinction is between "token-based" and "account-based" payments systems [Kahn and Roberds, 2009, CPMI, 2018]. Cash in a fiat-money system is the classic example of a token-based system: payment is made by transfer of the token from payer to payee, and physical possession of a valid token is all that is required for a payer to initiate a payment. While the underlying mechanisms are much more complex, cryptocurrencies often attempt to simulate users' experience in a token-based payment system. In contrast, an account-based system effects payment through debit and credit transactions on the balance sheet of a third party. A payer's identity is central to the payee's acceptance of the payment; physical possession of some object (e.g. a stolen checkbook or payment card) is not sufficient for the final payment to go through successfully, as opposed to a payment with stolen cash.[3]

In some account-based transactions, all participants have accounts with the same entity: for example, an "on us" transfer between two depositors' accounts at the same bank, or a transfer between two user accounts at PayPal. The term "closed loop" is sometimes used to distinguish systems in which all users must have accounts at a single entity. If the accounts are not with the same entity, then the payment needs to run on *payments rails*—the protocols, communications, and institutions that govern the interactions of the payment account providers. In the US, payments between bank accounts at different banks can travel a variety of rails, including rails provided by payments card companies, and several rails provided by the Federal Reserve—notably the large value service Fedwire, the batch service FedACH, and the faster payment service FedNow.

The terminology for faster payments is slippery, debated among observers, and dependent on whether reference is being made to speed of settlement or speed of availability.[4] We use "faster payments" as generically described by the BIS [CPMI, 2023]. This entails three key features: real-time or near real-time

[3] Although the distinction between token-based and account-based payments blurs in attempts to apply it to new electronic systems [Garratt et al 2020], it provides a useful baseline in considering these systems as well [Kahn, C., 2020]. In Kahn and Roberds [2009] the term "store-of-value system" is used instead of "token-based system." This might be better terminology since "token" is also used to refer to the distinct processes of "tokenization" described in section 5.

[4] For a discussion, see the posting in the Atlanta Federal Reserve's "Take on Payments" [Shaffer, 2024].

message transmission and funds availability, a system operating 24-hours 7-days a week, and unconditional, irrevocable payee access to funds. The FedNow website expands:

> To be classified as a faster payment, the payment option must 1) enable both payer and payee to see the transaction reflected in their respective account balances immediately and 2) provide funds that the payee can use right after the payer initiates the payment. And because of this, the payment is, by its nature, also irrevocable, meaning it cannot be reversed by the payer or the payer's financial institution (FI) after it is sent.[5]

We reserve the term "instant payments" for facilities that provide immediate settlement (meaning transfer of funds between banks within seconds). In the US this service is provided by FedNow and by the Real Time Payment (RTP) facility owned by The Clearing House. The Pix system in Brazil is also an instant payments system.

Before RTP was in place, the fastest alternative available in the US was wire transfer, primarily through the Federal Reserve's large value system Fedwire. Fedwire is primarily used to transfer large payments between banks' Federal Reserve master accounts. The process can be completed within minutes. Banks can also use the system to transfer time-sensitive retail payments on behalf of their customers; however, these funds are typically not available to end users as quickly.

Relatively fast payments are also available through ACH, the batch processing system in the US. Although this system typically settles payments over 1-3 days, it also includes within-day settlement mode. Settlement occurs four times a day. However, even systems which are not instant payments can simulate instantaneousness. What is required is that an agent be willing to guarantee the finality of funds to the payee even before the settlement of the payer's payment. In the UK's Faster Payment System, payments are batched for settlement, but customers generally receive funds instantaneously. This is a speeded-up version of the practice in the US of banks' allowing trusted customers access to deposits before settlement. Similarly, on Fedwire, the Federal Reserve offers sending banks (collateralized) daylight overdrafts so that recipient banks' payments are guaranteed. In the retail context, private providers may choose to prefund pay-ins when risks

[5] FedNow, "What are Faster and Instant Payments?" https://explore.fednow.org/explore-the-city?id=7&building=instant-payments-university&resource=4&role=fi_sp-eu_spe&resourceTitle=what-are-instant-payments

are determined to be sufficiently low, providing a "synthetic instant ACH" for payments (see section 4.7 for more information).

2. Policy Issues in Payments

For large value systems the prime policy concerns have always been two: systemic dangers and liquidity requirements. Awareness of the potential systemic effects of failures in large value payment system arose from the fallout to systems in the wake of institutional collapses like the 1974 failure of Bankhaus Herstatt in Germany and the 1991 failure of the international bank BCCI.[6] As a result, large value national systems throughout the world engaged in reforms to increase their safety by moving to *real time gross settlement* (RTGS), in which each payment by a bank to another bank consists of an irrevocable transfer of central bank funds,[7] meanwhile reducing the liquidity requirements on participating financial institutions through development of "liquidity savings mechanisms" [Martin and McAndrews, 2008a,b] [8]

On the other hand, on the retail side most developments in recent decades have been stimulated not by policy concerns, but by new technologies. The rise of the internet and e-commerce has led to new means of retail payment—cryptocurrencies and electronic wallets for example—and to major adaptations of existing payments methods, notably payments cards and bank-to-bank electronic transfers, supplanting, but not eliminating, physical cash and checks. Policy issues have arisen in response to these developments. Common concerns are competitiveness of services, customer safety, the dangers of fragmentation of the payment system, and threats to monetary sovereignty. These concerns in turn have led many countries to consider introduction of retail CBDC's.

[6] These and other near misses are documented in the "Allsopp report" [CPPS, 1996].

[7] For an explanation of the effect of the RTGS on system risk, see Kahn and Roberds [2001] and Kahn et al [2003]. For a documentation of the rapid changeover to RTGS see Bech and Hobijn [2007].

[8] These concerns led to the development of the CLS Bank, opening in 2002 and quickly becoming the dominant system in the world for settling bilateral large value foreign exchange transactions among financial institutions. CLS now handles more than $2 trillion worth of payment activity per day. https://www.cls-group.com/news/cls-fx-trading-activity-september-2024/#

3. Steps of a payment

Because of the additional players involved, and the centrality of identity verification in the process, even the simplest account-to-account payment consists of multiple steps. The details matter because of identity risk and credit risk at the customer level (and for large value payments because of credit risk at the bank level). Faster payments accentuate these risks.

We illustrate by examining the details of a typical faster payment. Suppose Alice wishes to pay Bob $5. She has an account at Bank A; she knows Bob has an account at Bank B. Figure 1 shows the basic process:

1. Alice sends a request to Bank A "Pay Bank B $5 for the benefit of Bob"
2. Bank A verifies Alice's identity and adequacy of Alice's funds
3. Bank A notifies Bank B of the payment
4. Bank B verifies Bob has an account
5. Bank B sends confirmation to Bank A
6. Both banks send confirmation to their respective customers.

On top of these messages, however, the payments protocols and bank policies must address the key ingredients of timing of funds transfers to and from customers *and* between banks (Figure 2):

1. Encumbering of Alice's account—also referred to as "funding" the payment. At what point does bank A place restrictions on Alice's use of the funds in her account? Relatedly, at what point does the payment become *irrevocable*? There are two main parts to irrevocability: At what point can Alice no longer halt the payment because of a change in mind or a mistake on her part, such as error in amount or naming the wrong recipient? And at what point can Alice no longer recall the payment because it was not in fact made by her, but by a malefactor posing as her?[9]

[9] Irrevocability is usually described as a yes/no decision; in reality, it is better understood as a series of conditions under which a payment can be undone, which become tighter and more costly over time, until they are effectively prohibitive. When issues arise, "Irrevocable is not the same as irremediable" [Gail Hillebrand of National Consumers League, quoted at https://fasterpaymentscouncil.org/blog/10535/Exploring-Irrevocability-and-Industry-Next-Steps]

2. How stringent are the identity checks made on Alice's request, and how much time is permitted to Bank A to make those checks? What are the bank's liabilities if an invalid payment is permitted?
3. Similarly for Bank B, what checks are required (for example anti-money laundering requirements) to verify that Bob not only has an account but has the right to receive the funds being sent?
4. Distinct from encumbering and release of funds by banks in the customers' accounts (sometimes described as *clearing*), a payment also involves *settlement*---the transfer of funds between the two banks.[10] What is the relation between the time of settlement and the time of appearance of funds in Bob's account? How much time lag is permitted between B's receipt of the notification and its release of funds to Bob's account? Is receipt *final?* Or are there conditions under which the money can be clawed back?

Distinct payment rails exist mainly because of the different costs attached to each of these considerations in differing use cases. We will distinguish between rails based on which of the three levels they operate: end user, bank clearing, or settlement, as well as whether they provide real time settlement or delayed settlement.

4. Demand for faster payments

Are faster payments desirable? At first glance the question is absurd, since faster is obviously better than slower and making better technologies available must be welfare improving. The real questions are what is the source of demand for faster payments and do the benefits exceed the various costs?[11]

For the typical individual in the US, for the typical retail transaction, surveys imply that the cost of making the payment is probably of greater concern than the speed of the payment.[12] However, there are

[10] See BOG [2018] for a clear delineation of clearing versus settlement in payments.

[11] Milne and Tang [2005] provide an early examination of costs and benefits in regard to the decision to develop the UK's Faster Payments system.

[12] Schuh and Stavins [2015] estimated that speed and security are statistically but not economically significant determinant of consumer payment choice, based on data from the Boston Fed's annual Survey of Consumer Payment Choice. "Instead, other attributes of payments—convenience, cost, and record keeping—have greater effects on

several reasons system users' snap answers to these questions can be misleading, even beyond the typical biases that result when surveys are substituted for market data. First, both benefits and costs are divided between (at least) three participants. Next the question in surveys is usually posed for a hypothetical typical payment—in fact the benefit may be much greater in occasional atypical emergency circumstances.

Popular accounts of the benefits of faster payments emphasize the reduction of "float"—that is, the reduced amount of time that the payment spends in limbo, available neither to the payer or payee, while presumably providing benefits (liquidity or interest) to the intermediating banks. In the current environment float is probably a secondary concern.[13] While the marginal cost of the typical transaction is trivial, the cost is orders of magnitude greater for the occasional misrouted or fraudulent transaction. These costs dominate as speed changes. Thus if faster technologies increase bank risks, and banks price in those costs, users could find fees overwhelming any benefit from the couple of days of interest gained.

There are two major classes of motivations for a payment between individuals: discharging a previously contracted obligation or serving as the monetary leg of a spot transaction (so-called "delivery versus payment").[14] The source of value in a faster payment technology depends on which motivation is involved. In the former case, the value comes from the speed with which the payee is able to access the funds. In the latter case, the value comes from the speed with which the payee is able to gain assurance that the funds have been successfully encumbered. We next examine the two possibilities in greater detail.

Discharging obligations: Illiquidity or Differences in discount rates

Discharging of obligations is one of two fundamental motives for payment. Among obvious common examples of payments that discharge obligations are bill payment[15] and payroll. Another important example is the initial funding of an agreed-upon loan.

consumer payment behavior" [page 596]. However, their focus is on consumers as payers, not as payees, and they also note that indirect effects could arise if speed is important to merchants or financial institutions.

[13] See Greene et al. [2015] for a review of the issues surrounding float in the case of UK Faster Payments.

[14] Another possibility is the transfer of money by a single individual between accounts with different payment institutions. See section 4.2

[15] For the rudiments of a theory of bill payment, see Kahn and van Oordt [2022].

Suppose Alice is obligated to transfer money to Bob. Making the transfer earlier is a Pareto improvement if Bob has the higher time rate of discount. Another way to say an individual has a high time rate of discount for money is to call him "financially constrained." When an individual places high value on obtaining funds without delay, there will be large gains from trade if unconstrained payers can provide funds more quickly. Examples could include paying a busker or an artisan for a handicraft purchased on the street or paying for casual or irregular employment. Financial constraints will be chronic for the segment of the population with least access to banking services. But even for individuals with adequate banking services, emergencies may arise, or large, rare payments which exceed the individuals' immediate borrowing capacities. For occasional needs, individuals will be willing to endure expensive alternatives, much like the "convenience charges" that consumers accept for occasional emergency trips to "foreign" or "independent" ATMs.

. Note that for these considerations to arise, there must not be a third party effectively able to provide a loan across the time when the payment travels. Illiquidity—the inability to borrow to solve an immediate cash need—could be due to unenforceability of repayment. It could be due to lack of information about the true prospects, with no way for another informed individual (say a future payer) to document the situation—in effect, an inability to collateralize the future prospect. Thus, this argument for faster payment doesn't normally apply to regular employment—faster receipt could just as well be accomplished by initiating the payment cycle earlier. Nor does it normally apply to individuals with long term relationships with financial institutions—the institution can advance the funds as soon as notification is received that the payment is to take place.

Likewise in the case of wholesale payments between financial institutions, the time it takes for a payment between banks to be effected is primarily determined by needs for verification, netting, and regulatory requirements; these are baked into the institutional procedures. Sound financial institutions all face the same short-term interest rates; for them, the benefits of faster transmission are at most a secondary consideration.

Delivery versus payment

The second fundamental role of a payment is to serve as the monetary leg of a spot transaction. Typical examples of delivery versus payment arise in P2B (person to business) transactions, such as retail point-of-sale transactions or one-time internet purchases. Other examples include sale of real estate or trades of financial assets. In such use cases, instant payments are valuable even when the recipient of the payment has a lower discount rate that the payer.

For example, when a vendor is attempting to establish a transaction with an unfamiliar customer, it is essential to assure that the payment is "good" before he is willing to part with the item. A credit guarantee is one possibility—this is the fundamental role of credit cards. Otherwise, it is necessary to establish that the payment is valid and irrevocable. Use of a faster payment arrangement—physical or electronic—provides a guarantee. Note however that in these cases immediacy is not necessary; certainty of eventual receipt is the crucial feature. Delays could arise, for example, if the payment system needs extra information about the vendor himself, or in more complicated cases, if other parties need assurances about the shipment of the goods to the customer. For the typical vendor, given assurance that the purchase has been funded, deferred availability is not a primary concern.

A more subtle example arises in the case of microdeposit account verification. This technique is well established for confirming a counterparty's identity and account linkage: back as far as the introduction of Paypal, the practice was established whereby the vendor sends the customer one or two small random amounts of money which he is required to identify. While the system is effective, the delays required for reporting under non-instantaneous payment makes it less useful for businesses desirous of establishing customer linkages: in the time it takes to receive the micropayment, the customer may lose interest and fail to reply. In this case what is "delivered" in return for the payment is a potential enduring relationship to a profitable customer. Thus the value of immediacy to the merchant can be orders of magnitude greater than the tiny values transferred.

3. FedNow and Alternatives

1. What it is

FedNow went live July 20, 2023, the first new payments service offered by the Federal Reserve since the development of ACH. The service is available to depository institutions eligible to hold accounts at the Reserve Banks.[16] The service is available 24/7 and enables funds to be sent from a sender's account to a receiver's account in near real-time in any amount up to $500,000, although the default limit is $100,000 and banks are free to impose lower limits. Payments on FedNow are irrevocable; the system is designed to enable depository institutions and payments service providers to build value-added services upon it.[17]

As of October 2024, about 1000 depository institutions have signed up to FedNow. The majority of these institutions have signed up only as receivers of funds through FedNow [Liang, 2024], although some larger institutions have also signed up to enable capabilities as a sender of funds.

FedNow provides "push" transactions (transactions initiated by the payer). The basic steps for a FedNow transaction are as follows:[18]

1. A payer authorizes his bank to send a payment of a specified amount from his account. The payer provides the recipient's bank and identifying information.
2. The payer's bank confirms the payer has funds available.
3. The payer's bank sends a notification via FedNow to the recipient's bank. At this point the payer can no longer change the transaction.

[16] Eligible depository institutions can access the service on their own or through a designated service provider, using their own master account with the Federal Reserve or the account of a correspondent. See "Who is eligible to participate in the FedNow Service?" https://www.federalreserve.gov/paymentsystems/fednow-additional-questions-and-answers.htm

[17] Additional information can be found on the Federal Reserve Website https://www.federalreserve.gov/paymentsystems/fednow_about.htm

[18] An example transaction is followed in detail at the Explore FedNow Website https://explore.fednow.org/explore-the-city?id=7&building=instant-payments-university&resource=5&role=fi_sp-eu_spe&resourceTitle=anatomy-of-instant-payment

4. The receiving bank receives the payment message, reviews transaction details and validates the recipient's account.
5. The receiving bank sends an "accept response" to FedNow. The Federal Reserve moves funds from the paying bank's master account to the receiving bank's master account and notifies the paying bank. The receiving bank deposits funds into the receiver's account.
6. Payer and receiver are notified by their banks that the funds have been sent.

The entire process takes a few seconds; the system specifications provide a timeout clock guaranteeing that a transaction will be completed or rejected in a maximum of 20 seconds.[19]

Financial institutions participating in FedNow use existing funds in their Federal Reserve accounts to cover the transactions or pay the Federal Reserve for overdrafts.[20] Thus they need liquidity. In order to maintain effective instantaneous payments during non-banking hours, the FedNow service also includes facilities for liquidity management, enabling institutions to supply liquidity to one another instantly as needed. Other features currently available include fraud prevention tools, rudimentary request for payment capabilities,[21] and tools for payments inquiries. Notably absent at present are directories to link individuals' accounts with routing information.

Participating institutions are charged 4.5 cents per transfer (free in 2024 for the first 2500 transfers per month) and 4.5 cents per return of transfer. Transfers for liquidity management are charged $1. Participation fees are $25 per month (and nonexistent for 2024). Each request for payment is charged 1 cent. In turn banks can freely set fees for these services to their customers, whether end users or intermediaries providing payments services.[22]

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[19] FedNow readiness guide, https://explore.fednow.org/resources?id=10 page 38.

[20] Credit for the FedNow Service is provided under the same terms and conditions as for Federal Reserve services. See "What features and functionality are included in the FedNowService?" at https://www.federalreserve.gov/paymentsystems/fednow-additional-questions-and-answers.htm

[21] A request for payment is a message sent from the payee's bank, to initiate a payment by identifying the payee and the amount requested. See section 4.6 for more details.

[22] The schedule of fees for FedNow is available at https://www.frbservices.org/resources/fees/fednow-2024

2. Development of FedNow

Compared with similar projects in other countries the gestation period for FedNow was long. Faster payments was part of the Fed's Strategies for Improving the Payments System initiative launched in 2013. Comments on the proposed system were requested in 2018, and the announcement that it would be created was provided in 2019. The pilot program began in January 2021, and the official launch occurred in July 2023.[23]

Central to the development, the Fed established an independent "Faster Payments Task Force" in 2015, bringing in a large number of representatives (Klein [2023] describes it as a "Kafkaesque 321 members.") from "financial institutions, nonbank payment providers, businesses (merchants and corporates), consumer groups, federal and state government agencies, regulators, standards bodies, industry trade organizations, consultants, and academics" [Faster Payments, 2017b]. In 2017 the task force issued a two-part final report. [Faster Payments, 2017a,b] envisioning the creation of a system by 2020 that was fast, ubiquitous, broadly inclusive, safe secure and efficient. It is instructive to compare the programs envisaged in the task force's final report and the related response from the Federal Reserve [Federal Reserve System, 2017] with FedNow as currently constituted. Of course, this comparison is in some sense unfair, since the task force vision was for an entire system rather than the specification of any particular component. Nonetheless, the comparison will enable us to understand the tasks that remain to achieve that original vision of an effective faster payments arrangement in the US.

Among its general principles the task force report stressed the need for broad adoption, as fundamental to the viability of a system. It noted that "in a multi-solution environment, achieving Broad Adoption is particularly challenging" and would depend on three other foundational issues: 1. mutual confidence among providers in the safety of products across the system, 2. mechanisms for interoperability, enabling products to identify one another and to communicate and complete transactions, and 3. a framework for institutional collaboration (which was anticipated to be the advisory committee itself).

[23] However, the actual launch was relatively early in comparison to the Federal Reserve's own prediction of availability "in 2023 or 2024" at the time of proposal [BOG 2019].

The specific suggestions of the Faster Payments Task Force clearly take into account the legal and regulatory limits of the Fed's powers [Faster Payments, 2017a,b]. While the task force calls for the Fed to develop a round-the-clock, 365-days-a-year settlement service supporting faster payments, it only recommends that the Fed "considers ways to broaden access to its settlement services within the bounds of its mandate." Similarly it calls for the Federal Reserve to "explore and assess the need for operational role(s) in the faster payments system to support ubiquity, competition, and equitable access to faster payments" Noting that "Based on historical experience, there is some concern that the payment industry may face challenges in enabling ubiquity, competition, and equitable access to faster payments" it calls for the Federal Reserve to "explore and assess the need for operational roles(s)" to address these concerns. And while directory services are central to ubiquity and interoperability, the task force only proposed the establishment of a work group to identify and recommend a directory design which can enable the use of "aliases" (that is, of non-personally identifiable information). The deliberations of the directory services work group of the Faster Payments Council[24] are ongoing.

Certainly, relative to the task force's initial wish list, the achievements of FedNow in isolation are mixed. The system is 24x7, but in a nation of 9000 banks and credit unions (and about 9000 master accounts [Fernandez, 2023]) a membership of 1000, even if those include the great majority of deposit accounts in the nation remains far from ubiquitous[25]—even more so if attention is restricted to institutions with send capability. As noted before, membership in the system is restricted to depository entities eligible for Federal Reserve accounts. Payments service providers in general must work through depository institutions, although the new open banking regulations by the Consumer Financial Protection Bureau (CFPB 1033) may reduce the

[24] The US Faster Payments Council is an industry-led membership organization, the successor to the Faster Payments Workgroup. Member segments include financial institutions, payments system operators, technology providers, and consumer organizations. The Federal Reserve is a founding sponsor and member. See https://fasterpaymentscouncil.org/

[25] While FedNow officials express themselves pleased with this result, they acknowledge the distance remaining until full coverage. One of the reasons generally cited for this is the heterogeneity of banks in the US and the wide differences among them in readiness for adopting new technologies [Nick Stanescu in Tang, 2024 at 20:42]. Another concern for community banks is potential for fraud [Gould, 2024]. The extensive time required for nationwide adoption was anticipated at the outset, see BOG [2019, 39301].

difficulties of doing so.[26] While restricting membership should in principle increase participating institutions' confidence in the safety of the system, the difficulties of adjusting to the security needs for instant payments, and the liquidity difficulties of round-the-clock service are a significant bottleneck for smaller financial institutions now and in the foreseeable future---and are an important reason for these institutions' hesitation in joining as sending institutions. Moreover, the need for an individual customer to hold a bank account in order to send or receive a FedNow payment limits its effectiveness in increasing financial inclusion.

Still the task force envisioned this development not in isolation but relative to an "ecosystem" of open, competitive and interoperable services. Likewise, the Federal Reserve's description of its proposed program emphasized it was to be the core of a system in which other parties could develop end-user and auxiliary services [BOG, 2019, 39300]. Thus, a more complete evaluation requires examining the other components of the existing system. We begin by considering the rails that constitute the closest substitutes for FedNow.

3. Competing Rails

Wire payments on Fedwire and CHIPS

Fedwire is the Federal Reserve's large value payment system. It operates as a real time gross settlement system, with payment irrevocable and only available during business hours. CHIPS (Clearing House interbank payments system) is a private system for large value payments, run by The Clearing House, an association owned by 20 of the world's largest banks.[27] Together Fedwire and CHIPS constitute the backbone of the US payments system. Over 4700 customers can send or receive funds transfers over the

[26] "CFPB Finalizes Personal Financial Data Rights Rule to Boost Competition, Protect Privacy, and Give Families More Choice in Financial Services," October 22, 2024, https://www.consumerfinance.gov/about-us/newsroom/cfpb-finalizes-personal-financial-data-rights-rule-to-boost-competition-protect-privacy-and-give-families-more-choice-in-financial-services/

[27] https://www.theclearinghouse.org/About/Owner-Banks

Fedwire Funds Service,[28] and Fedwire settled $4.4 trillion per day in the second quarter of 2024.[29] CHIPS settles $1.8 trillion in payments per day for its 41 participants.[30]

The systems are designed for wholesale payment activity; the limit for an individual payment on Fedwire is $9,999,999,999.99 [Fedwire 2023], as opposed to FedNow's $500,000 limit. Nonetheless the systems are also used, Fedwire in particular, for handling retail wire transfers. While Fedwire's per payment charges to banks are small, (in 2024, 94 cents for the first 14,000 payments a month[31]) banks typically charge customers much more for domestic wire transfers: up to $40 for the sender and $15 for the receiver.[32]

RTP

The closest substitute for FedNow is the RTP network service, launched by the Clearing House in November 2017. The network is open to all federally insured depository institutions and, although it has fewer participants than FedNow, (609 banks and credit unions as of October, 2024[33]), it currently can reach about 65% of US bank accounts[34]. In the third quarter of 2024, it executed 87 million transactions for a total value of $69 billion.[35]

Like FedNow, the system provides instant, irrevocable push transactions. The process for making a payment through RTP is similar to that through FedNow. Also, like FedNow, RTP has a limited facility for handling request for payments. One difference is in the funding arrangements: RTP participants fund a joint account held at the Federal Reserve Bank of New York for settling payments. Providing liquidity to this account involves additional steps [FedNow, n.d.]; banks are charged $2.00 per drawdown from this account.

RTP advertises itself as offering "Simple, Transparent, Uniform Pricing for All Financial Institutions." "The RTP© network has a single price for all participants with no volume discounts, no volume

[28] https://www.frbservices.org/binaries/content/assets/crsocms/financial-services/wires/funds.pdf
[29] https://www.frbservices.org/resources/financial-services/wires/volume-value-stats/quarterly-stats.html
[30] https://www.theclearinghouse.org/payment-systems/chips
[31] https://www.frbservices.org/resources/fees/wires-2024
[32] https://www.bankrate.com/banking/wire-transfer-fees/#average-wire-transfer-fees
[33] https://www.theclearinghouse.org/payment-systems/rtp/rtp-participating-financial-institutions
[34] https://www.theclearinghouse.org/payment-systems/rtp/institution
[35] https://www.theclearinghouse.org/payment-systems/rtp .

commitments and no monthly minimums to ensure that financial institutions of all sizes participate on the same terms. Financial institutions pay only for the transactions they originate."[36] When FedNow went online, it instituted prices that were identical to those of RTP—4.5 cents per transfer, one cent for request for payment—although some observers had anticipated lower charges [Antosz, 2023]. In apparent response to competition the RTP provides this statement of pricing policy: "TCH is committed to maintaining a pricing structure that provides for equal pricing to all institutions regardless of volumes on the system. TCH will only consider a change to this approach if another provider's different approach to pricing threatens the viability of the RTP network and requires TCH to react competitively to maintain the integrity and availability of the RTP network to all financial institutions."[37] As with FedNow, financial institutions are free to set their prices to their own customers for RTP services.

With such a similar service available, it may be asked why the Fed was induced to provide its own faster payment system. The answer lies in the unique political and economic dynamic between large and small banks in the US. At the time of its proposal, the Federal Reserve predicted that the TCH system would primarily serve large banks and not be readily accessible to all depository institutions; furthermore, a competing system was unlikely to arise privately. [BOG 2019, *passim*, see also Waller, 2024]. Some have argued that RTP would not have appeared as quickly as it did were it not for the realistic threat of a Federal Reserve alternative, while others have argued that in fact FedNow had a "chilling effect" on the adoption of RTP [Klein, 2023]. In any event, smaller financial institutions were among the strongest advocates for a public alternative to the clearing house's offering, and large banks, at least initially, among the largest opponents [BOG, 2019, 39302]

[36] https://media.theclearinghouse.org/-/media/New/TCH/Documents/Payment-Systems/RTP_-Pricing_02-07-2019.pdf?rev=fa89759032d84a71b342ad7c50f205b8&hash=24E545CE9D890DCCD216B9506BF6757E

[37] https://www.theclearinghouse.org/payment-systems/rtp/institution

ACH

ACH is the national automated clearing house network for transferring electronic funds. It is the technology that underlies direct deposits and bill payment, reaching all US banks and credit unions.[38] Typically it is used for recurring preauthorized payments rather than one-off purchases. The service provides batch processing, settling four times a day. Traditionally, ACH payments have taken one to three days, although since 2016 ACH has also provided a premium same-day service. Both the Federal Reserve and the Clearing House are ACH operators. The Fed's service FedACH is the largest; it initiated its services in the 1970s. The baseline charge to financial institutions for items sent on FedACH is about 1/3 cent to originator and receiver, with a 1/10 cent surcharge for same day service, and with a minimum monthly fee of $50 for originations and $40 for receipts.[39] According to the National Automated Clearing House Association (NACHA) an ACH transaction typically costs between $0.26 and $0.50 [Kahn, M. 2022], generally cheaper than instant payments services, and considerably lower than a credit card fee.

ACH is by far the dominant rail for electronic retail payment, with $21.5 trillion transferred in the third quarter of 2024. Of this amount, Same Day ACH payments totaled $844 billion or 4%. For the third quarter of 2024, there were 355 million Same Day ACH payments, up 67.5% from a year earlier [NACHA, 2024].

From the point of view of faster payments, an important limitation of ACH is its revocability. Both insufficient funds and fraud contribute to the failure of payments to complete, and the time gap between payment and settlement is a factor in ACH returns. While Same Day ACH reduces the problem somewhat, it by no means eliminates it: Suppose, for example, access to a bank account has been attained fraudulently. A customer-initiated return of the payment can take sixty days to process; meanwhile the vendor has shipped the goods to the fraudster [Sullivan, 2023].

[38] "The ABCs of ACH" https://www.nacha.org/content/abcs-ach
[39] https://www.frbservices.org/resources/fees/ach-2024#originationitem

4. Examples from Abroad

UK Faster Payment Service

The United Kingdom launched its Faster Payment Service (FPS) in 2008. It is now part of the offerings of Pay.UK[40] which is also responsible for the country's batch payment system Bacs. FPS runs 365 days a year and allows users to make payments from their bank account to users with accounts in other banks in a matter of seconds. Some non-bank payments service providers are also able to access the service directly, using settlement accounts at the Bank of England. While the steps in the process are similar to those in FedNow, the participants provide intraday credit to one another for these payments, settling among themselves three times a day. In September 2024, the Faster Payment System processed more than 430 million transactions with a total value of £350 billion.[41]

The system permits payments up to £1 million, but banks set their own limits, which can vary by the type of payment, the type of account and the method of access. Payments can be delayed up to two hours, although in practice most funds are immediately made available. Initial development of the Faster Payment System was stimulated by regulatory concern about bank delays in releasing paid-in funds [Greene et al. 2015]. Regulations introduced in 2009 required that payments be credited to the payee by the end of the business day on the day following receipt of the order from the payer.[42] This helped to induce a major shift of payments from Bacs to FPS.

Payments using FPS cannot be cancelled once made. However, FPS sets standards for banks to follow regarding the help they must offer when a mistake has been made. Like FedNow, FPS does not provide customer-facing apps or services and exercises relatively little control over other parties' decisions to

[40] Pay.UK is the operator and standards body for the UK's interbank retail system. https://www.wearepay.uk/who-we-are/ It is a not-for-profit company limited by guarantee. Its 40 guarantors (equivalent of shareholders) include UK banks, payments companies and trade associations. https://www.wearepay.uk/who-we-are/our-organisation/guarantors/

[41] https://www.wearepay.uk/what-we-do/payment-systems/faster-payment-system/faster-payment-system-statistics/

[42] The Payment Services Regulations 2009, section 70 https://www.legislation.gov.uk/uksi/2009/209/regulation/70/

offer them (or not). Like FedNow, FPS does not offer a directory service, only providing a list of recipient banks able to accept Faster Payments (covering more than 99% of UK accounts).[43]

Pix

Pix is the instant payment platform of the Central Bank of Brazil. The central bank began the project in 2016 and made the decision in 2018 to launch the scheme. Pix became operational in November 2020; by 2023, it was the main payment platform in Brazil, with more than 5 billion instant payments transactions in August 2024.[44] About 75% of the population has used Pix, including large numbers of individuals not active in digital payments before Pix [Neto 2024].

Relative to more developed economies, payment card penetration in Brazil was low. In 2019, 77% of retail payments were cash and 30% of consumers were unbanked [Matera, 2024]. While Pix requires a bank account, Pix transfers are free for consumers; before Pix, banks charged customers for transferring payments to accounts at other banks. The most popular initial use case for Pix was transfers between individuals. For these, the customer interface with Pix is extremely simple: individuals obtain a Pix key or QR code to initiate transfers to friends or for small daily transactions. Transactors can use aliases—typically a phone number or email address—for digital identification. While person-to-person transactions still represent a majority of the transactions in Pix, person to business and business to business transactions are growing rapidly[45] For merchants the average cost of a Pix transaction is estimated to be 0.22% [Duarte et al, 2022].

The Central Bank of Brazil mandated participation in Pix by all payments institutions with more than half a million transactions accounts. As of 2023 there were 799 participants in Pix, 34 of which were mandatory [Saiyid, 2023]. It is generally argued that mandatory participation helped generate a critical mass of users, providing an incentive for the others to join. Despite the mandate, the Central Bank of Brazil claims that the program has been a net benefit to commercial banks, because of the dramatic increase in the number of individuals with bank accounts [Neto 2024, at 24:27]. In addition, it is generally argued that the Bank of

[43] Details regarding the Faster Payments Service are available at https://www.wearepay.uk/what-we-do/payment-systems/faster-payment-system/how-faster-payments-work/

[44] https://www.bcb.gov.br/en/financialstability/pixstatistics

[45] https://www.bcb.gov.br/en/financialstability/pixstatistics

Brazil's control over infrastructure and technical specifications, by guaranteeing uniformity, were important for rapid adoption and acceptance.[46] This is in contrast to the earlier period in Brazil, immediately after the central bank was given power to regulate retail payment in 2013. In this period calls for the payment industry to create a new inclusive system met with little action. The Pix program was conceived as a response.

5. Comparison with CBDC[47]

A central bank digital currency is generally defined to be a digital payment instrument that is a direct liability of the central bank. FedNow is not a central bank digital currency. When the public sends instant payments through FedNow, customers are not directly paying one another with central bank liabilities; instead they see the transactions as transfers from payer to payee demand deposits, which in turn are liabilities of commercial banks. Since the commercial banks for their part settle FedNow transactions on the books of the Federal Reserve, it is sometimes argued that commercial banks' accounts with the Federal Reserve are in fact a wholesale central bank digital currency, despite the BIS's "negative definition": "a CBDC is a digital form of central bank money that is different from balances in traditional reserve or settlement accounts" [CPMI, 2018]. In any case, there is no "general purpose" (retail) central bank digital currency in the United States, and, notwithstanding the Board of Governors' investigations, [BOG, 2022] no serious prospect of one in the foreseeable future.

The less-than-stellar successes of CBDC's where they have been implemented, and the practical difficulties in doing so[48] have led many countries to a pause in development of retail CBDCs. (A notable exception is the Eurozone, which is now engaged in a parallel set of experiments in its goal of developing a digital Euro.[49])

One of the difficulties that has beset discussions of CBDC is the diversity of goals that a CBDC is intended to meet. These different goals impose conflicting requirements on CBDC design:

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[46] Other factors cited by observers include the country's high card fees and slow settlement—card settlement typically takes 30 days [Wu, 2024]. Pix may also have been the beneficiary of coincidental timing: the Covid epidemic created a demand for electronic payments just as Pix was being introduced.

[47] This section builds on Kahn, C. [2022].

[48] See, for example, Koonprasert et al [2024].

[49] [ECB 2023] and https://www.ecb.europa.eu/euro/digital_euro/progress/html/ecb.deprp202406.en.html

> Some proposals involve paying interest on the CBDC (and some envisage the possibility of negative interest). Some proposals assume that the holder interacts directly with the central bank through dedicated central bank accounts; others assume a separate institution takes on one or more of the jobs involved in managing and/or serving as custodian for customers' digital wallets. Proposals allow wallet providers varying degrees of flexibility in designing the "end-user experience," aggregating individual units of CBDC into accounts, and enabling their expenditure through a variety of means of validation. Some allow for offline functionality through payment cards or mobile phones. Proposals also vary in more technical ways: some employ decentralized ledgers (DLT) and/or allow for the use of smart contracts. [Kahn, C. 2022].

Among the key rationales for a CBDC are

1. Various perceived limitations of physical cash, including expense and encouragement of illegal activity, and the potential for an electronic alternative to mitigate these limitations.
2. The need for a cash-like alternative as electronic payments become more common and physical cash begins to disappear.
3. In particular, a need to expand the reach of benefits of the electronic economy to the underbanked and cash-dependent portion of the population.
4. A correction to the limitations of privately provided electronic arrangements-- helping to improve interoperability among existing electronic payment systems by providing a commonly accepted intermediate asset. Furthermore, a CBDC *may* improve financial stability by serving as a safe payment asset and refuge in financial crises, and as a disciplinary device against dodgy payment system providers.
5. Simplification of international transactions is conceivable if currencies were available as CBDCs.
6. Direct holdings of CBDC by the public might strengthen the force of central bank monetary policies, or at least prevent the deterioration of such policies were payments to be otherwise decoupled from the monetary base.

Clearly, many of these considerations are not addressed by FedNow: Waller [2024] for example explicitly discourages considering in the near term the possibility of directly linking FedNow with other fast payments systems internationally. Nor does FedNow tie the Federal Reserve's actions more directly to interest rates or the monetary base. Furthermore, given that FedNow has no direct link to the public and

requires banks as intermediaries, it is hard to see how it would significantly widen access among the unbanked to the digital economy, although the decreased risks of default might on the margin encourage banks to open accounts for riskier depositors and cut the burden of fees for overdrafts or insufficient funds.

The key overlap between FedNow and potential motives for CBDC is in the response of the payments environment. As a credible alternative rail for payments, FedNow acts as a goad and a stimulus, reducing the market power of its nearest substitute and thereby encouraging adoption by smaller financial institutions and development of vital ancillary services by new and recent entrants, all within, rather than outside the mainstream legal and regulatory structure.

4. Use Cases

According to a recent press release by FedNow, "Over the past year, use cases that have been gaining traction include digital wallet funding and defunding, instant payroll, bill payment, real estate transactions, microdeposit account verification, online marketplace seller payouts and more." [FedNow, 2024]. However, FedNow has so far published no figures documenting the use of its services. These numbers are likely to be significantly smaller than those for RTP, which themselves are, even after seven years, a tiny part of the US payments space.

Shortly before its opening, Loretta Mester, then-President of the Cleveland Federal Reserve and chair of the Fed's payments committee, listed some of the anticipated benefits taken into account in developing FedNow [Mester, 2023]. As examples of time-sensitive payments, she noted the value of just-in-time-payments for illiquid individuals, employer payments to gig workers, and government disbursements during emergencies. She pointed to the benefits of widening the network of banks beyond the limited number attached to RTP (a theme also emphasized by Waller [2024]), and to the increased resiliency of having an extra payments rail beyond the existing ones. However, she also pointed out a key indirect benefit: the

spurring of additional payments innovations from banks, payment processors, and other providers of payment services.[50]

In other words, understanding the thinking behind the development of FedNow requires explicitly considering not only the use cases, but also their relation to development of new services. In the absence of direct links to consumers, the future of FedNow is dependent on providers of those services.

1. Real Estate and Other Large Value Consumer Transactions

Substituting FedNow for Fedwire in occasional large value consumer transactions, such as small real estate transfers or automobile purchases, would seem an obvious move. Surely a one-time $50,000 transaction is better suited to a platform with a $500,000.00 limit than to one with a $9,999,999,999.99 limit. However, the cost to consumers of using either system are primarily charges by the banks; the marginal cost attributable to the provision of an individual transaction by either system is trivial. Any differences in speed are almost exclusively due to differences in operating practices of the banks for the two types of payments, not to the rails themselves. Banks' charges for such transactions, while high, are negligible compared to the amounts being transferred, so customer demand is likely to be price insensitive. Nor will the irritation of the high charge for the occasional major transaction be sufficient to induce a customer to switch accounts from one bank to another. In short, while the features of FedNow may make it the better location for such transactions, the benefits will be barely noticeable by the typical customers without regulatory intervention. If we hope to find transformative effects from FedNow, we must look elsewhere.

2. Loading Accounts

Mobile payments are now mainstream in the US: According to a 2022 survey, three fourths of US consumers are using mobile apps and more than a third are using digital wallets [FedPayments, 2023]. While payments within an application involves instantaneous transfers between users, moving funds into or out of the application along traditional rails either requires delay or credit provision. The problem was particularly

[50] See also BOG [2019] for the Federal Reserve's elaboration of these themes.

acute for onboarding funds to payment services. Thus, one relevant role for instant payments is the movement of money between a person-to-person payments app like Venmo and the customer's own bank account (sometimes referred to as "account-to-account" payment or A2A). As one payment service provider put it (before FedNow opened for business): "Any time you see an option to pay a few dollars for "immediate" funds, that is likely RTP" [Antosz, 2023].

This same flexibility is now extended, including FedNow as one more alternative. Currently A2A payments including digital wallet funding and defunding are the most common use case for FedNow [Nick Stanescu in Tang, 2024, at 4;40].[51] For downloading funds FedNow is likely to be particularly effective, since apps hold their funds with a limited set of financial institutions, which are likely to have opted to become FedNow senders.

3. Business to Consumer Payments

In the short run the easiest place a switch in behavior can arise is in payments made by businesses to individuals—payroll, commissions, loan disbursements. For these sorts of payment, ACH is the current default method. When payments need to be made faster, the One Day ACH option is available. But in those cases where immediacy is important, faster payment rails—either RTP or FedNow—can play a role.

If the business worked with a platform that made faster payments an option, then, before FedNow, the platform would determine whether RTP was available, based on the individual's bank account. Describing the benefits of this arrangement a reviewer noted "If an account is not RTP-eligible [the platform] instead delivers funds via same-day ACH with no extra action from the payer or payee. This helps create a more consistent experience for customers" [Broadbent, 2023]

In this arena the main effect of FedNow is to increase the number of banks for which faster payments options are available. It also complicates the decision-making as to which rails are to be used for each transaction. Thus, platforms are rolling out "dynamic routing," a feature which examines a variety of

[51] In contrast, most respondents in 2019 had expected person-to-person and consumer-to-business payments to be the greatest initial demand for FedNow [BOG, 2019, 39301]

criteria, such as traffic congestion, differences in costs and authorization rates to determine the best rail to use at the time the transaction is initiated. As a practical matter, however, except in cases of temporary outages, there is probably little to choose between FedNow and RTP if both are available.

4. Government Payments

Currently government payments to individuals are a key portion of ACH activity. In the case of regular government payments, adjusting government processes can always substitute for speed of payment. However, in the case of emergencies—for example, natural disasters—speed is crucial. Speed can also be important in the case of onboarding new recipients. Thus, everything else equal, movement of some government payments to a more efficient faster payment rail makes sense.

The US Treasury was one of the early adopters of ACH payment services and among the first institutions on FedNow at its launch. Government payments are likely to be a crucial source of volume for FedNow. However, the rollout is likely to be gradual and not immediately impacting regular and recurring payments [Lebryk, 2023].

Decentralization of decision making within governments is a further roadblock to rapid adoption. Even within the US Treasury department, no one locale is in charge of relevant decisions, much less across the rest of the federal government or state or local jurisdictions. Furthermore, while exceptional circumstances may merit faster payments, the danger of disruption of ordinary payments in the course of any transition causes administrators to hesitate to make a wholesale changeover. Therefore, rollout of government adoptions of faster payment alternatives is likely to be slow and piecemeal.

5. Pay by Bank

For repeated payments from customers to businesses—subscriptions, utility bills, mortgage payments—ACH is the primary rail in the US. But in many customer-to-business applications in the US, faster payments will compete with card payments instead. In these cases, the primary driver for switching

away from cards is their cost to merchants, which on average are between 1.5% and 3.5% for credit card transactions in the US [Gutierrez et al 2024], although lower for debit cards.

Costs are particularly high for card-not-present transactions, such as in e-commerce. Merchants have a large incentive to encourage customers to move to systems that avoid these fees; a prime possibility is electronic payment directly from the customer's bank account to the merchant's bank account ("pay-by-bank").[52] Banks' incentives in switching from card payment to pay-by-bank are more mixed: while they lose the interchange fees, they gain demand for their account services.

Pay-by-bank arrangements are more common in other countries than in the US. While Pix initially was primarily a person-to-person payment arrangement, about 40% of transactions by volume and about 30% by value are currently person-to-business.[53] In the Netherlands, the iDeal system, which is a system for paying online from the customer's bank account, commanded an estimated 62% of e-commerce transaction value in 2022, and similar systems dominate in several other countries [FIS, 2023]. Meanwhile, pay-by-bank has a very small share of US e-commerce; the FIS report estimates that the two categories of payment: 1) pay-by-bank on ATM rails and 2) Zelle payments through RTP together accounted for 9% of US e-commerce in 2022.

Direct online payment from a bank account is, of course, not new in the US. But combining it with instant payment opens up use cases for which ACH is inadequate, because of the need to guarantee the validity and finality of the funds before the business releases its goods. In these cases, in the presence of satisfactory verification, fee avoidance is a bigger selling point than speed.

For the customer, the pay-by-bank process involves selecting the option at checkout, and going to the bank's website, logging on as normal for online banking, and sending a payment to the merchant. For repeat purchases this is not difficult, but initial set up requires extra steps unless means are available—such as a standardized merchant directory—to pass the merchant information automatically to the customer's bank website. Furthermore, of course, it requires that the customer's bank offer send capabilities for instant payments.

[52] Confusingly pay-by-bank is also sometimes referred to as "A2A."

[53] https://www.bcb.gov.br/en/financialstability/pixstatistics Person-to-person constitutes about half of current volume, and business-to-business constitutes nearly half of current value.

Given the extra steps and setup necessary for the customer, incentives from merchants will generally be needed to induce adoption of pay-by-bank. Payments service providers argue that the savings to merchants are greater than the discounts necessary to encourage the use of pay-by-bank [Sullivan, 2023].

6. Push vs Pull

In payments, yet another fundamental distinction is made between *push* transactions (payments initiated by the payer) and *pull* transactions (payments initiated by the recipient with prior authorization by the payer). In the US, the ACH system provides facilities for both push and pull transactions. A typical ACH transaction is initiated by a business; for example, a utility company uses push transactions to send out payroll to employees and pull transactions to collect monthly payments from customers.

Currently, FedNow only provides push transactions. In part this was probably a confidence-building issue: financial institutions were more likely to have confidence in their ability to identify instructions from their own customers than to trust the legitimacy in a new system of requests from outside for disbursal of customer funds (although the ever-increasing problem of identity theft and scams involving authorized payments may make the distinction irrelevant). As a substitute, FedNow (and RTP) include the ability to send "request for payment" messages: the bank of the individual demanding payment sends the payer's bank information identifyig payer and payee and the amount due. The payer's bank then passes the information along to the payer, who can then choose to authorize the payment.[54]

With a push payment, the payer needs to provide his own bank information about the account in the receiving bank. As long as the payer's devices are secure, this means limited risks for the payer, but the payee needs confidence that the information given out cannot be used to withdraw funds from the payee at a later date. This can happen through the use of aliases, as in Venmo, or equivalently in systems, unlike those in the US, where individuals are used to having two bank account numbers: one solely for pay-ins. Aliases can be provided by the individual bank or stored in a system-provided directory. In the absence of these protections,

[54] The distinction between push and pull begins to blur if the payer preauthorizes payments to the particular payee up to some limit.

a payee would want to limit information provision to trusted counterparties, such as an employer or established online payment provider or wallet such as PayPal or Venmo. With a pull payment the situation is reversed: the payer provides potentially sensitive information to the payee. For this reason, electronic pull arrangements require the business ordering the pull to meet relatively stringent standards.

But while the responsibilities for security ought to be a primary concern for customers in push vs. pull situation, when it comes to spontaneous retail transactions with businesses, the concern that will come to the fore is the inconvenience of transmitting the payment information and on whom this burden is placed. In a pull transaction the consumer gives the business his identification and his bank name—the same information in any transaction. In a push transaction, the consumer must have the means to pass the business's information to its bank. The consumer will be unwilling to enter the information for each transaction.

This is where the request for payment arises: it enables the consumer to avoid entering the business's information manually. The arrangement is still more clunky (if safer) than a pull transaction: The consumer still must confirm the payment with his bank. For it to work for immediate payment, either the consumer must log on to his bank website to receive and confirm the request, or the bank must send a credible message to the consumer to which he can reply. [55]

Because of the steps involved, the use of FedNow and RTP for spontaneous purchases is limited. As one electronic service provider concludes: "The current state of instant payments in the US is that payouts (credits) are available but payins (debits) aren't quite here yet" [Andrews, 2023].

7. Synthetic Solutions

As noted before, in the absence of instant payments, it is possible to simulate instantaneousness, provided an agent is ready to take on risk. Note that in effect this is what the UK system does: funds are settled in batch but banks are pressured to credit accounts before settlement. Such pressure is easier to

[55] QR codes are another possible solution; a key concern among payments specialists remains the consumer safety and fraud potentials arising from their rapid, widespread adoption.

impose in a highly concentrated banking system. In the case of checks the Fed has authority to push for faster crediting through Expedited Funds Availability act of 1987, although it concluded in a study in 2007 that there was no need to do so [Klein, 2023]. It is debated whether this power extends to electronic payments [Conti-Brown and Wishnick, 2020].

An example of simulating instantaneous payment in the US context is the "synthetic instant ACH" solution offered by Plaid, "a synthetic real-time rail on top of ACH." [Andrews, 2023] The solution uses several products:

1) An instant verification product or an instant micropayment service to authenticate the payer's account.
2) A risk reduction product to score payment risks based on a large number of factors, giving the business the option to assume the risk of the payment in low-risk cases, or to engage in deeper examinations including verification of availability of funds in the buyer's account.
3) A transfer product to facilitate the actual transmission of funds.

Because of delays and the ability to reverse ACH payments, even knowledge that the funds are currently available is not sufficient to guarantee that the payment will go through. Nonetheless these techniques can enable sellers to treat most payments as if they have settled immediately. Note that Plaid does not provide guarantees on its own.

While Plaid regards synthetic instant ACH as an interim solution until RTP and FedNow's request for payment facilities improve, [Sullivan, 2023] improved risk scoring techniques could also reduce firms' sense of urgency in adopting faster payments.

5. Relation to Emerging Payments Technologies

FedNow has no realistic challenge from exotic systems like unregulated stablecoins,[56] which for the foreseeable future are likely to be a plaything of techies and a method of transmitting illegal funds, rather than a mainstream payments system. Nor are trustless blockchain arrangements a serious contender in a country with a reasonably working payment infrastructure. Nonetheless, some emerging payments technologies will have important influence on the future of FedNow.

As the previous section illustrated, FedNow's success depends on its ability to act as a complement to both existing and new payments technologies. FedNow's success as a rail for retail transactions will depend on the advent of applications which will let a customer seamlessly connect to his bank account to make a payment to a merchant labeled by its alias or QR code. Only when there is a well-acknowledged standard design for such an interface—either supported by an agreement among banks, or more likely through the emergence of a limited number of successful platforms—can such an arrangement take off.

While the most successful use case so far is transmitting funds to electronic accounts, e.g. funding a Venmo account or transferring a PayPal or Cash App balance, in the much longer run, there is the potential for competition between electronic alternatives and FedNow. If a payments arrangement—for example, a souped-up version of Amazon Pay accounts—began to be commonly used both to receive and send payments, then transfers between those accounts could in principle substitute for Federal Reserve payments rails entirely. The competition between the two systems would likely turn on relative convenience and perceived safety of funds in the accounts.

In fact, large banks are likely to be adept in adopting new conveniences when threatened by outsiders[57] and have the added advantage of regulatory protections for deposit holders. The role of the

[56] For a succinct critique, see BIS [2023] p 83.
[57] Kahn, C. [2024] provides a somewhat jaundiced view of banks' past responses to technological threats.

Federal Reserve will then depend on the relative advantages for the banks of sending balances to one another through the two instant payments channels.

FedNow was built with the explicit decision not to include many advanced features, instead relying on service providers to appear and add the features on if and when the demand arises. Two notable missing features are "programmability" and "tokenization."

In payments, programmability refers to "automatic execution of payments once a pre-defined set of conditions are met."[58] Use cases for automation include automated treasury management for corporations, and, more speculatively, using Internet of Things devices to condition release of funds. [Toh, n.d.]

Tokenization has two distinct meanings in the context of payments [McKinsey, 2024]. Assets can be "tokenized," meaning represented by digital code that specifies the identity of the asset (a piece of real estate, a particular share of corporation, or, notoriously, a work of digital art) and the conditions under which it can be transferred. Tokens for a variety of assets can then be stored in "unified ledgers." If the ledgers are also able to handle tokenized representations of money (which could be a tokenized bank deposit, a non-bank stablecoin, or a CBDC), efficiency gains in the trading of these assets can be realized from increased speed, flexibility, and reduced errors of copying information. Allowing the platform to be programmable—that is to handle complex conditional instructions for transferring the assets—can allow further efficiencies in situations where multiple trades are being made simultaneously, where regulatory steps must be taken before an exchange can be completed, or in situations with multiple transactors at play, such as transactions involving trade credit along a supply chain [BIS, 2023].

In FedNow use cases, however, the more relevant use of the term "tokenization" is as it applies to users' bank or card account information. In this case tokenization means providing a substitute identifier in order to shield sensitive information. In a simple example, the identifier is supplied by a credit card company for a one-time payment so that an online vendor does not have further access to the customer's account. Not

[58] Programmable money, on the other hand, is sometimes defined more stringently as a digital store of value with programmability features inseparably built in [Lee, 2021].

only does this protect the customer, it also protects the vendor from liability for a data breach. More complex cases allow for repeated payments, such as "card on file" for subscriptions or "one-click" checkouts [Square, 2014]. Tokens can also be used as alternatives to full card information on mobile devices or in apps.

For a system like Pix, which establishes design standards end-to-end, decisions about functionality such as programmability and tokenization are key. Programmability was a priority for Pix, allowing for scheduled payments and blocking transactions [Neto, 2024]; however, the feature allowing automatic recurring payments is delayed until 2025 [Menezes, 2024]. By confining its remit to bank-to-bank communication, FedNow has sidestepped the question of what user features to include—at the expense of uniformity and rapid acceptance.

6. Regulatory Implications

It is hard to attribute significant implications to FedNow in the realm of monetary policy: even should the system grow well beyond its current level, it is in essence a method of moving money from one deposit account to another—with virtually no aggregate effects. One of the concerns about CBDC is its potential to disintermediate banks;[59] faster payments systems raise no such concerns.[60]

However, if it catches on widely, FedNow could have some effects on banks and banking. First, it becomes another way of withdrawing funds quickly from a troubled bank. Starting with Northern Rock at the beginning of the great financial crisis and continuing with Silicon Valley Bank more recently, we have seen that bank runs can be accelerated by technologies for rapid withdrawal. In this respect FedNow, combined with social media, could conceivably increase the vulnerability of individual banks even if the effect on the banking system overall is neutral.

[59] A large literature deals with this question. See for example, Andolfatto [2021], Whited et al [2023], Bidder et al [2024] and the conference summarized in Mullin et al [2022].

[60] In fact, Pix's developers saw this as an argument in favor of faster payment over CBDC [Neto, 2024].

Instant payment systems also create additional threats from fraud and scams. Banks must up their protections to defend themselves, and the cost of so doing, particularly for smaller banks, has been a barrier to participation in faster payments systems, particularly as senders of payments. Nonetheless, instant payments are only one of the technologies currently increasing fraud dangers today, so that readiness for faster payments may be incorporated as systems are improved to address the other threats.

In one important respect faster payments may prove to be a boon to banks, particularly to smaller banks, because they work through deposit accounts. To the extent that it encourages pay-by-bank use cases, faster payments can restore banks' centrality to the payments landscape, combatting the encroachment of cards and new technologies. Even more significantly, some pay-by-bank solutions have the potential to restore to banks the detailed information regarding customer activity which is currently being lost to other payments providers. Customer information drawn from account transactions has long been claimed to be a valuable asset of banks for credit monitoring [Mester et al. 2007, Berg et al 2022] and more recent theory has emphasized the importance of such information for marketing and pricing [Garratt and van Oordt, 2021, Parlour et al 2022, Ahnert et al 2024].

7. Challenges Moving Forward

Proponents of FedNow have emphasized that it is not simply a faster payment system but a "faster and better" payments system, with technical features guaranteeing resiliency, efficiency, access, and innovation, including round-the-clock availability, fraud protections and ISO 20022 compliance. This paper has only considered those aspects of improvement that impact speed. A central bank has no such luxury; it must focus continually on reliability of its offerings, because it cannot risk any chance of losing public confidence.

Some observers have questioned whether the Fed was truly interested in faster payments, given that they would cut into its ACH business [Klein, 2023]. However, in the medium run, having the redundancy may provide benefits to the Fed in terms of resiliency [Mester, 2023], and in the longer run, FedNow could

relieve the Fed of the need for massive upgrades to ACH, as the faster payment operations gradually take over more and more of the retail payments burden.[61]

Still, for visionaries who are looking for a universal instantaneous electronic payment system for the US, FedNow is a disappointment. Unlike Pix in its first year, FedNow is not readily recognized by consumers in its country. Although it is early days, FedNow has no use case in which its dominance is imminent.[62] It has had no effect so far in consolidating the confusing and sometimes self-defeating introduction of new and generally incompatible methods for making digital payments.

FedNow's services essentially duplicate those offered by a private competitor; in some respect, this is precisely the point [BOG, 2019]. The resultant market structure—a private/public duopoly between the Clearing House and the Federal Reserve—now exists in three payments arenas: large value, batch, and retail fast payments. Since network externalities make backbone payments services a natural monopoly, this market structure has some clear advantages in terms of efficiency and competition; the duopoly provides resilience as well as giving confidence to smaller players fearful of excessive market power.[63]

In a key respect the comparison to Pix is unfair. As former Cleveland Fed President Mester has emphasized, "Unlike central banks in other countries, the Fed has not been given complete regulatory or supervisory authority over the U.S. payment system" [Mester, 2023]. Nor is it permitted to supply its service for free; The Board of Governors notes that the Monetary Control Act of 1980 (DIDMCA), "requires the Federal Reserve Banks to set fees to recover not only all direct and indirect costs of providing the payment services over the long run but also the imputed costs, such as taxes and the cost of capital, that would have been incurred and the imputed profits that would have been earned if a private firm had provided these services."[64] Nor can the Federal Reserve control the charges faced by end users of the system, without

[61] Officially, the Federal Reserve has only stated that FedNow will co-exist alongside its other services. https://www.federalreserve.gov/newsevents/pressreleases/other20230720a.htm

[62] Frost et al. [2024], in a cross-country analysis argue that the factors encouraging widespread adoption of fast payments are central bank ownership of the system, non-bank participation, a large number of use cases and cross-border connections.

[63] See Liu et al. [2024] for an analysis of the complications imposed by such a structure.

[64] "Federal Reserve's Key Policies for the Provision of Financial Services" https://www.federalreserve.gov/paymentsystems/pfs_about.htm

specific congressional mandate, and, as has been the experience in the US with other payments services,[65] even with a mandate any regulatory attempts to limit banks' surcharges will be fraught. With no way of forcing banks into the system, acceptance will inevitably be a coordination problem, unless killer applications are developed. The slowness of the project has less to do with technological complexity than with the need to get buy-in from a variety of autonomous, conflicting constituencies along the way.

And in one important way, this focus on buy-in has played to US strengths. Attention to the interests of platform service providers and developers has led smoothly to the inclusion of FedNow as an alternative rail in their instant payment products. While FedNow falls short in achieving interoperability among the backbone rails themselves, developers' ability to include all rails as alternatives within their products mutes this criticism.

While apps' ability to direct payments along multiple rails reduces the need for interoperability among the rails, there remains a problem with interoperability among the applications themselves. A seamless transition between apps requires a common location for accounts of payment service providers—the most logical location is the Fed itself. The lack of master accounts for fintech payments companies imposes a serious impediment to interoperability and may require further relaxation of the restrictions on Fed master accounts for non-banks.

A fundamental advantage that the Fed possesses is the ability to play a long game. The experience with the introduction of Fed ACH services is instructive in this respect: Once that system was built initial adoption was gradual; there was a long lag before it became the mainstay of retail payments. Nonetheless delay still has political fallout, and so the Fed's focus on building up participation is not merely a bloodless calculation of efficiency benefits.

[65] See for example the lawsuits and academic debates around the implementation of restrictions to debit card interchange fees (the Durbin Amendment to the Dodd–Frank Act 2010): Kern [2015], Kruzel [2024], Bird [2024].

8. Summary

The world is headed towards faster payments, but different countries are adopting fundamentally different strategies to get there. We have investigated the drivers for faster retail payment and examined the Federal Reserve's program for making faster payment, comparing it with services in the UK and Brazil. Where FedNow is a true instant payment service, using real time settlement, the UK's Faster Payment Service provides funds to the recipient in real time, but delays settlement between the participating banks. Where FedNow is essentially a back-office service dealing only with the bank-to-bank portion of the payment process, Pix provides a more elaborate set of tools and tighter control over other participants in the payments process, to generate a simpler, more consistent end-to-end experience for users. We have examined the reasons for the different decisions, based on the difference in already existing payments arrangements, the differences in structure of financial systems and the difference in regulatory powers.

We have also examined goals FedNow is intended to meet, the use cases it is intended to address, and its relation to substitute rails and new payments technologies. While FedNow is a superior way to route lower value wire transfers, this use case will not significantly alter the landscape. FedNow will be superior to ACH for government payments, but the changeover will be subject to long delays. The short run drivers of demand for FedNow services with the greatest potential—on-boarding and off-boarding of electronic wallets, and spontaneous consumer payments for goods through pay-by-banking—require functionalities not yet readily available: broader access to master accounts, directory services, improved request for payment or pull functionality. Eventually FedNow will become the dominant rail for retail payment, but the speed with which these features are incorporated will dictate when the future arrives.

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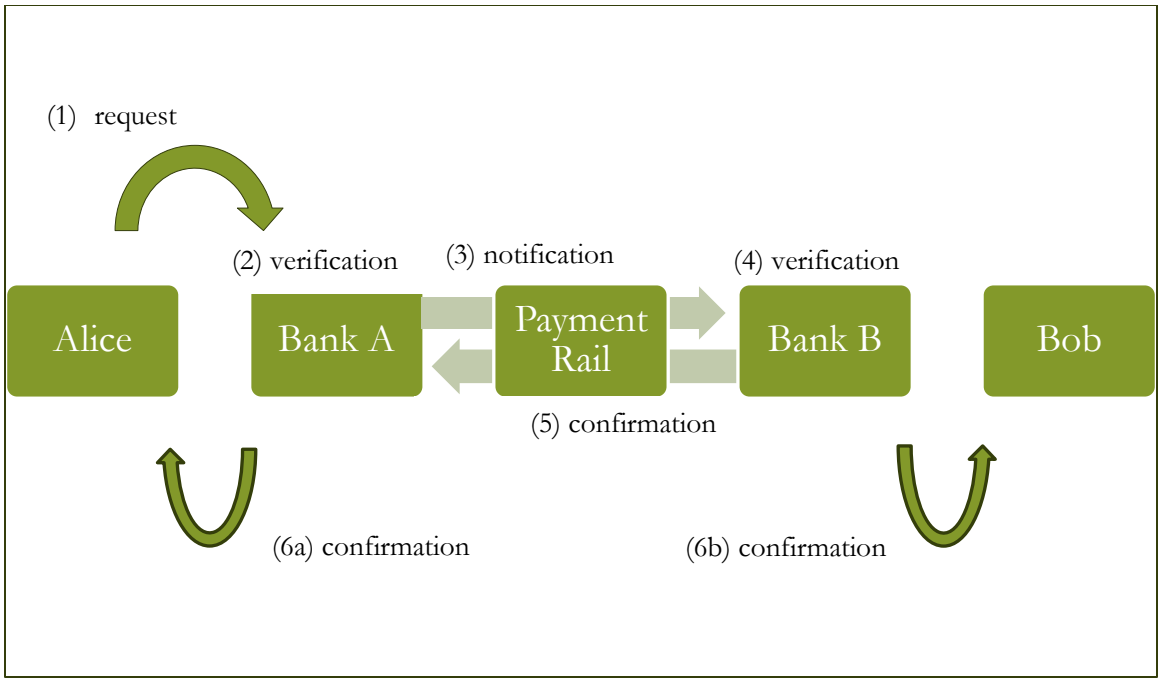

Figure 1 Faster Payment Messaging

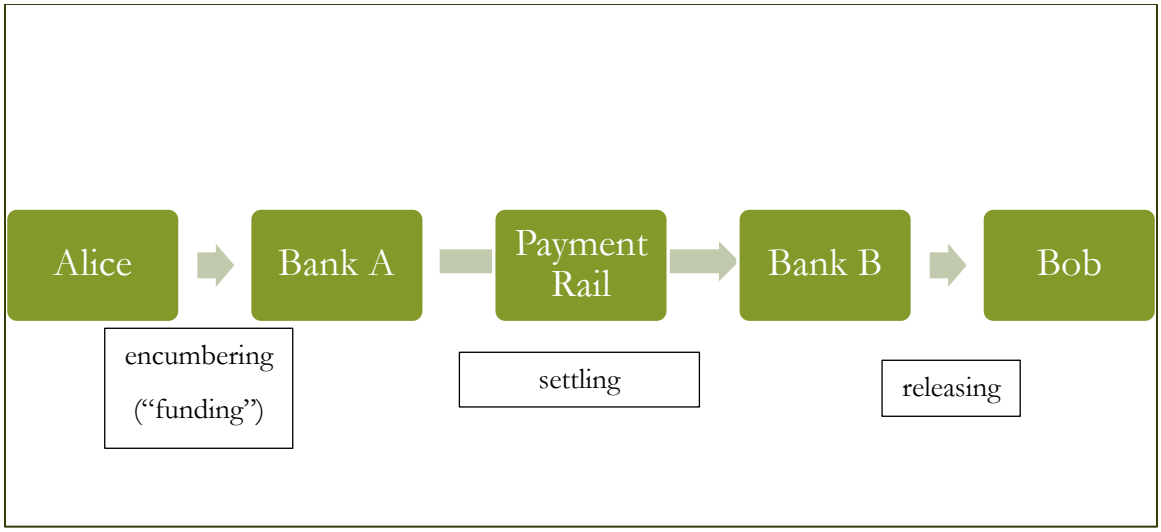

Figure 2: Faster Payment Flow of Funds[66]

[66] This depicts the flow in an RTGS system. Note that in non-instant systems settlement may occur after funds are released.