

**CAPCO**

# JOURNAL

THE CAPCO INSTITUTE JOURNAL OF FINANCIAL TRANSFORMATION

## ORGANIZATION

Costs and benefits of building  
faster payment systems:  
The U.K. experience

CLAIRE GREENE | MARC RYSMAN  
SCOTT SCHUH | OZ SHY

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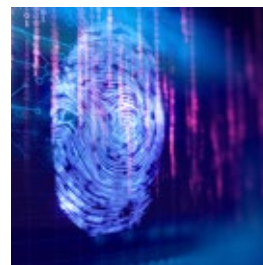
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# Costs and benefits of building faster payment systems: the U.K. experience<sup>1</sup>

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## ABSTRACT

A number of countries have implemented faster payment services that allow consumers and businesses to rapidly transfer money between bank accounts. These services compete with slower, existing payment services. In 2008, the U.K. implemented its Faster Payments Service (FPS) at a cost of less than £200 million (.014% of U.K. GDP, or U.S.\$307 million) spread over seven years, plus investment costs borne by each participating bank to connect to the FPS. This paper examines the economic cost-benefit analysis underlying the U.K. FPS investment decision and describes the subsequent diffusion and use of FPS through 2014.

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An expanded version of this paper is available on the website of the Federal Reserve Bank of Boston at <https://www.bostonfed.org/publications/current-policy-perspectives/2014/costs-and-benefits-of-building-faster-payment-systems-the-uk-experience-and-implications-for-the-united-states.aspx>.

The views expressed in this paper are those of the authors and do not necessarily represent the views of the Federal Reserve Bank of Boston, the Federal Reserve Bank of Atlanta, or the Federal Reserve System.

## 1. INTRODUCTION

A number of countries have implemented faster payment services that allow consumers and businesses to rapidly transfer money between bank accounts, in transactions known as “account-to-account (A2A)” payments.<sup>2</sup> These services can be provided by banks or nonbanks (with cooperation from banks) that are connected to a new central infrastructure<sup>3</sup>, which supports faster authorization, clearing, and settlement (ACS) than existing payment services, along with faster confirmation to the payer and payee of each money transfer.

In 2008, the U.K. adopted and implemented a new Faster Payment Service (FPS) rather than investing in improvements to speed up its existing payment system.<sup>4</sup> According to VocaLink (2009), a key motivation for the U.K. decision was a request by the Office of Fair Trading (OFT) to remove the float from standing orders (regular recurring payments for a set amount) in the U.K. banking industry. It is not known whether British banks or nonbank payment service providers would have taken this step eventually without the directive of government authorities.

This paper examines the economic cost-benefit analysis underlying the U.K. FPS investment decision.<sup>5</sup> We report quantitative estimates of the monetary costs associated with the FPS but only qualitative descriptions of potential benefits to all parties involved: consumers, merchants, financial institutions, other businesses, and government. This analysis provides a framework that may help the payments industry and payments policymakers to assess the viability, costs, and benefits, and social welfare of adopting faster payment services.

The cost to U.K. banks of building, installing, and maintaining the British FPS was relatively modest. According to sources at VocaLink, which operates the infrastructure of the U.K. FPS, it cost less than £200 million (U.S.\$307 million), or .014% of U.K. GDP, to install and operate the FPS for the initial contract period of seven years (2008–2015), plus estimated investment costs of up to £50 million (U.S.\$77 million) for each participating bank to connect to the FPS.<sup>6</sup> Thus, the estimated maximum total cost of FPS was less than .06% of U.K. GDP in 2008. For payment system participants, introduction of the new FPS may also have led to revenue transfers to the FPS or losses associated with substitution from existing payment methods, but the U.K. data suggest that revenue effects from substitution have been relatively small thus far.

Direct revenue from the use of FPS during the initial period was zero, because users do not pay for each transaction. Costs and revenues beyond 2015 are not known at this time.

Identifying potential benefits from faster payments is more challenging, and currently it is impossible to produce complete, accurate, and precise quantitative estimates.<sup>7</sup> Instead, this paper uses survey data [Faster Payments (2013)]<sup>8</sup> on the use of FPS by U.K. participants to describe its diffusion through the end of 2013. Then it surmises what types of benefits may ensue to whom when A2A payments are made faster from authorization to settlement or when confirmation of payment is communicated faster.<sup>9</sup>

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### **“A new payment technology like FPS may yield additional benefits beyond speeding up individual payments.”**

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A new payment technology like FPS may yield additional benefits beyond speeding up individual payments. While these benefits are even harder to assess and measure, they may be more important than speed per se. The following apocryphal quotation, attributed to auto maker Henry Ford, illustrates the difficulty in assessing benefits of products and services before consumers can actually experience them: “If I had asked people what they wanted, they would have said faster horses.” Nevertheless, faster A2A payments could provide the following benefits: (1) facilitate business-to-business (B2B) payments; (2) facilitate mobile payments, a rapidly developing payments application; (3) improve payment

<sup>2</sup> These countries include Singapore, Mexico, India, South Africa, and Switzerland, as well as the U.K. A detailed description of the last four systems is given in Summers and Wells (2011) and Jacob and Wells (2011). Faster payments systems vary in their functionality and use. Lodge (2014) identifies more than 35 faster payments systems around the world. Clear2Pay (2014) cites about a dozen systems.

<sup>3</sup> “Infrastructure” refers to the servers, software, and communication networks that connect participating financial institutions and transmit payment messages from the sending account to the receiving account and back.

<sup>4</sup> For detailed evaluations of the British FPS, see Milne and Tang (2005) and Summers and Wells (2011).

<sup>5</sup> A similar study was done by the Reserve Bank of Australia; see RBA (2012, p. 1), which states: “While not wishing to dictate how the strategic objectives are met, the paper also outlines the Board’s thinking on a possible approach to architecture for providing real-time payments.”

<sup>6</sup> All values in British pounds are converted to U.S. dollars using the OECD’s estimates of the PPP dollar-pound exchange rate (see <http://bit.ly/2CW0t4b>).

<sup>7</sup> Stavins (1997) describes a similar challenge in examining the costs and benefits of switching from paper check presentation to electronic check presentation with truncation.

<sup>8</sup> 2012 data is used because the Faster Payments Tracking Survey was discontinued in later years.

<sup>9</sup> The value of speed may be different for recurring bill payments than for payments made at the point of sale (POS). A full analysis of this differential is beyond the scope of this paper and little research is available for bill payments. For more detailed research on POS speed, see Klee (2008), Borzekowski and Kiser (2008), Schuh and Stavins (2015), and Polasik et al. (2013).

security;<sup>10</sup> (4) be available at all times (24/7/365); (5) facilitate person-to-person (P2P) payments, which are typically handled by cash and check in the U.S.; and (6) facilitate faster international payments using standards such as ISO 20022.

Although we cannot provide monetary estimates of the benefits of the U.K. FPS, the total costs of the new system relative to the U.K. population (63 million in 2012) suggests that the value of benefits per individual per year need not be large to give FPS a positive net present value. Because the U.K. payment system prior to the FPS bears striking similarity to the current U.S. payment system, the U.K. experience has implications for the U.S. payments industry.<sup>11</sup>

## 2. CONCEPTS AND DEFINITIONS

### 2.1 Payment system

According to the Bank for International Settlements [BIS (2003)], a payment system consists of a set of instruments, banking procedures, and, typically, interbank funds transfer systems that ensure the circulation of money. Summers (2012) uses a much broader definition, where a payment system is an infrastructure (consisting of institutions, instruments, rules, procedures, standards, and technical means) established to effect the transfer of monetary value between parties who are discharging mutual obligations.

Each payment activity is divided into steps. Different payment instruments may use different steps to accomplish money transfers originated by a payer and received by a payee. Moreover, even if two payment instruments use similar steps, they may vary significantly with respect to the time it takes to accomplish each step. The definition of steps also depends on the role played by the entity participating in the payment activity.

### 2.2 Authorization, clearing, settlement, and notification

Electronic transactions are generally divided into three major steps: authorization, clearing, and settlement. Table 1 presents a possible timeline for an FPS transaction and compares it with a typical debit card transaction.

Two important points need to be made regarding Table 1. First, the term “clearing” is used differently in discussions concerning the British FPS and debit card transactions. In the U.K. FPS process, “clearing” occurs when end users are debited and credited. In debit card transactions, clearing refers to the exchange of data between the card issuer and the card acquirer. Second, in the U.K. FPS process, the payer and the payee are debited and credited before banks settle their funds transfers. This need not be the case for debit cards.

Three key terms characterize electronic funds transfers.<sup>12</sup>

Table 1: Possible timelines of U.K. FPS and debit card transactions.

STEP	FPS (U.K.)	DEBIT CARD (SINGLE MESSAGE)
1	Request: payer submits payee’s bank account details and amount.	<b>Authorization (approved/declined):</b> card swiped at POS, typed online, or provided over the phone. Issuing bank may put a \$1 to full amount hold on payee’s account. <b>Clearing:</b> data exchanged provide the verification for the dollars debited from issuing banks and credited to acquiring banks.
2	<b>Clearing or rejection:</b> funds withheld from payer’s account and credited to payee’s account.	<b>Settlement:</b> aggregated netted funds transfers among banks. Transfers include interchange fees from the acquirer to the issuer.
3	(Possible time gap until settlement.)	(Possible time gap until settlement ends. Few hours or longer.)
4	<b>Settlement:</b> funds transfers among banks (three times daily during business days).	Within 24 hours, funds released by acquirer or card processor are credited to the payee’s account.

Sources: VocaLink (2009) and Herbst-Murphy (2013), mostly pp. 12–14.

<sup>10</sup> A detailed discussion of security is outside the scope of this paper.

<sup>11</sup> In 2012, the Federal Reserve announced an updated strategic plan that emphasized a preference for faster U.S. A2A payments. More recently, the Fed set forth a “vision to improve the speed and efficiency of the U.S. payment system from end to end” [FRS (2013, p. 2)].

<sup>12</sup> The definitions of clearing and settlement are taken from BIS (2003). BIS (2003) does not define authorization; hence, the reader is referred to <http://bit.ly/2l3Cqh6>. In the context of debit card transactions, Herbst-Murphy (2013, p. 1) refers to authorization as the creation of electronic records in the merchant’s transaction system and at the cardholder’s bank.

**Authorization:** “Giving power or permission to (someone or something).” At the POS, authorization begins when the payer swipes a card. For electronic A2A transfers, a payer (fund sender) may use online, ATM, phone, or a mobile device to fill out a form instructing a financial institution to transfer funds. The payer generally has to click (or press) on a “confirm” button, thereby having a second chance to cancel the authorization. Authorization for online debit card transactions is similar; however, at the POS, authorization begins when a card is swiped.

**Clearing:** “[T]he process of transmitting, reconciling and, in some cases, confirming payment orders or security transfer instructions prior to settlement, possibly including the netting of instructions and the establishment of final positions for settlement. Sometimes the term is used (imprecisely) to include settlement.”

**Settlement:** “An act that discharges obligations in respect of funds or securities transfers between two or more parties.” Also, “the completion of a transaction, wherein the seller transfers securities or financial instruments to the buyer and the buyer transfers money to the seller. A settlement may be final or provisional.”

The FPS (U.K.) column in Table 1 separates the settlement (final) stage from other stages because, in most cases, the sender and receiver of funds are not concerned with (and may not even be aware of) when banks settle their own accounts, unless the receiving bank conditions crediting the payee on final settlement between the sending and the receiving banks. As discussed below, the U.K. FPS separates the settlement stage from clearing, so in that system the payer’s account is debited and the payee’s account is credited within seconds, although banks settle only three times daily.

### 2.3 “Faster” payments

There is no uniform definition of a “fast payment service.”<sup>13</sup> One reason is that the speed of each electronic payment can be measured with respect to at least four steps of the payment process: authorization, clearing, settlement, and notification(s). The first three steps occur in sequence (see rows 1 and 2 of Table 1), whereas notification(s) can be sent to the transacting parties at any stage (or stages) within this sequence.

No funds transfer can be initiated without an authorization, so the first stage is required. However, clearing may be an independent step (as depicted), or it

may be combined with (or occur very close in time to) either the authorization stage or the settlement stage. Thus, the following four parameters may be included in the definition of “fast”:

1. The ability to process (or at least originate and clear) transactions 24/7/365.
2. The length of time between origination and confirmation of clearing.
3. The length of time between origination and confirmation of settlement.
4. The practice of handling transactions in a nonbatched manner, meaning that each transaction is individually processed through the network (different from the way processing occurs in the existing FedACH in the U.S. and Bacs in the U.K.; see Benson (2009)).<sup>14</sup>

Note that the above four parameters are not mutually exclusive as shown by the fact that the FPS in the U.K. and Singapore seem to satisfy most or all of these criteria.

### 2.4 Gross versus net settlement

Table 1 separates the settlement (final) stage from all other stages because implementing faster payment services, as done in the U.K., need not rely on instantaneous settlements (which are transfers of funds between two banks via a central bank or a similar clearing house).<sup>15</sup> This implies that the receiving bank may have to extend credit to the payee until settlement is completed. However, a delay in settlement allows banks to aggregate several transactions into a single settlement, and this aggregation may facilitate net settlement, which reduces the amount transferred if banks transact in both directions.

Gross settlements mean one-by-one transfers of funds, which may complicate or overload the network – particularly if the faster payment service results in a high volume of low-value transactions. This suggests one possible explanation of why the FPS process in the U.K. separated the settlement stage from other stages, perhaps to allow banks to gain economies of scale by netting out bi-directional transactions and also to avoid

<sup>13</sup> See FRS (2013) and GPF (2013) for examples.

<sup>14</sup> In a batch payment system, the originating bank bundles several payment requests into a single file that is submitted to the central clearing organization. This explains why faster payment systems may require a technology change.

<sup>15</sup> In the U.S., these bank-to-bank transfers are referred to as wholesale payments.



using CHAPS (the Clearing House Automated Payment System, Britain’s real-time gross settlement system).

Instead, the FPS relies on the Bank of England to handle settlement. Thus, the FPS is a new system only for authorization and clearing. Relying on an existing settlement system reduced the construction cost of the FPS and suggests another explanation for why the FPS uses net settlement rather than gross. Note that a delay in settlement creates a tradeoff between the cost of more frequent settlement and the credit risk associated with immediate transfer to the payee.

### 3. THE U.K. PAYMENT SYSTEM

#### 3.1 The U.K. payment system before the FPS

Prior to the establishment of the FPS in 2008, the payments landscape in the U.K. was similar to that in the U.S. Cash was popular for small transactions, whereas debit cards and credit cards were common for larger-value retail transactions. Checks were also reasonably common and were used for similar purposes as in the U.S. U.K. banks relied on two networks: CHAPS (a real-time gross settlement [RTGS] high-value network similar to Fedwire in the U.S.) and Bacs (formerly known as Bankers’ Automated Clearing Services, similar to the automated clearing house (ACH) networks of the Fed and The Clearing House [EPN] in the U.S.), in addition to checks and an ATM network.

Milne and Tang (2005, p. 6) describe Bacs as a provider of three types of payment transactions: bulk (salaries and pension payments, which require submission at least two days in advance of the payment date), direct debit (which are scheduled 14 days in advance), and standing orders (A2A transfers, which require at least two days’ notice). Milne and Tang (2005, p. 10) report that immediate person-to-person transfers were most often made using cash or bank drafts. Table 2 roughly compares the payment systems in the U.K. and the U.S. The similarities of the two countries’ payment systems suggest that the experience of the U.K. with respect to faster payments may be instructive for the U.S.

#### 3.2 Speed of payment networks in the U.K.

Following is a description of payment methods in the U.K. and an evaluation of the speed at which users can transfer payments.

**Cash:** if speed is measured by the time it takes for money to change hands, then cash is a fast payment mechanism. If speed is measured as the time it takes to transfer money from one account to another, cash is a slow payment instrument. Two trips to the ATM (or some combination of ATM, bank teller, check cashing store, cash-back at retail, etc.) are required.

**Debit:** when a consumer initiates a transaction with a debit card, the consumer’s bank is immediately informed and typically places a hold on the consumer’s account, but the bank does not credit the merchant’s account for up to two days [Herbst-Murphy (2013)].<sup>16</sup> This discussion highlights a fundamental difference between card transactions and the operation of the FPS system in the U.K. For card transactions, banks first transfer the money from the issuing bank to the acquiring bank, and only then are funds debited from the sender’s account and credited to the receiver’s account. In contrast, the U.K. FPS system first debits and credits the payer and payee’s accounts, respectively, before the participating banks settle their own accounts with the central bank.

**Credit:** the credit card market works similarly to the way the debit card market works because Europe uses a dual message system for both credit and debit transactions.<sup>17</sup> However, consumers’ billing is

Table 2: Description of payment systems in the U.K. and the U.S.

TYPE	U.K. PAYMENT SYSTEM	U.S. PAYMENT SYSTEM
RTGS (large value)	CHAPS	Fedwire/CHIPS
Batch (slow, any value)	Bacs	FedACH and EPN
Ubiquitous Faster Payment Service	FPS	Not provided by banks
Paper checks	To be phased out	Declining fast
Credit, debit, and prepaid cards	Mostly Chip & PIN	PIN and signature networks and closed loop
Bank account (mainly for bills)	Giro	Bank account number (via ACH)
ATM	Single network	Multiple networks
Coins and notes	British pound	U.S. dollar

Source: Authors’ analysis

<sup>16</sup> The U.K.’s Payments Council’s Q&A web page states the following: “A debit card transaction will usually be debited from your account on the following working day. However, if the amount of the transaction is above the floor limit of that retailer, the card issuer will earmark the funds on your account at the time the transaction is made. The time it takes for the money to reach the retailer is dependent upon the terms of the contract with their merchant acquirer (bank).” See <http://bit.ly/PQEMUu>.

<sup>17</sup> Herbst-Murphy (2013) discusses dual and single message systems for debit and credit cards. A dual message system is slower because it was designed for signature credit cards, whereas a single message system relies on a PIN at either a POS or an ATM. Roughly speaking, a single message system combines into a single stage the authorization and the writing of files on the sending and receiving banks. Herbst-Murphy (2013, Figure 1) refers to the stage when accounts are debited and credited as “settlement,” whereas in the FPS terminology used in this paper, this stage is referred to as “clearing.”

delayed to a predetermined date, or even later if the consumer chooses to borrow by taking advantage of their preauthorized revolving credit. A credit card transaction is revocable. Credit card payments are authorized immediately at the POS and the card issuer is committed to pay at this time.

**Paper check:** within two days of the day the payee deposits the check into a bank account, the bank must start paying interest on the deposited amount; however, funds may not be available for four days [BIS (2012)].

**Bacs:** the Bacs system is an electronic system that operates between banks. Consumers do not have direct access to the Bacs system. It is typically used for direct deposit of salary (Bacs direct credits), for paying recurring bills such as utilities (Bacs direct debits), and for business-to-business payments. Before the FPS was implemented, Bacs also was used for payments made via online banking. The Bacs network operates as a batch system. Payments submitted to Bacs are subject to a three-day clearing and processing cycle [BIS (2012)].

**CHAPS:** CHAPS is a real-time payment system, envisioned for high-value transfers between banks. End-users are charged fees. Transfers executed in CHAPS are irrevocable.

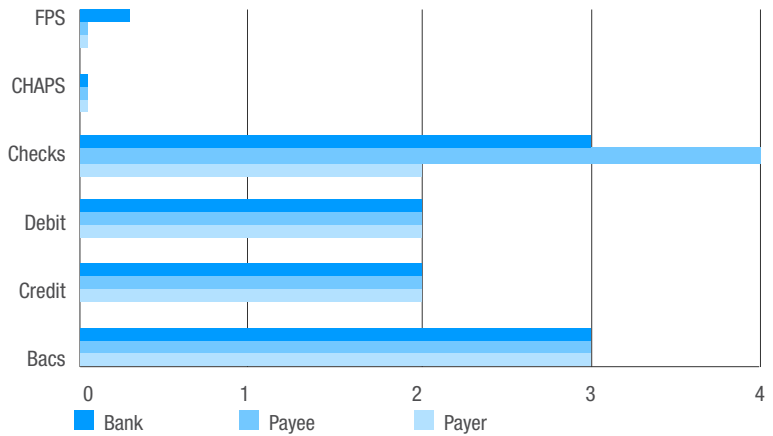
Figure 1 displays rough estimates of the duration of funds transfer from start to end for each payment network from the viewpoints of the sender (payer), receiver (payee), and the participating banks.

As Figure 1 shows, CHAPS and the FPS transfer funds within seconds from the perspectives of both the payer and the payee. However, from the banks' perspective the FPS settles only three times during each business day. Figure 1 also shows the maximum time for payments made via Bacs, payment cards, and checks; however, it is possible that transactions may appear to be faster from the payer's perspective and even from the payee's.

### 3.3 The U.K. FPS

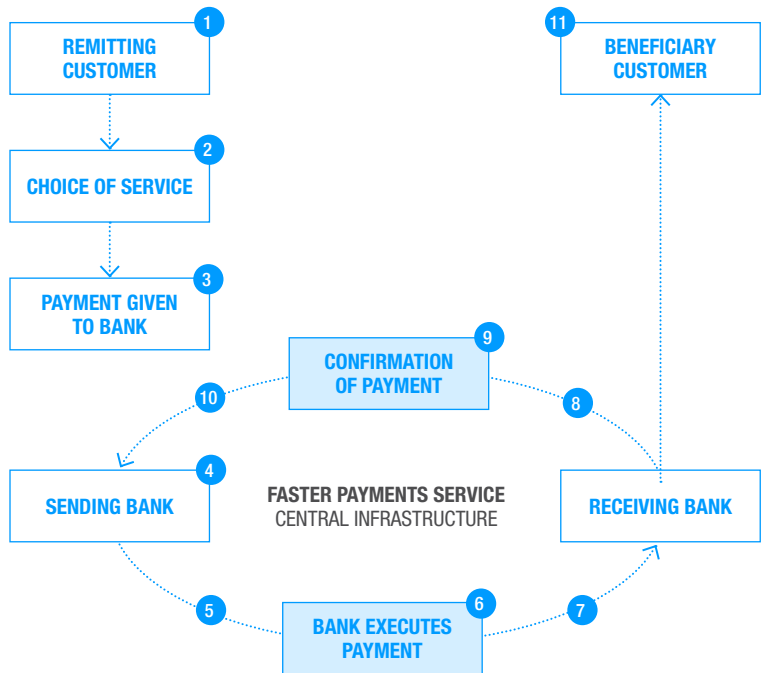
Figure 2 illustrates the structure of the FPS process in the U.K. The sequence of 11 steps illustrated in Figure 2 occurs in a few seconds as follows: (1) A bank customer (payer) decides to send money to a customer of another bank. (2) The payer chooses a mechanism to instruct the bank (mobile phone, online, landline phone, or an ATM). (3) The payer provides the payee's sort (routing) code and bank account number. (4) The

Figure 1: Duration from start to finish from the consumer and bank perspectives



Source: Authors' estimates

Figure 2: How the U.K. FPS works



Source: <http://www.fasterpayments.org.uk/about-us/how-faster-payments-works>

sending bank performs security and sufficient funding checks of the payer's account. (5) The sending bank submits the transaction to the FPS. From that stage, the transaction cannot be canceled. (6) The FPS checks that all the relevant information is included and submits the payment instruction to the receiving bank. (7) The receiving bank sends a message back to the FPS that it has accepted or rejected the payment after confirming that the payee's account is valid. (8) The FPS credits the receiving bank (if accepted) and sends a message to



the sending bank confirming that the transaction was successful (or rejected). (9) The sending bank marks the transaction as complete. (10) The sending bank notifies the payer that the transaction has been completed (or rejected). (11) The receiving bank credits the payee's account for the amount sent.

In terms of speed, the U.K. FPS operates 24/7/365, and clearing and confirmations of individually processed transactions usually occur within a second or two. Settlements are made three times daily; see VocaLink (2009).<sup>18</sup> It is up to the receiving bank to decide to make the funds available immediately to the payee or to delay receipt. In practice, most banks make the funds available immediately. Payments can be originated via the Internet, ATM, over the phone, or via mobile.

Unlike the slower, batch-based networks, the FPS is limited to credit (push) irrevocable transactions.<sup>19</sup> The irrevocable nature of the payment makes correcting errors more difficult than with some other payment methods. While there are mechanisms in place in the U.K. to reverse mistaken or fraudulent transactions, faster payments could be difficult to contest.<sup>20</sup> If a payer provides the wrong sort code or account number when making a payment, the bank must make a reasonable effort to recover the money, but the bank is not liable for losses.

By late 2014, 49 million account holders in the U.K. (compared to an adult population of 52 million) had access to the FPS. Initially, each transfer was limited to £10,000 (\$15,365). Some banks have raised the limit beyond £10,000 for individual customers to £250,000 for business customers.<sup>21</sup> FPS values accounted for 1.0% of total clearing values in 2013 [PC (2014a)]. This share by value is low due in part to the size of other types of transactions. For example, the average CHAPS transaction was £1.99 million in 2014, while the average FPS transaction was £589, as discussed below and shown in Figure 9.

Through 2014, the introduction of the FPS in the U.K. has had little or no effect on transactions made at the POS. For purposes of this discussion, POS refers to payments that must be made prior to the delivery of goods. An FPS system announced for 2015 enables users to pay directly from their bank accounts by scanning a barcode or tapping an NFC reader with their mobile phones.<sup>22</sup>

One improvement to the FPS was the introduction of mobile FPS, whereby users who register their accounts can make payments using their mobile phone numbers without having to reveal their bank account details.<sup>23</sup> This service aims to make it easier for individuals to pay one another.

<sup>18</sup> Because settlements occur only three times per day, banks in the U.K. have signed a loss-sharing agreement in case one of the banks fails before funds are settled.

<sup>19</sup> The newly constructed faster payments system in Singapore (called Fast, for Fast And Secure Transfers) is able to handle debit requests: <http://bit.ly/2GYFw4H>.

<sup>20</sup> "Bank digit mistakes costly" BBC One (June 19, 2013), <http://bbc.in/2F7D0wm>

<sup>21</sup> See <http://bit.ly/2l0uEVn>

<sup>22</sup> Rossi, B., 2013, "VocaLink announces new mobile payment system 'Zapp,'" Information Age, June 25, <http://bit.ly/2teUstt>

<sup>23</sup> The service is called Paym; see <http://bit.ly/1igZzbS>. Like FPS, Paym is offered by the participating banks, which guarantee that 90% of bank customers will have immediate access to this service.

A second enhancement is adherence to international standards, which eventually would permit faster payments between countries. The U.K. FPS and Singapore's Fast are compatible with ISO 20022.<sup>24</sup> The purpose of this standard is to unify payment messages across all electronic payment systems in Europe and all other participating countries.<sup>25</sup> Concerns have been raised that payment systems in the U.S. are incompatible with ISO 20022.<sup>26</sup>

#### 4. USES AND POTENTIAL BENEFITS OF FASTER PAYMENTS IN THE U.K.

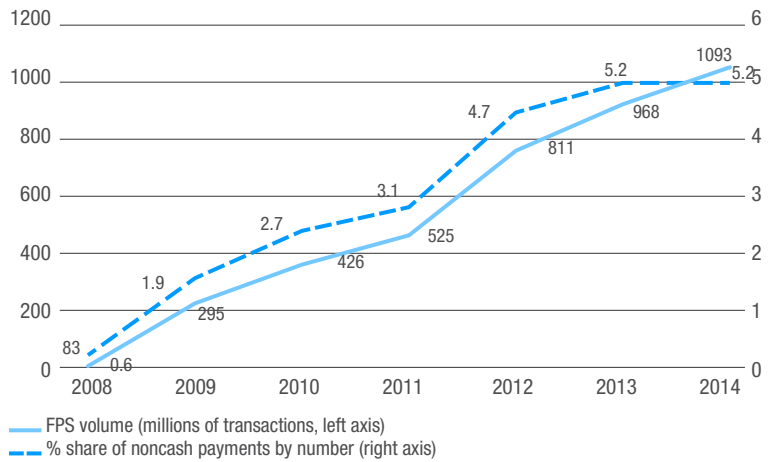
Using limited data available, this section describes how businesses and consumers in the U.K. used the FPS shortly after its introduction. Data are limited, but there are a few interesting findings. In 2014, 1.1 billion payments initiated by consumers, businesses, or government were processed via FPS.

Overall in the U.K. in 2013, consumers, businesses, and government made 18.5 billion noncash payments, so payments via the FPS represented about 5.2% of all noncash payments by number (up from 4.7% in 2012). Including cash payments, faster payments were about 2.6% of all payments by number (PC 2014b, Table 27.1). Figure 3 displays the volume of FPS transactions since 2008, when the FPS became operative.

As shown in Figure 4, faster payments in the U.K. consist primarily of three types of payments:

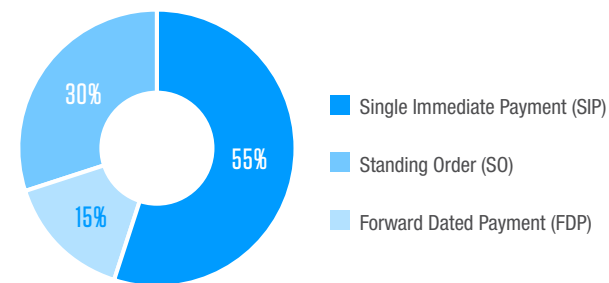
- **Single immediate payment (SIP):** A one-time payment initiated via Internet banking, telephone banking, or an ATM, to be executed immediately. For example, a consumer might use an SIP to pay a credit card bill. In May 2014, SIPs were the dominant type of faster payment by volume: 55% of all FPS transactions by number.
- **Forward-dated payment (FDP):** An instruction to a bank to make a one-time payment on a future date. For example, a business or consumer might schedule a tax payment due on a future date. In May 2014, FDPs were 15% of all FPS transactions by number.
- **Standing order (SO):** Regular recurring payments for a set amount, to be made on the same day of every month or week. For example, a business might schedule a monthly payment to a cleaning service. Standing orders can be set up at any time, but this payment type is only sent Monday through Friday. In May 2014, SOs represented 30% of all FPS transactions by number [FP (2013), updated using "Payments Statistics Monthly"].

Figure 3: FPS volume, 2008–2014 (in millions)



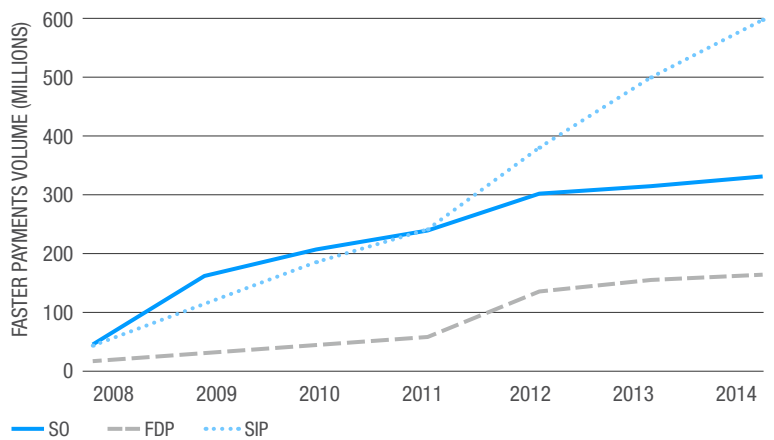
Source: PC 2014b, p. 14, Table 1.6, and authors' calculations based on PC 2014b, p. 85, Table 27.1

Figure 4: Shares of faster payments types (by number of payments) in the U.K., May 2014



Source: FP (2013), updated using "Payments Statistics Monthly"

Figure 5: FPS volume, 2008–2014 (in millions)



Source: PC (2014b, p. 14, Table 1.6)

<sup>24</sup> See, <http://bit.ly/2oFzM9g>.

<sup>25</sup> See, European Payment Council, <http://bit.ly/2CYjxlK>.

<sup>26</sup> See, <http://bit.ly/2tbIMIw>.

Previously, these types of payments initiated via telephone or online banking were executed via the Bacs system, where the payer initiated the payment on business day 1 and the payee received the payment on business day 3. At best, the money would reach the beneficiary two days later (for a payment made on Monday the beneficiary would be credited on Wednesday), but since this was a Monday-through-Friday service and had an evening cut-off time, a payment initiated on a Friday evening would reach the beneficiary on the following Wednesday. For all FPS, including the almost half of these faster payments scheduled in advance (Figure 4), this multi-day timeline from initiation to receipt no longer applies.

Figure 5 shows the strong growth between 2011 and 2014 in SIP, that is, one-time payments authorized online or by phone or ATM. The number of SIP and FDP made using the FPS grew by more than 75% in 2012 (PC (2013c), p. 82).

As noted above, consumers, businesses, and governments use the FPS. Much of the analysis in this section relies on the “2013 Faster Payments Service Traffic Survey” [FP (2013)], which provides data on all transactions over the FPS for five dates in May 2013.<sup>27</sup> Unfortunately, the report (discontinued in later years) does not provide full information about the payer or payee of the transactions and provides only very limited information about the transaction. It makes use of sort codes, which are codes associated with each transaction that primarily identify the bank. As it happens, knowledgeable sources are able to recognize some sort codes as being associated with banks that particularly specialize in businesses, consumers, or governments, and this provides some information. But sort codes cannot be used to identify the specific payer or payee.

## 4.1 Consumer payments

According to the FP (2013, p. 23), consumers made an estimated 487 million payments, or approximately 60% of the payments sent via the FPS in 2012. Another data source, a survey of U.K. consumers, found a smaller number of faster payments by consumers in 2012, 356 million [PC (2013b)]. Figure 6 shows how

the U.K. consumer payment survey classifies consumer payments.

### 4.1.1 ONE-TIME PAYMENTS BY CONSUMERS

In the U.K. in 2012, consumers made almost 31 billion payments, including 25.9 billion “spontaneous” payments, which the Payments Council defines to include purchases in person, by mail, and online; payments for services, for example at hotels and restaurants; and payments to individuals [PC (2013b)].<sup>28</sup> Spontaneous payments also include one-time credit card payments. Of the 25.9 billion spontaneous payments, 239 million (1%) were electronic payments.

The most common type of payment made via the FPS is payment of a credit card bill [FP (2013), p. 23–24]. In 2012, more than two-thirds of all credit card bill payments were made using FPS [FP (2013), p. 35]. This suggests that consumers are taking advantage of same-day receipt to pay credit card bills on time with the most up-to-date knowledge of their financial situation, which they could not have done previously with SIP.

By value, the largest total value amount of FDPs according to the Faster Payments Service Traffic Survey (2013) was paid to public sector sort codes. FDPs also are one-time payments. This suggests that consumers are using FDPs to schedule the payment of taxes.

### 4.1.2 REGULAR PAYMENTS BY CONSUMERS

In 2012, U.K. consumers also made 4.8 billion payments for “regular,” or recurring, commitments, including household expenses like rent, gasoline, and insurance, and personal commitments like health insurance, subscriptions, and loan repayments. Of these recurring consumer payments in 2012, 3.6 billion (75%) were electronic payments [PC (2013b)].

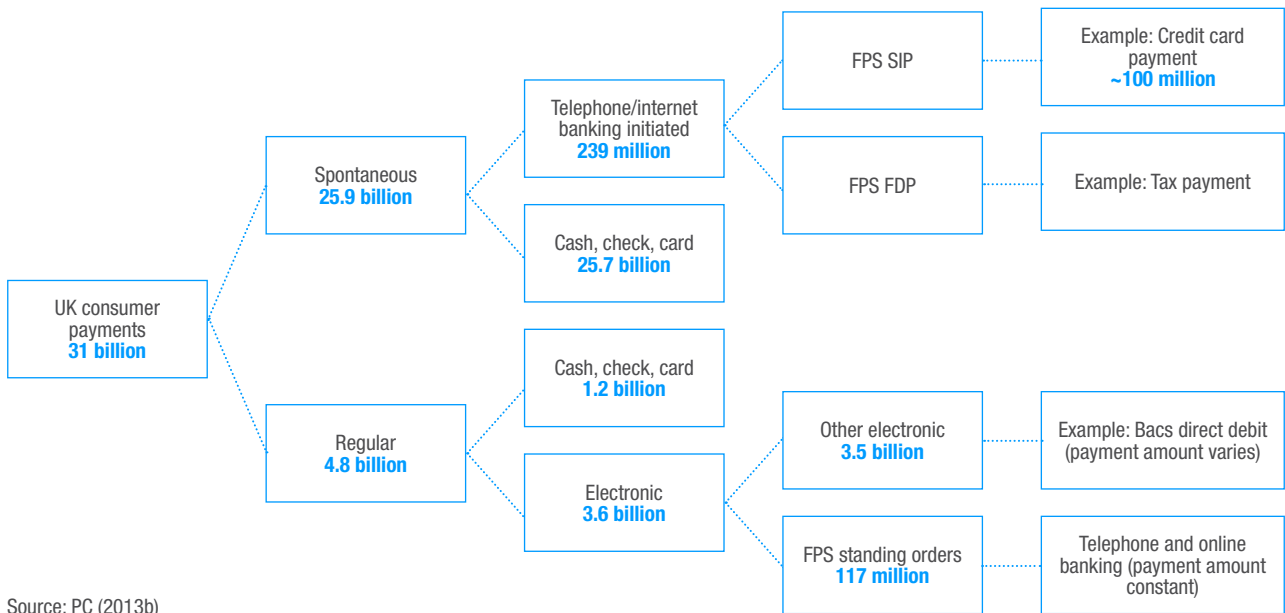
Almost all constant-value recurring payments authorized by telephone or online are executed via FPS standing orders (nonparticipating banks would be the exception): 94.6% [PC (2013a)]. The remainder are processed via Bacs. Thus, the FPS system has almost entirely taken over the standing order market.

PC (2013b) reports 117 million payments by FPS

<sup>27</sup> This annual survey reports on all transaction data for five dates in May 2013, month-end and month-start (April 30–May 1), a mid-month weekend [Friday, May 17 (encompassing May 18 and 19 because these payments settled on Monday May 20)], and two days around the middle of the month (May 21–22).

<sup>28</sup> The Faster Payments Tracking Survey was discontinued in later years. This section uses 2012 data for comparability.

Figure 6: Consumer reported payments in the U.K. in 2012



Source: PC (2013b)

standing orders in 2012. FP (2013) arrived at a similar estimate for recurring payments made by telephone or online. Use statistics for the FPS in May 2013 show that about one-third of all payments associated with individuals were made on the last day of the month. Of payments by individuals on the last day of April and first day of May, 80% were standing orders [FP (2013, p. 25)]. That is, about one-quarter of the use of FPS by individuals (129 million payments) is for SOs at the end of the month, most likely for recurring monthly bills for constant amounts.

According to FP (2013), FPS SO payments are for lower values than FPS one-time payments. More than half of SOs at both the beginning of the month and the middle of the month were for £100 or less. On all days surveyed in May 2013, about 20% of SOs were for £10 or less, “many for £4.33 and £4.34 exactly, probably monthly payments of £1 weekly commitments” [FP (2013), p. 21]. This suggests that the FPS is being used to automate small payments by individuals to other individuals, for example, for workplace coffee clubs or lottery pools.

An important consideration is that if the payment level varies from month to month, such as with a typical telephone bill, automatic payment cannot be done by SO. Consequently, constant-value payments, for example, for rent or life insurance, are much more likely to be processed over the FPS than are payments for, say, electric utility bills, which vary in value from month to month. This is an important limitation of the FPS as implemented in the U.K.<sup>29</sup>

## 4.2 Business and government

In the U.K. in 2012, businesses made 3.5 billion payments [PC (2013c), p. 87]. Approximately 324 million business (including government) payments (calculated as 40% of FPS by number), or 9% of business payments by number, were made via the FPS.

### 4.2.1 BUSINESS-TO-BUSINESS

For business-to-business payments, PC (2013d) reports that of the 832 million automated payments in 2012 (made by Bacs direct debit or direct credit, standing order, FDP, and SIP), 60 million (about 7%) were FDPs or SIPs via the FPS [PC (2013d), pp. 39-40]. Small and medium-sized businesses may now choose to receive credit and debit card merchant payments via the FPS (reducing settlement time by as much as three days) [PC (2013d), p. 46].

<sup>29</sup> In practice, direct debits make up the majority of recurring, scheduled payments by consumers.

#### 4.2.2 BUSINESS-TO-CONSUMER

Business-to-consumer payments were about 264 million by number in 2012. For business-to-consumer payments, FP (2013) found that sort codes associated with businesses sent more payments on Friday, May 17, than on any of the other four days of the survey. “This was in part driven by employment agencies and payroll companies making weekly wage payments” [FP (2013), p. 15]. This suggests a potential benefit of faster payments. When the payment of wages and salaries can be based on contemporaneous data on employment status or hours worked, payments are more accurate and timely. FP (2013, p. 14) reports “Employment agencies paying staff on weekly bases using the Faster Payments Service tend to use single immediate payments because of its flexibility.” In addition, government can use the FPS to pay benefits to recipients. As of 2013, however, most workers are paid wages and salary via Bacs Direct Credit. In 2013, 90% of working adults in the U.K. were paid by Bacs Direct Credit [PC (2013), p. 31].

According to the FPS, financial users and businesses users were the second and third largest users, respectively, of SIPs. Some of these financial users and businesses seem to be using speed of payment as a competitive advantage. FP (2013, p. 27) commented on the growing use of faster payments by businesses to pay customer refunds and insurance claims. The Payments Council [PC (2013), p. 34] notes that “a number of new businesses have emerged in recent years advertising speedy payment,” citing businesses that buy second-hand cars or jewelry, lenders, and gaming companies.

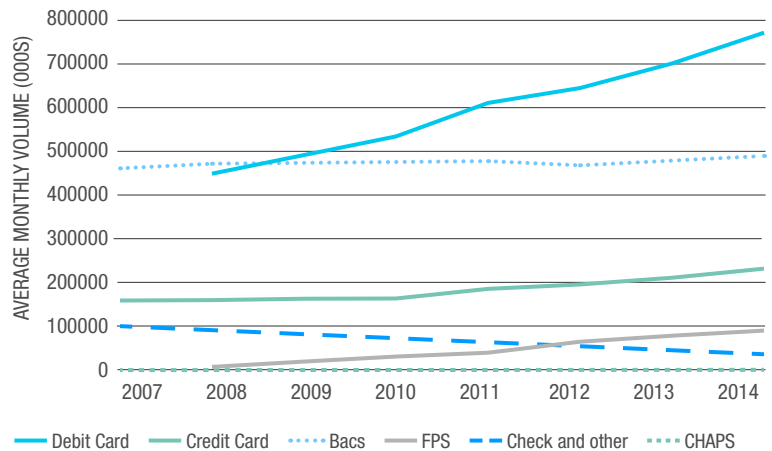
Financial firms also use SIPs. “Most payments by financial firms to individuals were around £100 or less and included a relatively large number of payments of less than £1. As noted earlier in this report, these could be interest payments from old savings accounts” [FP (2013, p. 27)].

#### 4.3 Consumers and the U.K. FPS

Research by the U.K. FPS found that person-to-person payments for coffee, lunch, shared housing expenses, etc., amount to £12.6 billion per year [PC (2014c)]. At the time of this research, it was anticipated that the Paym mobile method, introduced in mid-2013, would make it easier for friends and family to settle IOUs.<sup>30</sup>

As of 2016, the U.K. FPS offered technology for POS transactions.<sup>31</sup> Research has shown that speed at checkout is a relevant consideration [Klee (2008); Schuh

Figure 7: U.K. transaction volumes by payment method, 2007–2014 (before and after the FPS)



Source: PC (2013c), updated

and Stavins (2015)]; therefore, a payment method that slows down speed at checkout is not attractive. As Figure 7 illustrates, debit card volume increased after the introduction of FPS. At the time of writing this article, costs to merchants for POS services are unknown. If costs prove smaller than merchant card fees (including interchange), merchants could surcharge consumers for the difference between the costs of accepting the two payment methods, as permitted by U.K. consumer protection rules. Discounts from the stated price for the use of a particular means of payment are permitted [BIS (2013)].

Broader adoption of international standards such as the ISO 20022, the standard for financial services messaging, could facilitate the use of faster payments for cross-border payments. VocaLink suggested some benefits of international standards for cross-border payments. “[T]he standardisation of approach reduces the burden of interoperability between systems, assisting both reconciliation and integration with the end to end business process, as well as enabling a greater “payload” of identifying information to accompany the payment” [VocaLink (2013, p. 9)]. ISO 20022 includes standards for payment initiation, cancellation, and modification of payments, and settlement instructions.<sup>32</sup>

<sup>30</sup> Faster Payments, “Paym launch confirmed – pay using just a mobile number from 29th April” <http://bit.ly/2l3WVtW>.

<sup>31</sup> FinTech Futures, 2016, “VocaLink, Zapp bring faster payments to retailers,” BankingTech, June 13, <http://bit.ly/2FpEJg9> and Rossi, B., 2013, “VocaLink announces new mobile payment system ‘Zapp’,” Information Age, June 25, <http://bit.ly/2FRzZKy>.

<sup>32</sup> ISO 20022 Payments Dashboard Business Processes Description, <http://bit.ly/2Fb5k10>

Overall, from a consumer perspective, it appears that consumers in retail settings in the U.K. and the U.S. have good options for fast payments. Debit and credit transactions appear immediately, and cash is often an option. Merchants may see this differently, as their payment may be delayed. But consumers tend to be the driving decision-makers in retail settings, and they have little reason to adopt something new, unless incentives change; for example, if merchants were to choose to offer discounts. However, person-to-person transactions are different. These are often completed by check, a slow process that often involves physically mailing a check or depositing at a bank, ATM, or via the Internet (by taking an image of the check). Similarly, real-time payments may be attractive in bill-pay contexts. Unlike the case with ACH or check payments, a consumer can schedule a real-time payment at the last minute, which supports better money management (and procrastination).

## 5. COSTS OF THE FPS IN THE U.K.

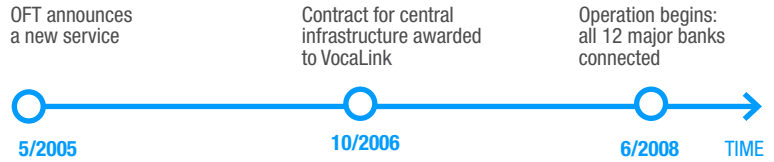
The U.K. FPS experience provides a good example of how a general-purpose, fast payment system can be constructed and become operational in three years. Figure 8 below illustrates the construction timeline.

The FPS started operating in 2008. The key to its success is that commercial banks had a strong incentive to construct and connect to such a network. The whole process was pushed forward by the Office of Fair Trading (OFT, one of U.K.'s antitrust authorities), which offered commercial banks no choice but to remove the float from funds transfers [VocaLink (2009)]. In addition, at that time, check clearing in the U.K. was planned to be phased out in October 2018 (since then postponed).<sup>33</sup>

### 5.1 The U.K. payment system investment decision

To determine whether the benefits from an enhanced payment system outweigh the costs requires the decision-makers to examine various technological issues in general and all the available options related to existing electronic payment networks in particular. This is because the choice of technology has a direct impact on both the expected benefits and the expected costs. In general, such a debate would focus on four options:

Figure 8: Timeline for the construction of the U.K. FPS.



Source: Faster Payments Service

1. Speeding up an existing A2A payment system; for example, making the Bacs (ACH batch based) clear transactions several times during a 24-hour cycle or modifying CHAPS to permit low-value transactions.
2. Building a totally new A2A faster payment system, such as the VocaLink FPS.
3. Modifying other existing payment networks to make them suitable for A2A transfers; for example, using an existing debit card or an ATM network.
4. Using an existing Real Time Gross Settlement (RTGS) network by reducing end-user fees for low-value funds transfers.

The costs of establishing and maintaining a faster payment service involve three main components:

1. The installation cost of constructing, deploying, and maintaining the central infrastructure of the FPS.
2. The connection cost to each individual bank of adopting new technology and capital to access the new fast payment network.
3. The transfer costs of possible reductions in the revenue of banks and nonbank money transmitters resulting from shifting some volume from other payment services to the new FPS. (Lost revenue is not a social cost; rather, it is a transfer from one agent in an economy to another; see section 5.4.)

The cost estimates here are from sources at VocaLink, which runs the central infrastructure and also conducts surveys of participating banks in order to learn about the cost to banks. At the time of this writing, VocaLink (subsequently acquired by MasterCard) was 100% owned by banks. Sources at VocaLink have indicated that the cost to build and launch the U.K. FPS, plus the operation for the life of the initial contract (seven years), is estimated at somewhere between £150 and £200 million (U.S.\$230–U.S.\$307 million), of

<sup>33</sup> <http://bit.ly/2Ff5xA4>



which £40–£50 million (U.S.\$61–U.S.\$77 million) was a fixed cost paid up front by the 12 participating banks for the construction and launch. These figures do not take into account individual bank costs. The costs to individual banks were wide ranging, depending upon the bank’s existing capabilities and the extent of the changes each bank elected to include within the scope of its FPS project.

According to VocaLink, the cost of constructing Singapore’s Fast was lower, due to experience with the U.K. system. It should be mentioned that VocaLink does not bear any volume risk because it does not charge banks any per transaction fee. That is, banks pay a flat fee to use the service, so the system is immune to demand fluctuations. Because it operates below capacity, volume also does not affect cost.

As for the second cost component, the adoption cost to each participating bank varied significantly among the banks, even when adjusted for volume. Some banks used this opportunity to overhaul their entire accounting system in order to accommodate fast clearing. Some banks reported this cost to be in the hundreds of thousands of British pounds (rather than in the millions; see VocaLink (2009), p. 16]. On the other hand, some banks spent in the tens of millions of British pounds. The major problem in estimating bank-specific adoption cost is that for banks that overhaul their entire accounting system, it is difficult to isolate the portion that is attributable solely to the adoption of the FPS. Since banks are not charged any per transaction fee, any increase in volume does not add to a bank’s total cost.

Table 3 provides a summary of the “real” overall cost of the implementation in the U.K. The term “real” refers here to the diversion of human and physical resources from other activities. These can also be viewed as “social costs.”<sup>34</sup>

We have already noted that the costs of FPS are very small relative to U.K. GDP (national income). Another way to evaluate the relative total cost of FPS is compare it to the per capita value of benefits required. With a U.K. population of 63 million people and estimated maximum total cost of £800 million (U.S.\$1.23 billion), the FPS would require a per capita annual benefit of £2.05 (U.S.\$3.15) to give the seven-year investment project a positive net present value.<sup>35</sup> For example, if the FPS helped avoid a late fee on one monthly bill per consumer per year, it would more than amortize the total costs.

Table 3: Estimated cost of building and maintaining FPS in the U.K.

BEARER	COST DESCRIPTION (REAL)	ESTIMATED AMOUNT, MIN TO MAX
Split by 12 banks	Central infrastructure: construction (fixed cost)	£40 million–£50 million (U.S.\$61 million–U.S.\$77 million)
Split by 12 banks	Central infrastructure: Maintenance (variable cost)	£100 million–£150 million (U.S.\$154 million–U.S.\$230 million), spread over seven years between 2008 and 2015
Each of 12 banks	Adoption costs	£0.10 million–£50 million (U.S.\$0.15 million–U.S.\$77 million); max times 12 banks = £600 million (U.S.\$922 million)

Source: VocaLink representatives in email and phone conversations with authors.

### 5.3 Changes in float

In assessing the impact of the FPS process in the U.K. on the costs or gains from float, Milne and Tang (2005, p. 7) point out that a transition from Bacs (ACH) to FPS will not have any float-related impact on the sender and the receiver because even under the slow system, “the debiting and crediting of customer bank accounts takes place on the same day so there is no float income for banks generated by either of these payment instruments.” This statement refers to “bulk credits,” which are transfers such as salaries and pensions, as well as “bulk debits,” which are payments for utility or other variable-amount recurring bills (as noted above, these variable-amount recurring payments are not processed by the FPS). However, float can arise with standing orders (such as regular payments for magazine subscriptions and club dues), “where it is usual for banks to debit customer accounts two working days before the crediting of the recipient account. However, recently some individual banks have changed their practice... so this change in practice eliminates float on standing orders paid by customers of the bank.”

### 5.4 Revenue impact on existing payment networks

The question of whether the new service would generate substitution from other payment instruments, such as checks, cash, CHAPS, Bacs, and cards, was raised in a preliminary study commissioned by the OFT [Milne and Tang (2005), p. 16]. That study mentioned that a large portion of scheduled payment orders should be unaffected by the new service because they are scheduled in advance for fulfillment at a certain future date; such payments include salaries, utility bills, and pension payments.

<sup>34</sup> Gains or losses from float are not included in this table, as they are generally netted out in general equilibrium.

<sup>35</sup> Calculated using a discount rate of 3%.

Figure 7, above [computed from PC (2013c)], confirms that the increase in the volume share of the FPS transactions did not correspond to declines in the volume of CHAPS, Bacs, and debit card transactions. The only significant reduction in payments was in the volume of checks, which were scheduled to be phased out in the U.K. Because checks are also used for person-to-person transfers, the FPS may have affected check volume.

Figure 9 displays average transaction values from the time that the FPS was introduced in the U.K. through 2014. Note that the CHAPS average transaction value in 2014 was £1.99 million, which would fall above the vertical axis limit.

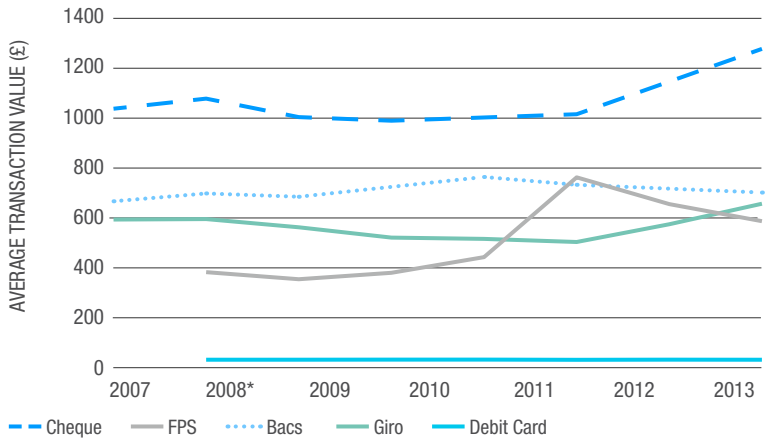
The figure reveals a sharp increase in transaction values made via the FPS in 2012, partly because participating banks increased the limit on the amount that could be sent. Note that none of the other payment methods exhibited major change.

The volumes of Bacs and CHAPS have not decreased appreciably (Figure 7), but it is not possible to say how the introduction of FPS has affected these two electronic networks. A comprehensive model of the payment system is needed to properly estimate substitution among payment methods. For the sake of illustration, one way to approach this kind of computation would be to look at a potential loss of revenue to the banks if some volume from CHAPS switched to the FPS, which currently does not charge payers and payees.<sup>36</sup> The CHAPS volume in 2012 was 33,936,000. Banks charge £30 (U.S.\$43) to send (they do not seem to charge for receiving). The median CHAPS transaction value in 2003 was £17,000 (U.S.\$27,086).<sup>37</sup> If a £10,000 (U.S.\$15,365) restriction corresponded to 25% of the distribution, then the maximum revenue loss would be  $1.018/4 = £0.255$  billion (U.S.\$0.362 billion) Based on this rough calculation, a potential loss to banks could be in the range of £0 to £0.255 billion (U.S.\$0 to U.S.\$0.362 billion).

### 5.5 Future costs

Table 3 shows the estimated maintenance cost of the FPS in the U.K. to be in the range of £100–£150 million (U.S.\$154–U.S.\$230 million) for the entire first seven years of operation (2008–2015). This cost is likely to continue in the future because, so far, the capacity of the network seems sufficient for current traffic. This cost was divided among the 12 banks that started and owned the project since the beginning. The cost per bank falls as more banks join.

Figure 9: U.K. transaction values by payment method, 2007–2014 (before and after the FPS)



\*Note that for FPS, 2008 only includes July – December  
Source: PC (2013c), updated

However, future enhancements that will use the FPS, such as POS applications, may incur additional costs. For example, the Paym mobile service also contains a user directory so that the consumer whose account is credited does not have to reveal his bank account to the sender. It is natural to assume that some add-on service of this type could also be provided by nonbanks, such as merchant organizations and merchants who adopt the FPS, who then could bear some cost of subsequent enhancements.

### 5.6 Revenues

Since operation began, banks in the U.K. have provided FPS to their customers free of charge. Consequently, no revenue has been collected. There may be two reasons for this. First, as with most new networks, to gain momentum, charging no fees could be viewed as providing “introductory offers” to end users so they could assess the gains from using the FPS. Second, the participating banks themselves were not charged any per transaction fees to use the FPS, only fixed fees that were spread over the first seven years of operation. Banks have, therefore, borne zero marginal cost (the cost of making one additional FPS transaction). This means that if banks were to charge end-users per transaction fees, the basis of the fee could not be marginal cost, but rather “demand” or “utility.”

<sup>36</sup> Due to lack of data on revenue generated by U.K. banks from Bacs services, similar estimates of potential loss of revenue from shifting volume from Bacs to FPS are unavailable.

<sup>37</sup> See Bank of England Archive, <http://bit.ly/2FezZKY>.

In the future, banks will have to decide whether to charge users nominal fees that would cover their initial investment and operating cost or whether to cross subsidize this service. VocaLink (2009, p. 4) has already questioned banks on their vision for future revenue, and the response received has been as follows: “Two-thirds of banks interviewed were very positive that Faster Payments could deliver new revenue streams, with potential revenues identified in the business-to-consumer segment reaching £2.9 billion by 2018 and £1.9 billion in the business-to-business space.”

## 6. CONCLUSIONS AND IMPLICATIONS

Faced with a directive from the U.K. Office of Fair Trading to increase the speed of payments, the U.K. banking system chose to build a totally new A2A faster payment system. By most counts, the resulting VocaLink FPS has been a success. In addition to being faster, it is low cost and technologically advanced relative to legacy payment systems, features that benefit U.K. consumers and firms. In particular, the U.K. FPS provides a valuable service to customers with a pressing need to make exceptionally fast payments (relative to legacy systems) in certain payment contexts that help them avoid fees or other costs, pecuniary and nonpecuniary.

Given this success, it is somewhat surprising that in 2015, seven years after starting to operate in the U.K., FPS accounted for a low share of total U.K. payments (around five percent).<sup>38</sup> Whether this outcome was the result of intentional planning and design of the FPS, deficient demand for the service, resistance to revenue losses, or some other reason is not known at this time. However, it appears at least somewhat paradoxical that a lower cost, technologically advanced, faster payment system would not have spread more quickly and widely. Studying the subsequent performance of the U.K. FPS will be an important topic for future research and for understanding the ultimate value of such systems for modern economies.

Because the U.K. VocaLink system was an early successful application of faster payments, it has implications for subsequent efforts to speed up payment systems in other countries. For example, VocaLink reported to the authors that its U.K. experience yielded many insights that aided its development of a similar system in Singapore. In 2012, the Federal Reserve announced a desire to improve the speed, security, and end-user experiences in the U.S. payment system within a decade. Since then, the Fed has encouraged the U.S. payments industry to develop, propose, and install a faster payment system(s). Given the marked similarities between the U.K. and U.S. payment systems, the potential benefits of faster U.S. payments are likely to be similar to those experienced in the U.K.

However, there are differences between the U.S. and U.K. economies that may affect the costs and design of a U.S. FPS. Chief among these differences may be the structure of the banking systems. There are many more banks in the U.S. In 2014, the top five U.K. banks held 98% of all deposits, whereas the top five U.S. banks held only 56%. Another potentially important difference is how revenues would be raised to pay for the FSP services to be provided. In the U.K. FPS, no fees were charged directly to users, unlike payment card schemes that typically impose fees on payees (usually merchants) but not payers (typically consumers). Thus, the optimal business strategy for long-run success in a U.S. FPS may differ from that of the U.K. FPS.

In any case, the U.S. payments industry and policymakers have a distinct advantage in their decision-making because they can study and learn from the experiences of the U.K. and other countries with faster payment services. Studying the evolution of faster payment systems in various countries over time will also be an important line of future research.

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<sup>38</sup> 2016 UK Payment Markets – Summary available at <http://bit.ly/27Szlli>



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