Costs and Benefits of Building Faster Payment Systems: The U.K. Experience and Implications for the United States*

Scott Schuh
Federal Reserve Bank of Boston

Payments System Modernization: Opportunities and Challenges
Canadian Payments Association and Bank of Canada
October 26, 2015

** Current Policy Perspectives No 14-5 (co-authored with Claire Greene, Marc Rysman, and Oz Shy). The views expressed in this presentation do not necessarily represent the views of the Federal Reserve Bank of Boston, the Federal Reserve System, or any entities referred to in the presentation.*

C P R C CONSUMER PAYMENTS Research Center
FEDERAL RESERVE BANK OF BOSTON™

Context and motivation

FRS payments improvement policy

- **Press Release** (Oct 2012)*
  - *"First, we want to gain the industry's insight in understanding end-user needs … And second, we want to engage with the industry to bring forward improvements in U.S. payments that **accelerate the speed**, increase the efficiency, and enhance the convenience, accessibility, safety and security of payments."*

- **Policy white paper** (Jan 2015)**
  - *"Strategy #2 – Identify effective approach(es) for implementing a safe, ubiquitous, **faster payments capability** in the United States (beginning in 2015)."*
  - *"Over three-quarters of respondents agreed that the following attributes would be important in a **(near) real-time payment system: ubiquitous participation, confirmation of good funds, timely notification of payment status to end-users and near-real-time posting to end users**."*
  - *"Overall, **faster payments features are preferred to slower ones, but are not the most important features driving choice of payment method**."*

* "Cleveland Fed President [Sandra Pianalto] Highlights Strategic Focus for Federal Reserve Financial Services in Remarks to Payments Industry Leaders." https://fedpaymentsimprovement.org/wp-content/uploads/2013/09/102212_frfs_strategic_plan.pdf
** "Strategies for Improving the U.S. Payment System." https://fedpaymentsimprovement.org/wp-content/uploads/strategies-improving-us-payment-system.pdf

"How much would a faster payment system cost?"

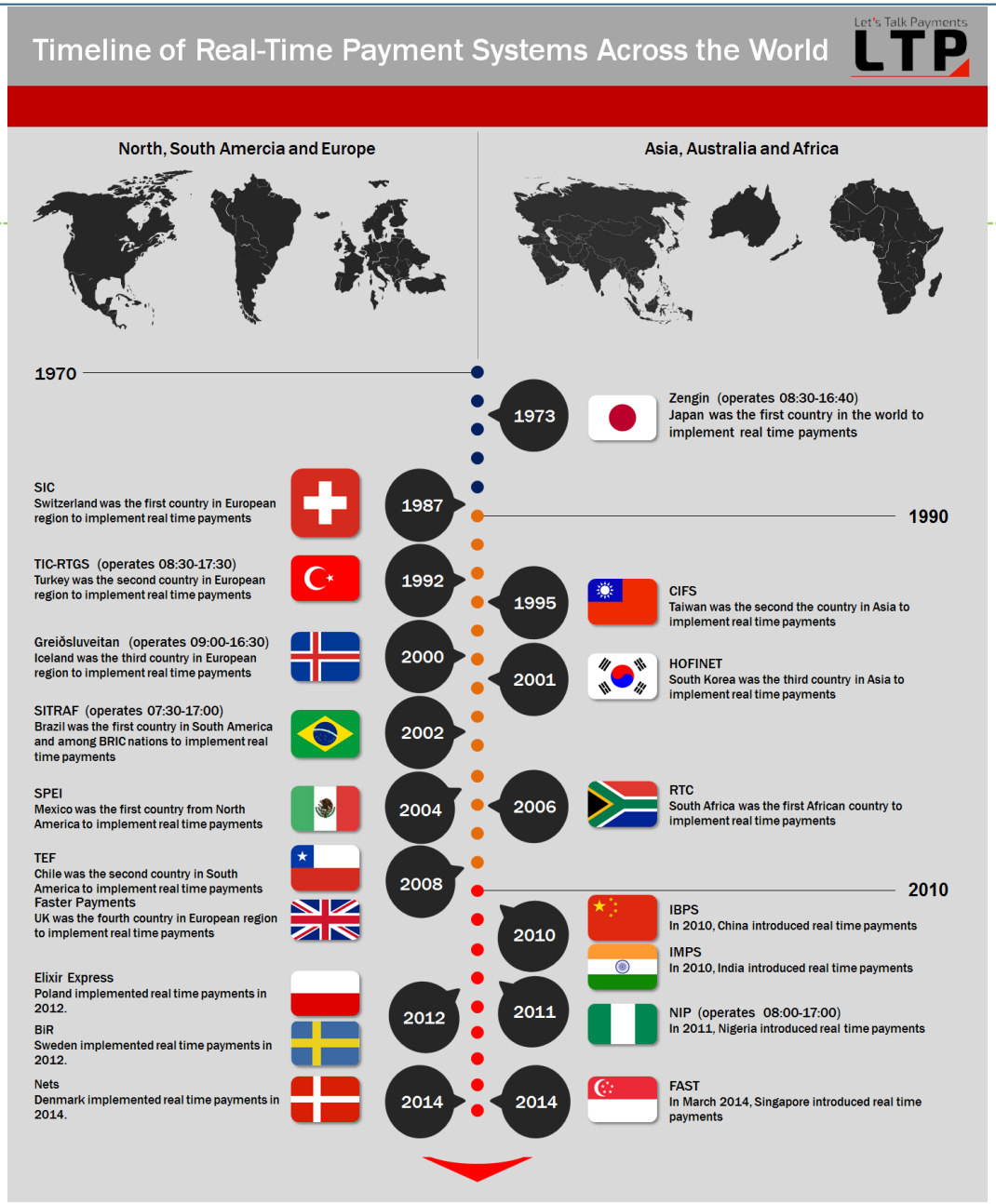
Eric Rosengren (March 2014)
President, Boston Fed
Member, PSPAC

The views in this presentation do not necessarily represent the views of Eric Rosengren.

The challenge in valuing new products…

"If I had asked people what they wanted, they would have said faster horses."

– Henry Ford

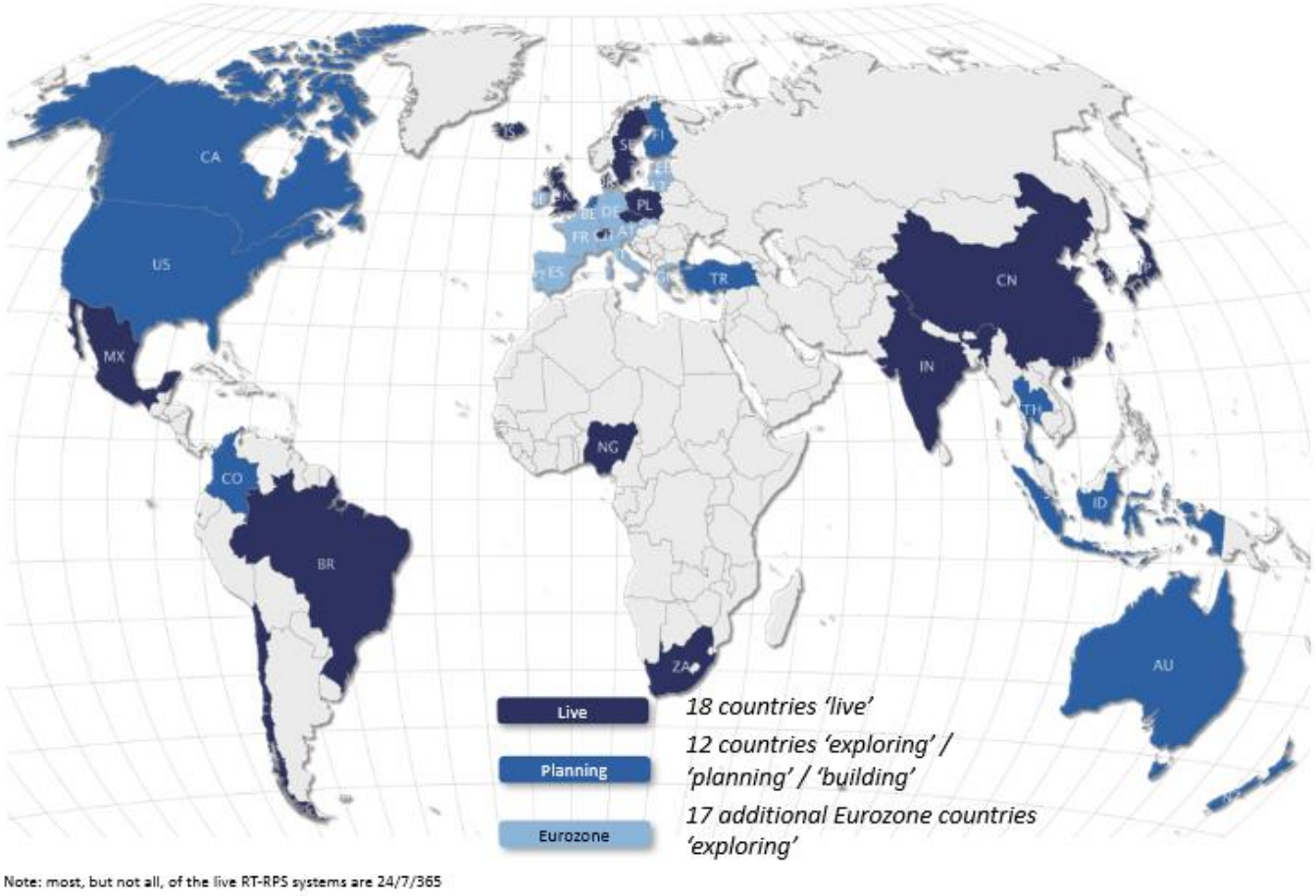


UK VocaLink FPS

Australia SWIFT
2015 FPS

Singapore
VocaLink FPS

Faster payment systems, 2015

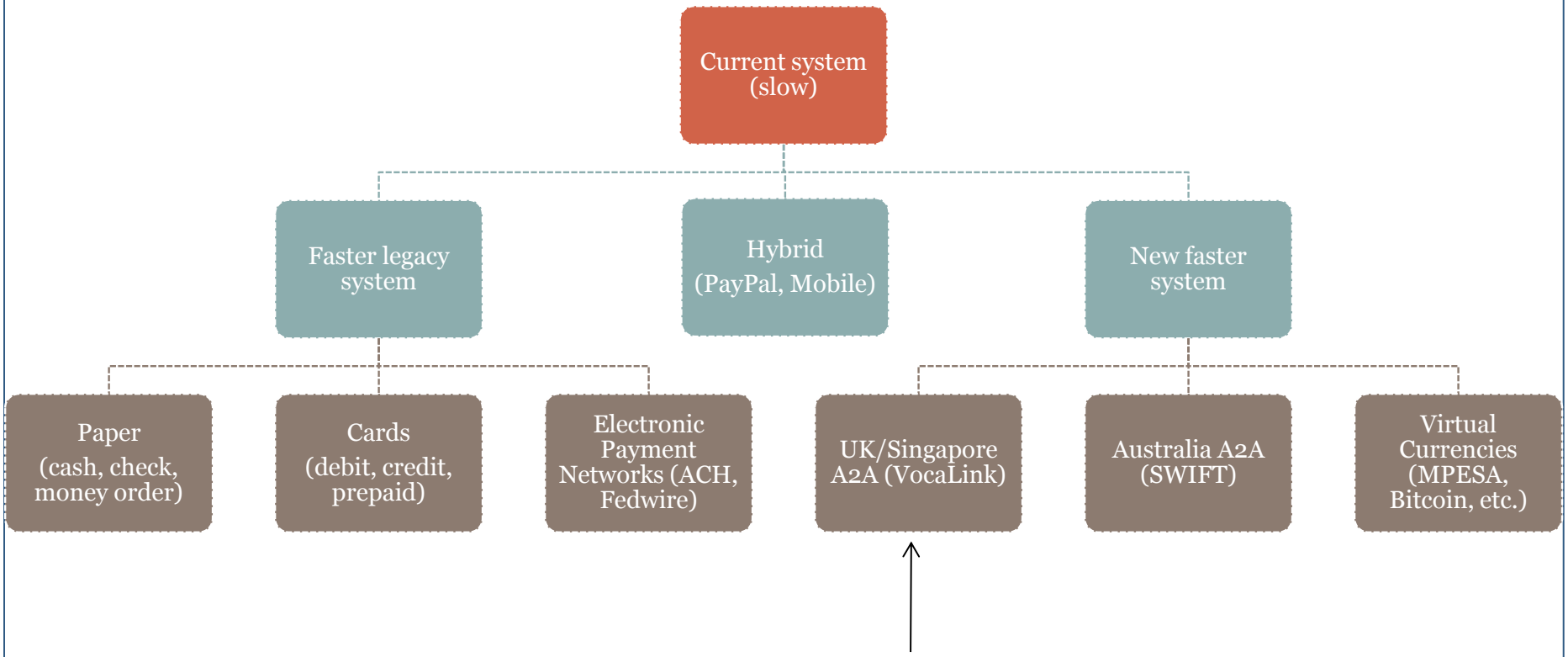


Note: most, but not all, of the live RT-RPS systems are 24/7/365

Source: SWIFT, Global Adoption of RT-RPS white paper, 2015.

Methodological approach

Options for achieving faster payments



Cost-benefit analysis in PDV

Ideal social welfare evaluation

$$\textit{Expected}(\text{PDV benefits}) \overset{?}{\gtrless} \textit{Expected}(\text{PDV costs})$$

Our analysis

- Costs = *quantitative* estimates of investment expenses (nominal $US)
- Benefits = *qualitative* estimates of potential utility/welfare (descriptive analysis of FPS data)

Criteria for evaluating costs of UK FPS?

- Relative to **national income?** (GDP)
  - Total cost is small in absolute terms (<.07%)
- Relative to **costs of faster legacy systems**?
  - *Data not collected for UK (data for US discussed later)*
- Relative to **revenues** (profits)?
  - Economic criteria for firm/industry investment projects:

    Expected PV(profits) = *Expected* [PV(revenues) – PV(costs)] >= 0

Definitions

Payment processing definitions

- ***Authorization (A)***: *"Giving power or permission to (someone or something)."* At point of sale (POS), authorization begins when the payer swipes a card, pushes a key/button, etc.
- ***Clearing (C)***: *"[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 (S)***: *"An act that discharges obligations in respect of funds or securities transfers between two or more parties."*
- ***Confirmation***: *"Notification of all parties that the payment has been made."*

Sources: Green, Rysman, Schuh, and Shy (2014);
Bank for International Settlements (BIS). 2003. "A Glossary of Terms Used in Payments and Settlement Systems."

What is "fast"?

- Typically unstated/unclear and context-dependent

- Four possible definitions:
  1. CONTINUOUS: – The ability to process (or at least originate and clear) transactions 24/7/365.
  2. A→C: The length of time between origination (authorization) and confirmation of clearing.
  3. A→S: The length of time between origination (authorization) and confirmation of settlement.
  4. RTGS: The practice of handling transactions in a non-batched manner, meaning that each transaction is individually processed through the network.

Source: Green, Rysman, Schuh, and Shy (2014).

UK and US banking/payment systems

UK has fewer banks, more concentration

U.K. banks	
Ranked by percentage share of deposits	
1. HSBC Holdings	33.8%
2. Barclays	19.0%
3. Lloyds Banking Group	17.4%
4. Royal Bank of Scotland Group	17.4%
5. Standard Chartered	10.2%
6+*	2.2%

U.S. banks	
Ranked by percentage share of deposits	
1. JPMorgan Chase & Co.	15.4%
2. Bank of America Corporation	13.3%
3. Wells Fargo & Company	12.9%
4. Citigroup Inc.	11.5%
5. U.S. Bancorp	3.1%
6+**	43.8%

Source : S&P Capital IQ, most recent annual results as of 8/14/2014. Used with permission.

* 311 total

** 6,081 total

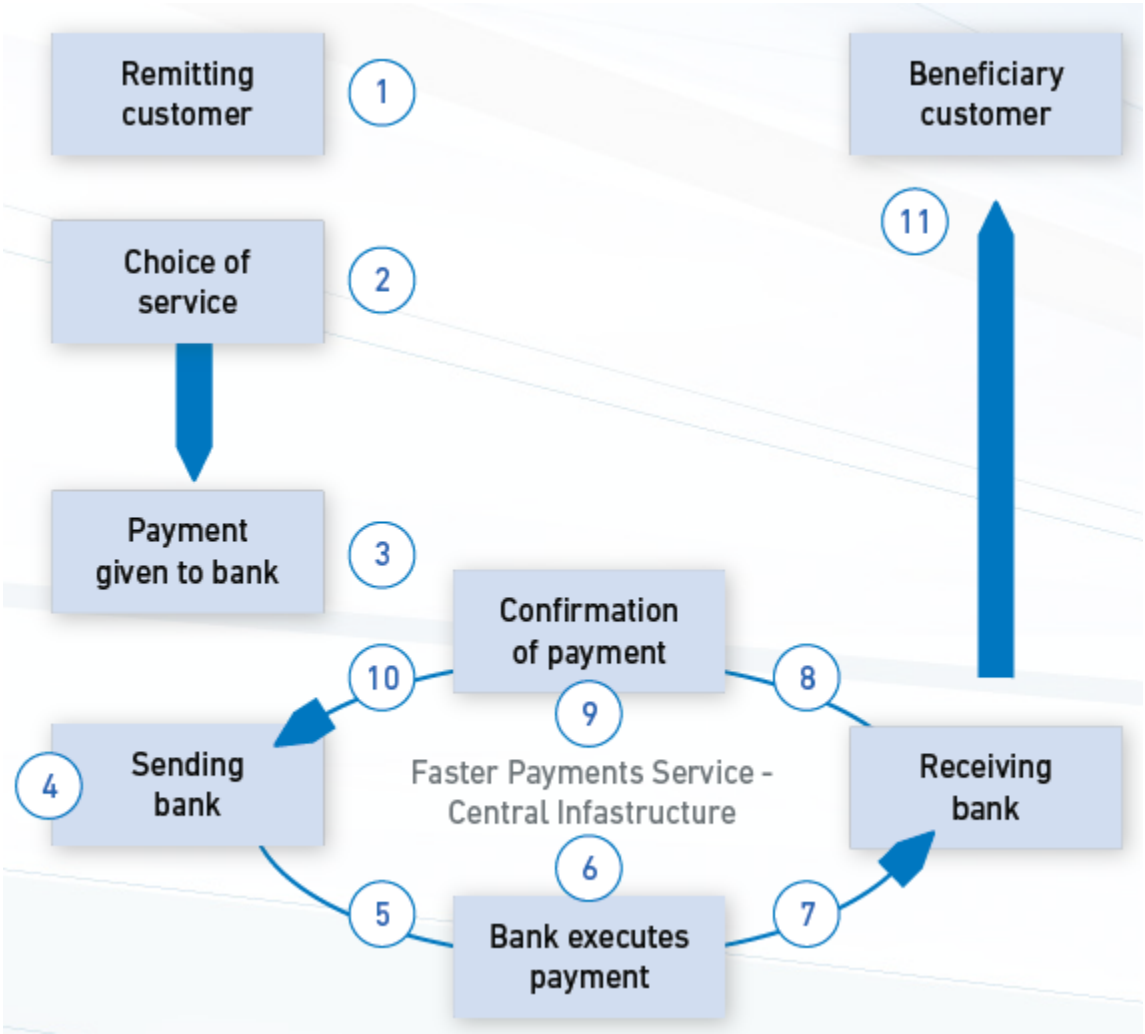
Source: Green, Rysman, Schuh, and Shy (2014).

UK versus US payment systems

Type	U.K. Payment System	U.S. Payment System
RTGS (large value)	CHAPS	FedWire, CHIPS
Batch (slow, any value)	Bacs	FedACH, EPN
Ubiquitous Faster Payment Service	FPS	Not provided (yet)
Paper checks	To be phased out	Fed, SVPCo
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.

UK Faster Payment Service



UK payment networks and transaction types

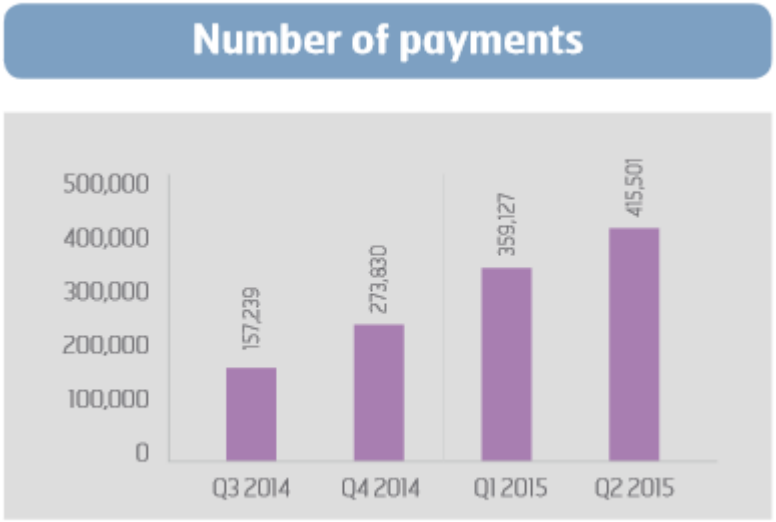
	P2P, B2B		Automatic Bills		Non-automatic Bills		Other (POS, etc.)	
	A2A	Other	Constant amount	Varying amount	Online	Not online	Online	Not online
FPS	✓		✓		✓			
Credit card		✓	✓	✓	✓	✓	✓	✓
Debit card		✓	✓	✓	✓	✓	✓	✓
Bacs	✓		✓	✓	✓			
CHAPS	✓		✓	✓	✓			
Cash		✓				✓		✓
Check		✓			(rare)	✓	(rare)	✓
Mobile (sms/text)								✓

?

Source: BIS Red Book 2012, http://www.bis.org/cpmi/publ/d105_uk.pdf

Mobile FPS: Paym

- Launched in April 2014
- Users link their mobile number and bank account
- Mobile number used for payment
- Mostly P2P but businesses can accept Paym



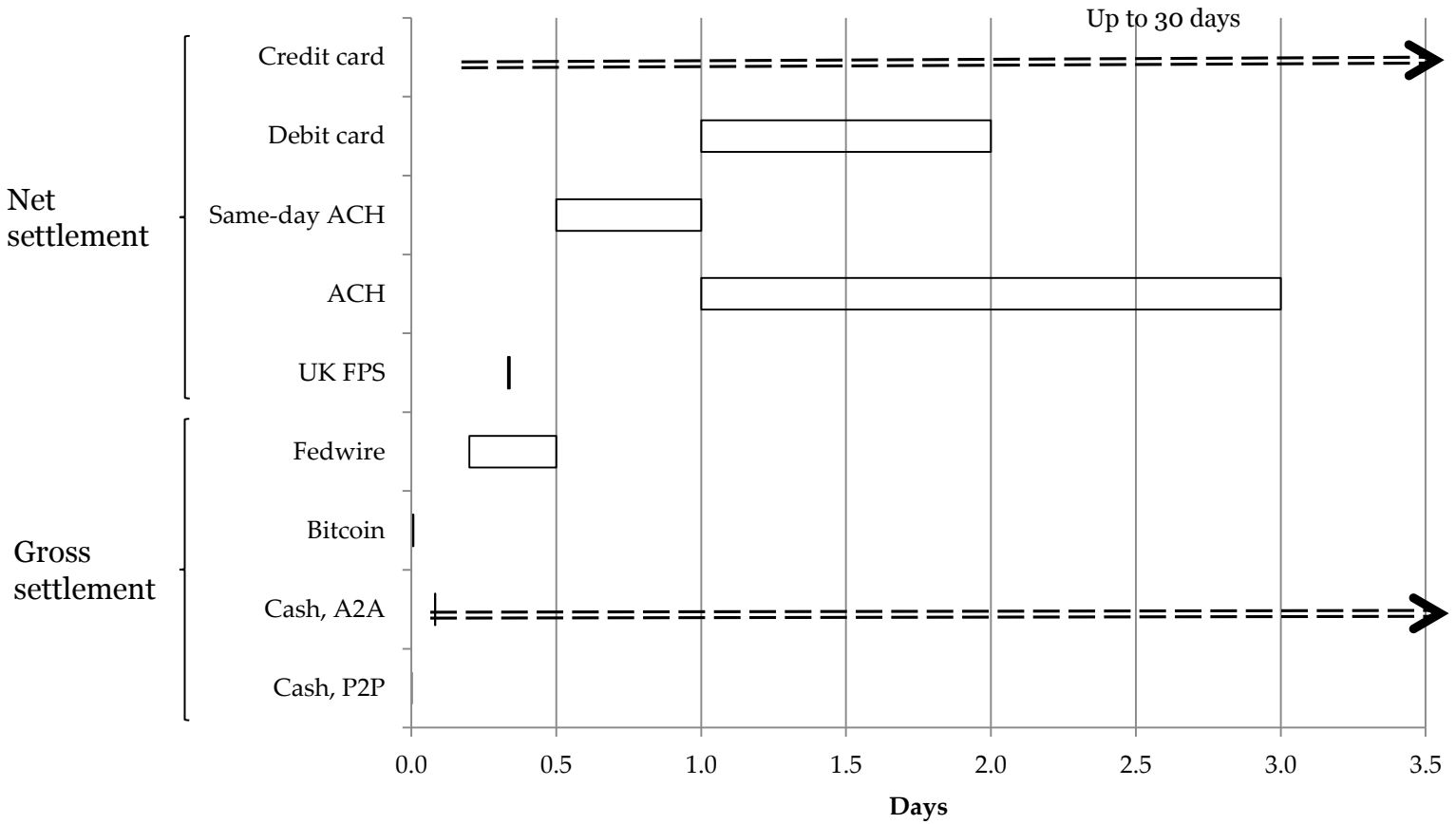
Source: Paym transaction data

What's it for?

25%	Petrol money
22%	Helping with bills
22%	Paying back an IOU
19%	Household costs
19%	Lunch or dinner

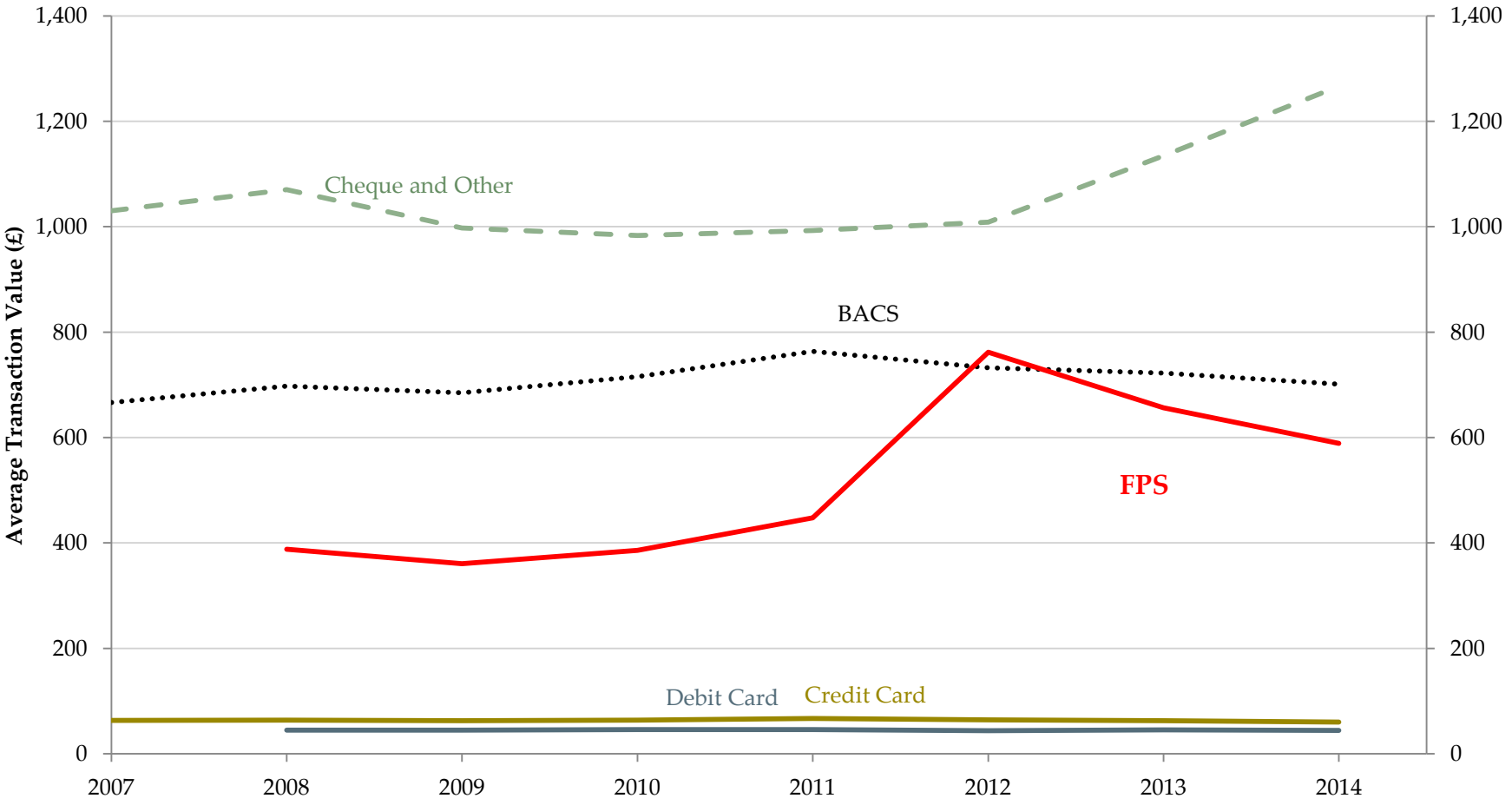
Source: TNS online survey

Clearing and settlement times



Source: Authors' estimates; Greene, Rysman, Schuh, and Shy (2014).

UK average transaction values



Source: Green, Rysman, Schuh, and Shy (2014); New credit card data from the UK Cards Association.

UK FPS decision

- Office of Fair Trading (OFT) ***mandated*** FPS
  - To reduce float on standing order payments (like automatic bill payments)

- Why was a ***mandate*** necessary?
  - E[NPV] <= 0 ?
  - Market failure(s)?
  - Other?

Costs of UK FPS

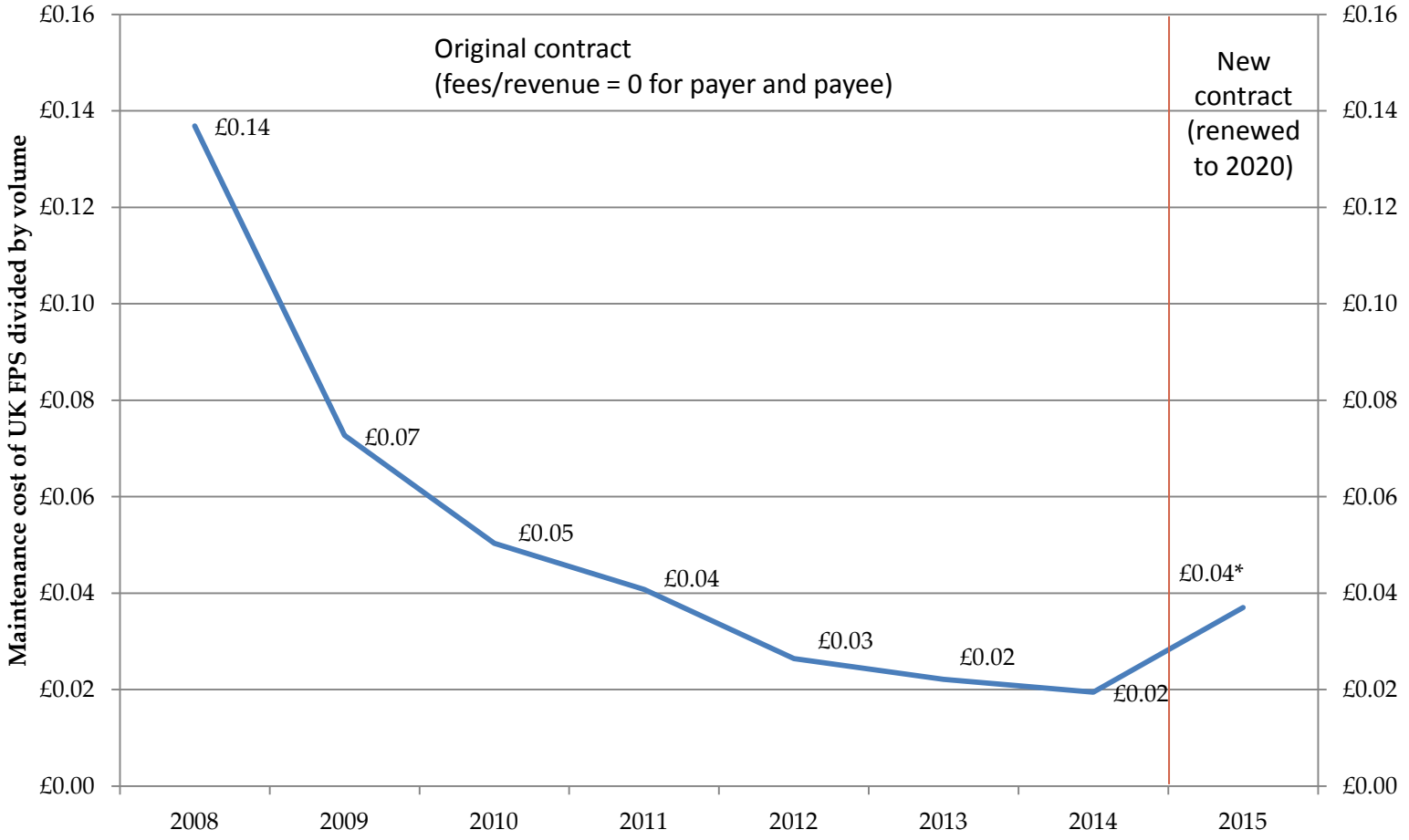
Costs of new A2A FPS

		2008 NPV	Setup	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	% of GDP
UK FPS	**Total**	**$711-1,821**	**$465-1,574**	**$40**	**$34**	**$33**	**$34**	**$34**	**$34**	**$35**	**.026-.067%**
(2008-2014)	Operating (variable)	$246		$40	$34	$33	$34	$34	$34	$35	.009%
	Fixed investment	$465-$1,574	$465-$1,574								.017%-.058%
	Construction	$93	$93								.003%
	Construction of earlier payment platform used for UK FPS	$370	$370								.017%
	Banks' adoption	$2-$1,111	$2-$1,111								.000-.041%
Singapore FPS	**Total**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**
(2012-?)											
Australian Swift	**Total**	**$903**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**?**	**.063%**
(2016-2025)											

Discount factor: 0.97. All numbers in millions.
Note: US $ estimates are subject to exchange rate fluctuations.

Sources: Greene, Rysman, Schuh, and Shy (2015); industry sources.

FPS per-transaction costs



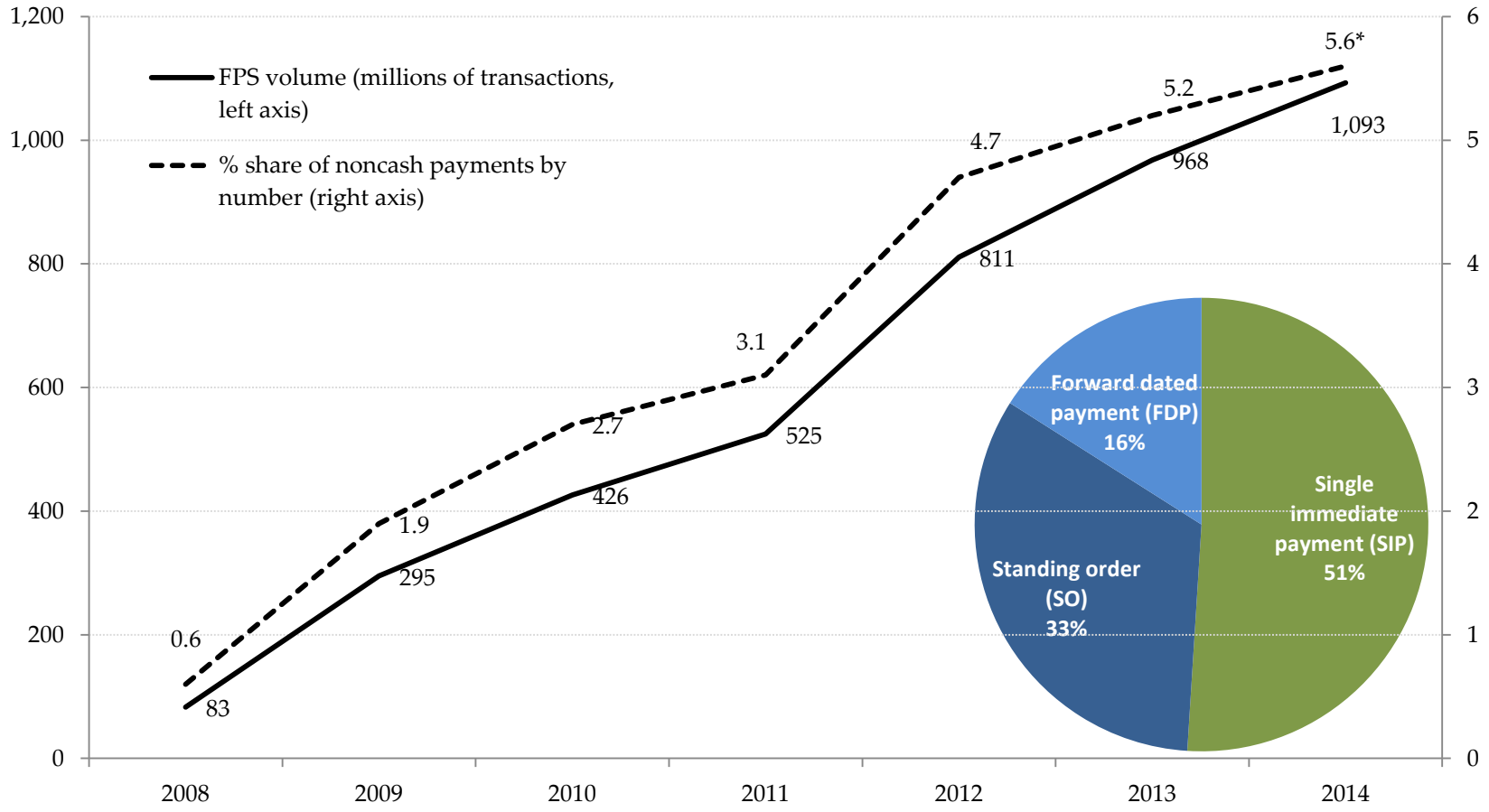
Source: Green, Rysman, Schuh, and Shy (2015), author's estimates.
* Also includes costs of FPSL.

Benefits of UK FPS

Potential benefits of UK FPS

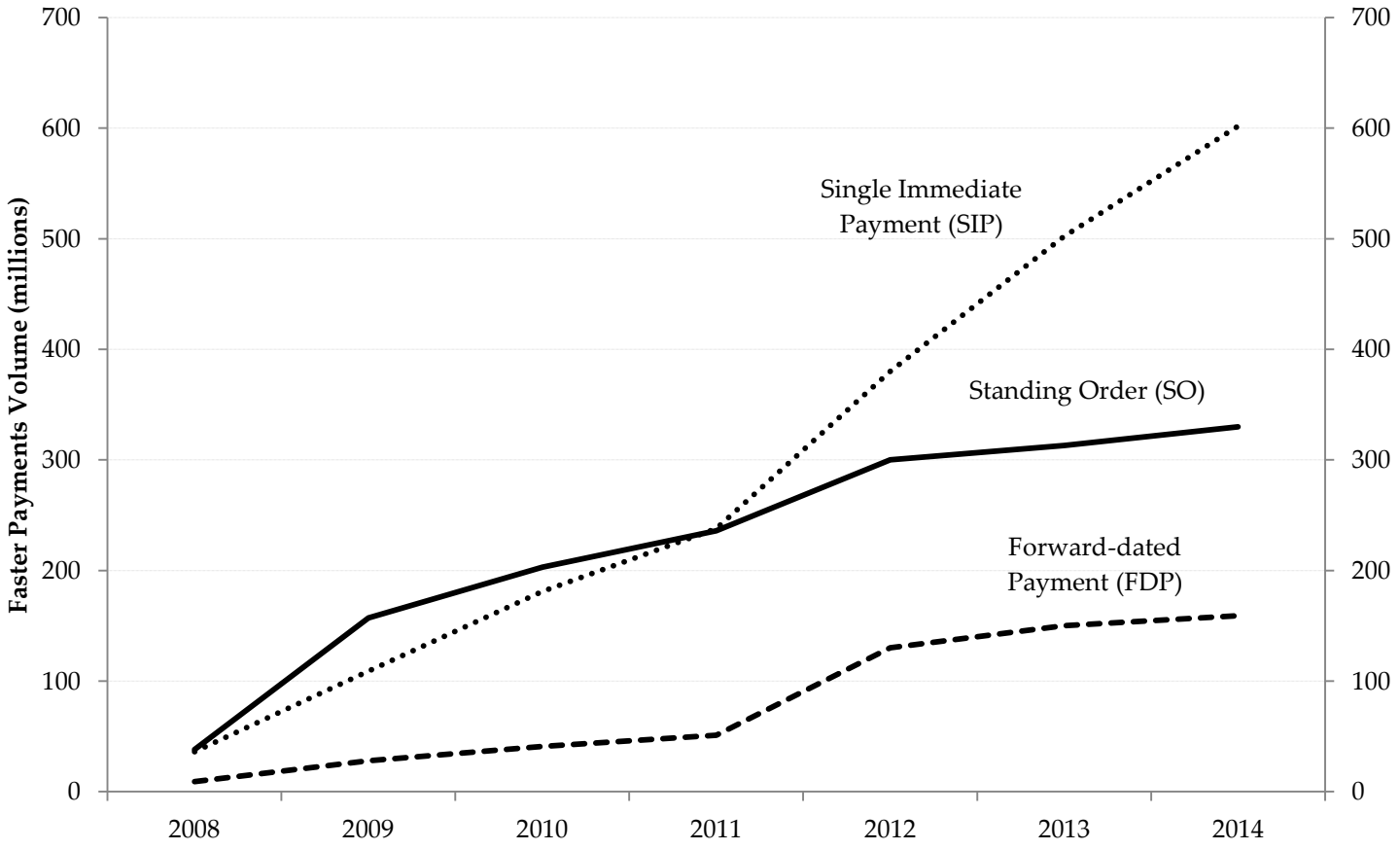
- Reduced float on standing orders (ABP)
  - Benefit for some but aggregate net benefit = 0?
- New service(s) where previously unavailable
  - Very hard to evaluate value (consumer welfare)
- Better than legacy service(s)?
  - Faster, cheaper, more secure, etc.?
- New technology and opportunities
  - Spillovers, learning, etc.

Use of FPS is low but growing



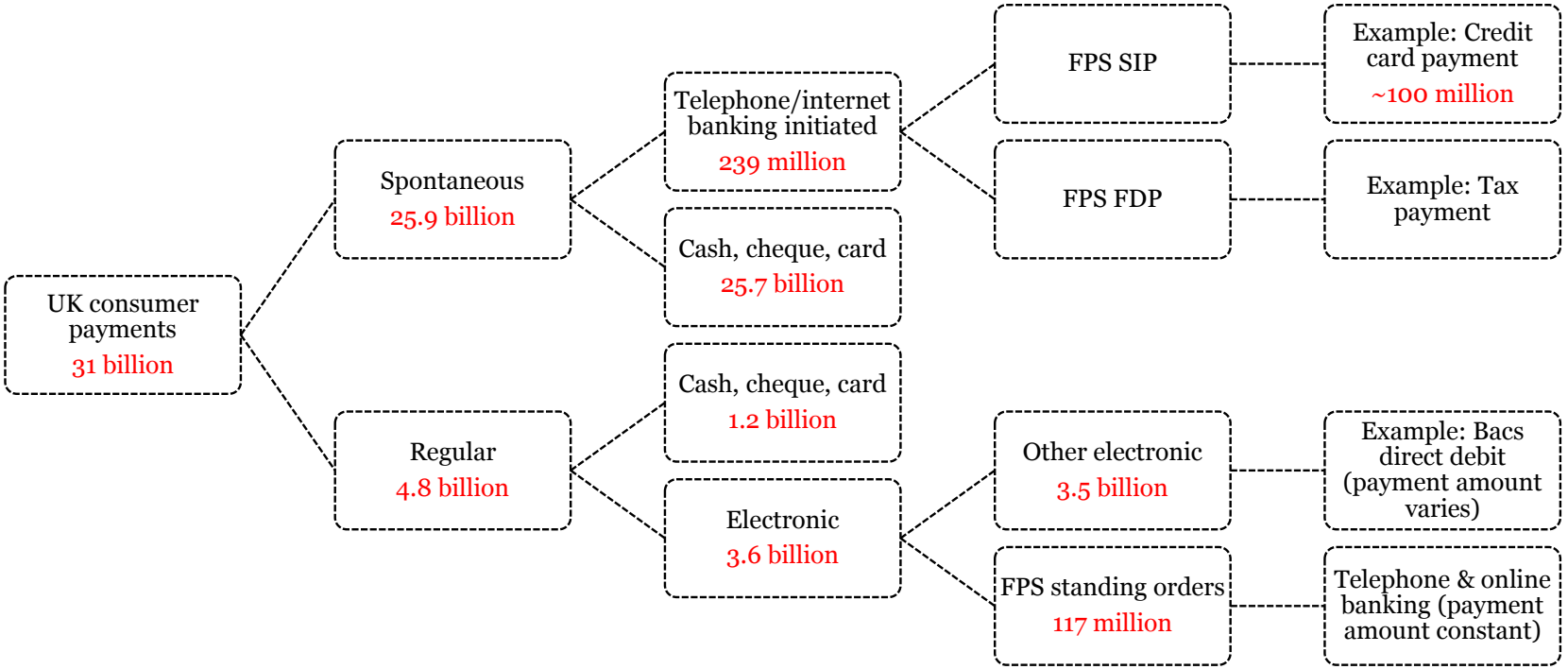
Source: Green, Rysman, Schuh, and Shy (2014).
* Share compiled by author with data from UK Payment Council and UK Card Association.

FPS volume by type of payment



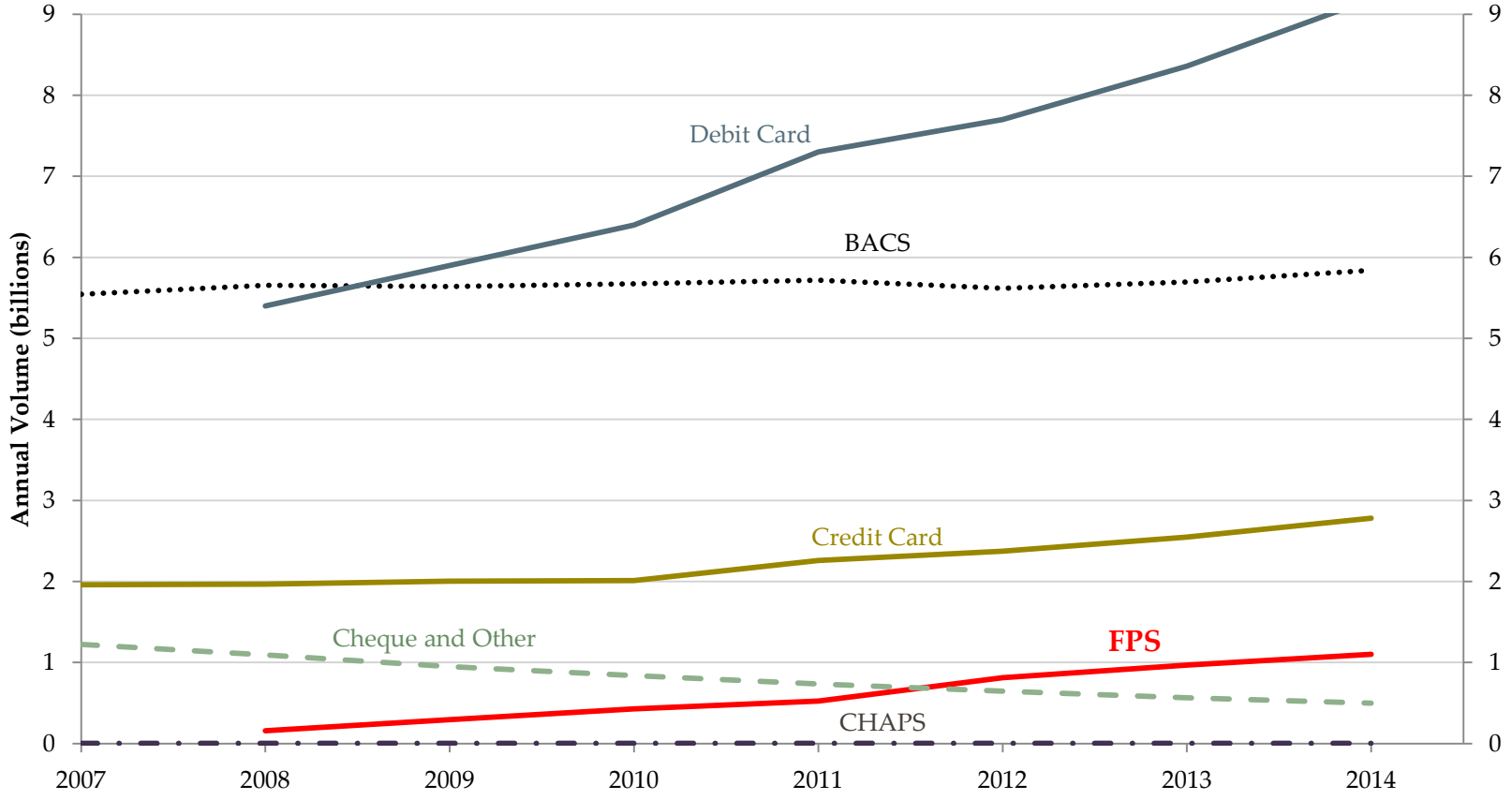
Source: Greene, Rysman, Schuh, and Shy (2014).

Consumer use of FPS (2012)



Source: Greene, Rysman, Schuh, and Shy (2015).

Modest substitution from legacy systems (so far)



Source: Green, Rysman, Schuh, and Shy (2014); New credit card data from the UK Cards Association.

Implications for the US

Operating costs of US legacy systems

	2008-2014 Operating Costs ($US millions)		% of 2008 GDP
	Per year (avg)	2008 PDV	
Public sector	**1,650**	**10,253**	**.071**
Cash	1,140	7,030	.049
FedACH	107	659	.005
Fedwire	83	509	.004
Commercial check collection	321	2,054	.014
Private sector	**>9,904**	**>61,316**	**>.424**
Card networks operating expenses	9,904	61,316	.424
Visa	2,643	16,367	.113
MasterCard	1,346	8,431	.058
Amex	3,774	23,339	.161
Discover	2,141	13,179	.091
EPN	?	?	?
Depository Institutions	?	?	?
Total	**>11,554**	**>71,569**	**>.494**
UK FPS operating costs	***35***	***246***	***.009***

Discount factor = 0.97

Source: Board of Governors of the Federal Reserve System Annual Report 2008-2014; Board of Governors of the Federal Reserve System Currency and Coin Services; Annual reports of Visa, MasterCard, Amex, and Discover. Volume shares were used for Visa and MasterCard to get US operating costs. For Discover, operating costs were defined as the sum of employee compensation, information processing, professional fees, premises and equipment costs, and "other expenses".

Key question

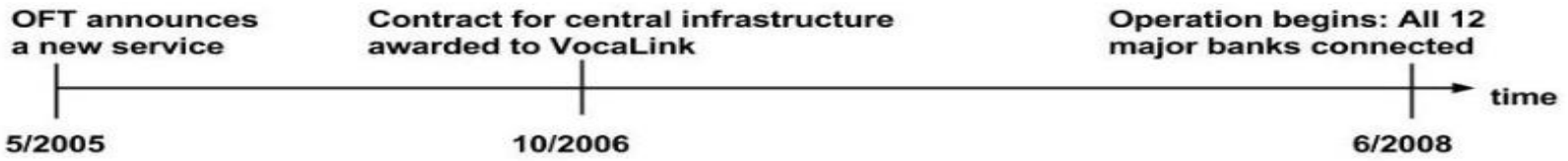
Apparently a new UK-style FPS is relatively inexpensive. So, why doesn't the United States have one already?

Potential answers:

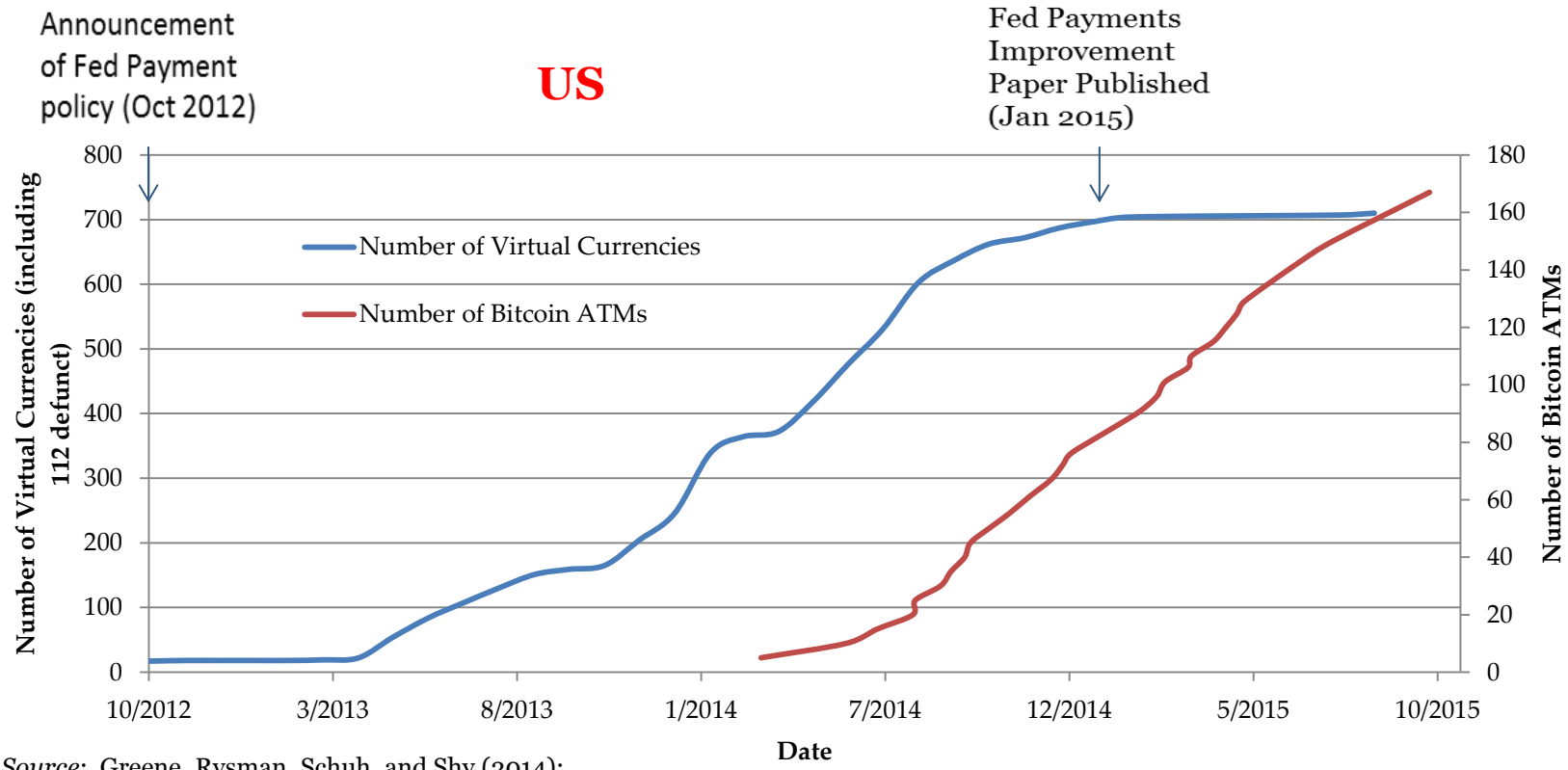
- It takes a long time to make a decision?
- US already has a fast (enough) payment system
- Speeding up legacy systems is cheaper/better
- NPV < $0 (costs exceed benefits)
- Potential market failure(s)

Comparison of UK and US timelines

UK



US



Source: Greene, Rysman, Schuh, and Shy (2014);
http://mapofcoins.com/, http://coinatmradar.com/country/226/bitcoin-atm-united-states.

Is US payment system fast (enough)?

- **TCH** – "Yes!!"
  - See comment on Fed's "Industry Consultation" paper
- **Fed's Future Payments Team** – market research shows some consumers may want faster ACS, esp. notification
- **Schuh and Stavins (2015)** – economic research suggests consumers may not change their behavior
  - Most influential speed is at *point of payment* (checkout)
  - Increased speed unlikely to increase adoption/use (existing)
  - Benefits accruing to merchants, FIs, govt's may matter

Sources: "U.S. Payment System: Recommendations for Safe Evolution and Future Improvements." The ClearingHouse.
"Strategies for Improving the U.S. Payment System." Federal Reserve System.
"How Do Speed and Security Influence Consumers' Payment Behavior?" Scott Schuh and Joanna Stavins. 2015. *Forthcoming* in the Contemporary Economic Policy (CEP).

Options for faster U.S. legacy systems

- **Same-day ACH**
  - Costs for receiving banks (RDFIs) :
    - One time investment cost of $118 million
    - Operating costs from $6 million in 2016 to $49 million in 2027
      - (*Source*: NACHA's December 2014 Request for Comment)
  - Costs for sending banks (ODFIs): *Unknown*
  - Benefits: *Unknown*

- **The Clearing House (TCH) plans**
  - Oct 2014: Proposes new faster payments system
  - Dec 2014: supports same-day ACH https://www.theclearinghouse.org/press-room/in-the-news/2014/12/20141209-pr-nacha-same-day-settlement
  - Details?

- **Same-day settlement of debit cards?**
  - Debit authorization, clearing, notification almost instantaneous (but not A2A)
  - Settlement is one day (minimum) – can this be accelerated to same day?

Options for a new U.S. faster system(s)

- **UK-style FPS (A2A)**
  - Buy/install system from VocaLink, SWIFT, or other provider
  - What is the NPV?

- **Alternatives**
  - FedWire expansion
    - TBD
  - Virtual currency
    - Bitcoin ACS + notification <= 10 minutes
    - Cryptographic version of US dollar?
      - Treasury/Fed initiative? (Nothing formal yet)
      - Private sector proposals
        - Canadian Mint (now defunct)
        - Ripple www.ripple.com (new)

Maybe A2A FSP has NPV < 0 in the US?

- Expected US benefits likely similar to UK benefits
  - Similar payment systems
  - Similar economy, society, culture
- Perhaps costs would be higher than estimated?
  - Initial estimates of UK FPS fixed investment were low
    - Estimated fixed cost now $465 million to $1.57 billion
      - Who would pay this?
  - US banking system structure is different (less concentrated)

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

What do UK banks' costs mean for US?

Bearer	Cost Description (real)	Estimated Amount, min to max
Split by 12 banks	Central infrastructure: construction (fixed cost)	£40 million–£50 million ($61 million–$77 million)
Split by 12 banks	Central infrastructure: maintenance (variable cost)	£100 million–£150 million ($154 million–$230 million), spread over seven years between 2008 and 2015
Each of 12 banks	Adoption costs	£0.10 million–£50 million ($0.15 million–$77 million); max times 12 banks = £600 million ($922 million)

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

- Would US infrastructure cost be similar?
  - Higher cost due to larger size of US economy?
  - Higher fixed costs due to greater number of banks (unless 3rd party operators emerge)
  - Lower cost due to learning and experience? (VocaLink says yes)
  - Duplication costs if legacy systems are not disbanded….
- How many banks would fund/own system?
- What would other banks pay to connect to new FPS?

Other considerations

Costs and benefits of speed

- More speed is not free!
  - For economic efficiency, price should reflect cost
- How much speed do we really need (function of benefits)?
  - What is the optimal rate of settlement?
    - RTGS – instantaneous ACS
    - Batch – discrete ACS
      - Short – UK FPS = 3x per day; Long – checks (2+ days)
  - Depends on the type of payment transaction
  - Depends on the type of payee and payer (consumers, business, government)
    - Businesses don't mind checks?
      - Long-term repeated relationships with suppliers, customers
      - High cost of changing systems
      - Lots of data/information that needs to be secured
  - Depends on the quality of credit (most payments involve credit)
    - Supply of credit (efficiency, productivity)
    - Demand for credit (creditworthiness)

Who should pay for more speed?

- Ultimately, the public pays (one way or another)
- Ideally, the users who demand speed and benefit from it should pay for it
  - Not everyone benefits from speed
    - Sometimes only one party benefits (either payer or payee)
  - If cost is not low for end users, there is not much benefit from a new system
- If a new faster payment system were constructed, who should own the network, hence revenues?
  - Private sector
  - Public sector
  - Public-private venture
    - E.g., public ownership of network and unrestricted private access

Is market failure(s) blocking FPS in US?

- Extremely difficult to assess in electronic network industries.
- Most likely suspects in payments:
  - Imperfect information
  - Coordination failure (missing market)
    - Standard setting (property rights)
  - Barriers to entry
    - Network access and competition (not contestable?)
  - Other
    - Fairness, equity, regressive transfers (credit card market)
- Possible consequences of market failure
  - High revenues/profit margins
  - Pricing well above marginal cost

Do payment card revenues reflect market power?

Instrument	Consumer Cost To Pay ($)	Merchant Cost to Receive (% of sale)	Bank Revenue ($ per year)
Cash	0 to 6 each for ATM fees	½	7½ billion
Check (personal)	< 1	1¼	?
Certified & cashier's checks, money orders, traveler's checks	0 to 8 each	1¼	?
Debit card	0 for card 0 to 50 for OD fees	< ¼ to 5 (varies by $ paid)	Interchange = 15 billion OD fees = 13-32 billion
Credit/charge cards	0 to 100 for annual fees [-¾ to 30 percent for interest]	1½ to 3½	Interchange = 60 billion Interest = 25 billion Fees = 8 billion
Prepaid card	5/month	1½ to 3½	Interchange = 5½ billion Fees = 5-10 billion
OBBP	0	0	0
BANP	0	0	0
ACH (between banks)	0 to 25 (varies by delivery speed)	0	1½ billion
FedWire	25 to 40	[$17 to $25]	1½ billion

Source: Authors' calculations and estimates from multiple sources, 2014 (available on request).

End-user pricing of A2A >> marginal cost

	ACH* (A2A)		clearXchange	FedWire	UK FPS	Western Union	
Time for settlement	Within bank	Between banks	A2A within the five banks	A2A	A2A any banks	A2A bank-to-bank	bank-to-pickup
<1 day	$0			$25-$40	**$0** (future unknown)		
1 day		$10					
3 days		$3					$2-$30
5 days			$0			$5	

*ACH costs here come from Bank of America's online banking web site.