

The Transformation of Money from Physical to Electronic

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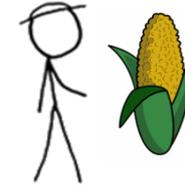
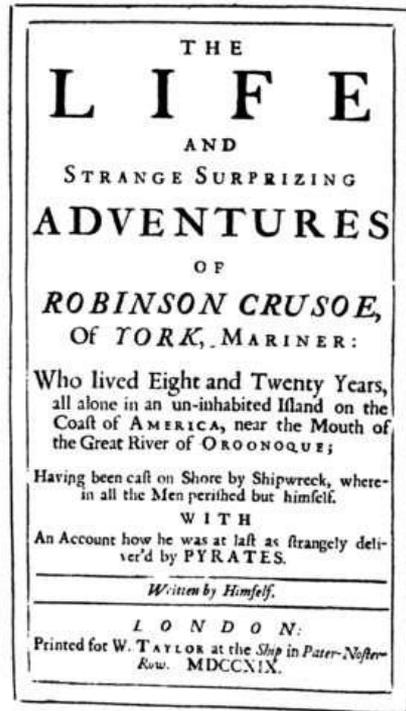
Overview

- History of money (brief)
- Money and payments today
- Electronic money and virtual currencies
- Future of money, payments, and banking

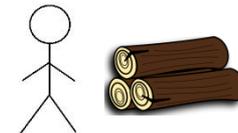
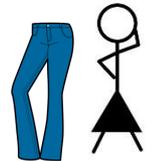
History of Money

Transition #1

From “Robinson Crusoe” economy to exchange



???

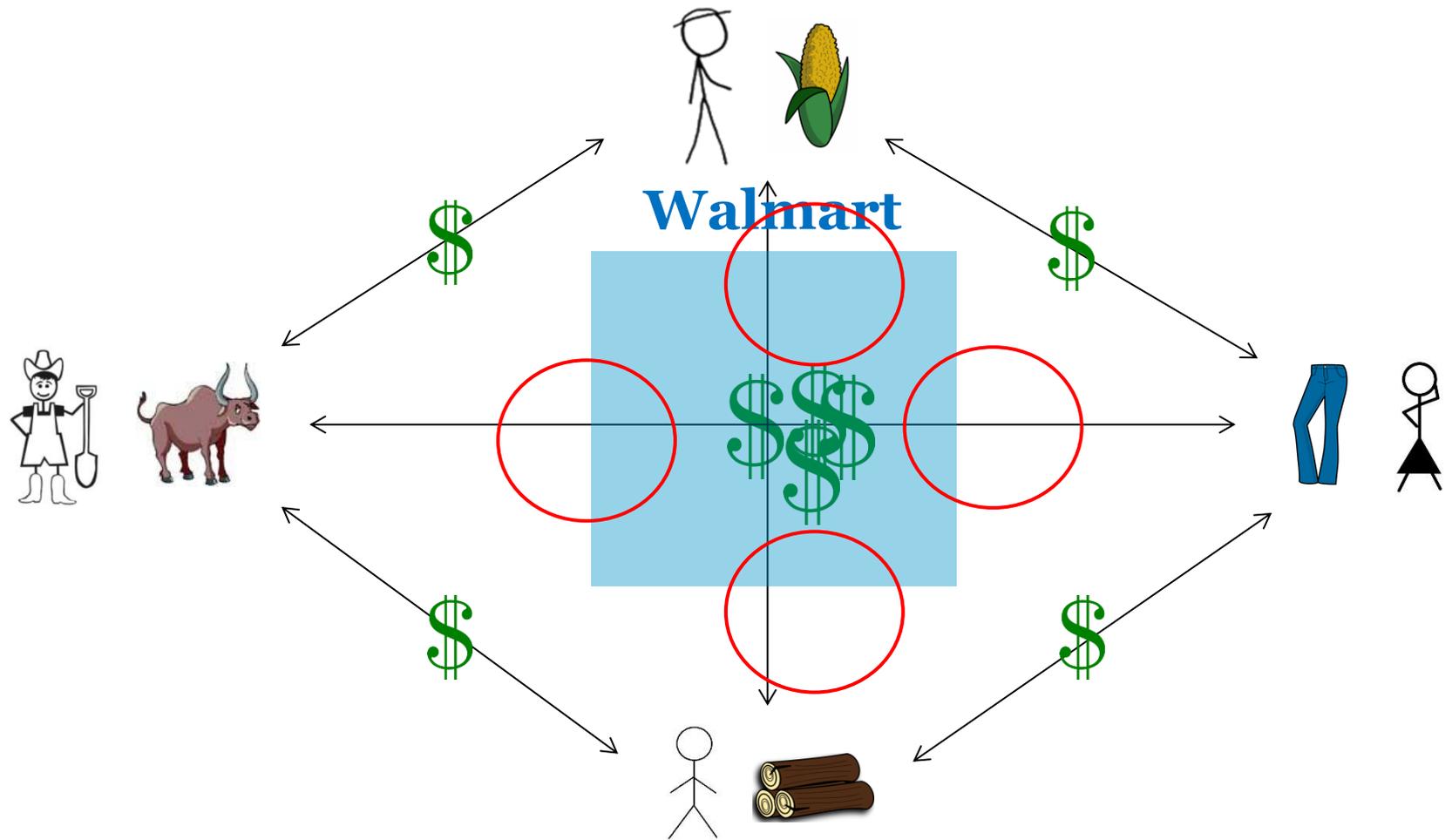


Producer = consumer

Exchange (barter) = “double coincidence of wants”

Transition #2

From barter to monetary economy



Three main functions of money

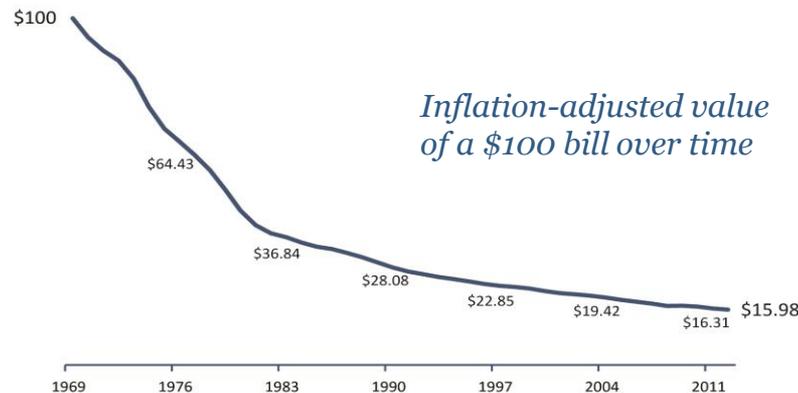
- **Unit of account**

- \$0.01, \$0.05, \$0.10, \$0.25, \$1, \$2, \$5, \$10, \$20, \$50, \$100,...

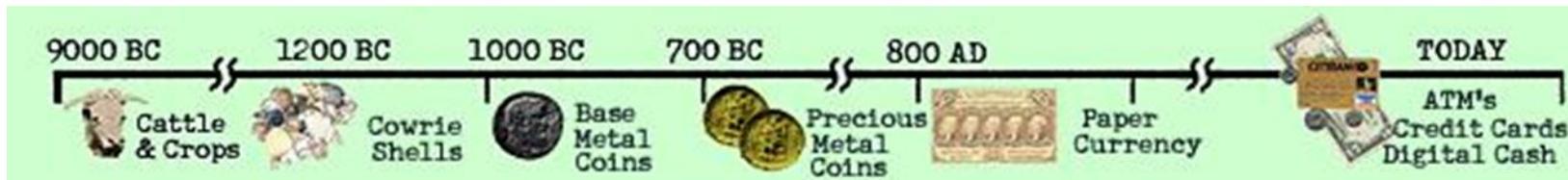
- **Medium of exchange**

- Coins, bills, and deposit accounts (checks, debit cards, etc.....)

- **Store of value**



History of money as medium of exchange



Innovations to reduce transaction costs:

- Smaller in size
- Lighter to carry
- More durable to last longer
- Cheaper and easier to store
- Safer from theft and fraud
- Faster to authorize, clear, and settle
- Lower fees for payer and payee

Private versus public money

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Private

- Emerges from market
- Has intrinsic value
 - Metals, commodities, etc.
- Backed by owner(s)
- Not legal tender
- Value susceptible to private motives (profit, market pricing, fraud)

Public

- Created by govt. fiat
- Maybe intrinsic value
 - E.g., gold standard
 - Debt (government IOU)
- Backed by tax authority
- Legal tender (pays tax)
- Value susceptible to govt. motives (inflation tax, exchange rates)

Transition #3

From physical to electronic money

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“Yesterday”

“Today”

Will that be



OR

First National Bank
Hollywood, Ca. Date April 1, 2002

Pay to the
Order Of Parisian Gown Shoppe \$ 750.00

Seven hundred fifty xx Dollars

Lawrence Exeter, Jr.

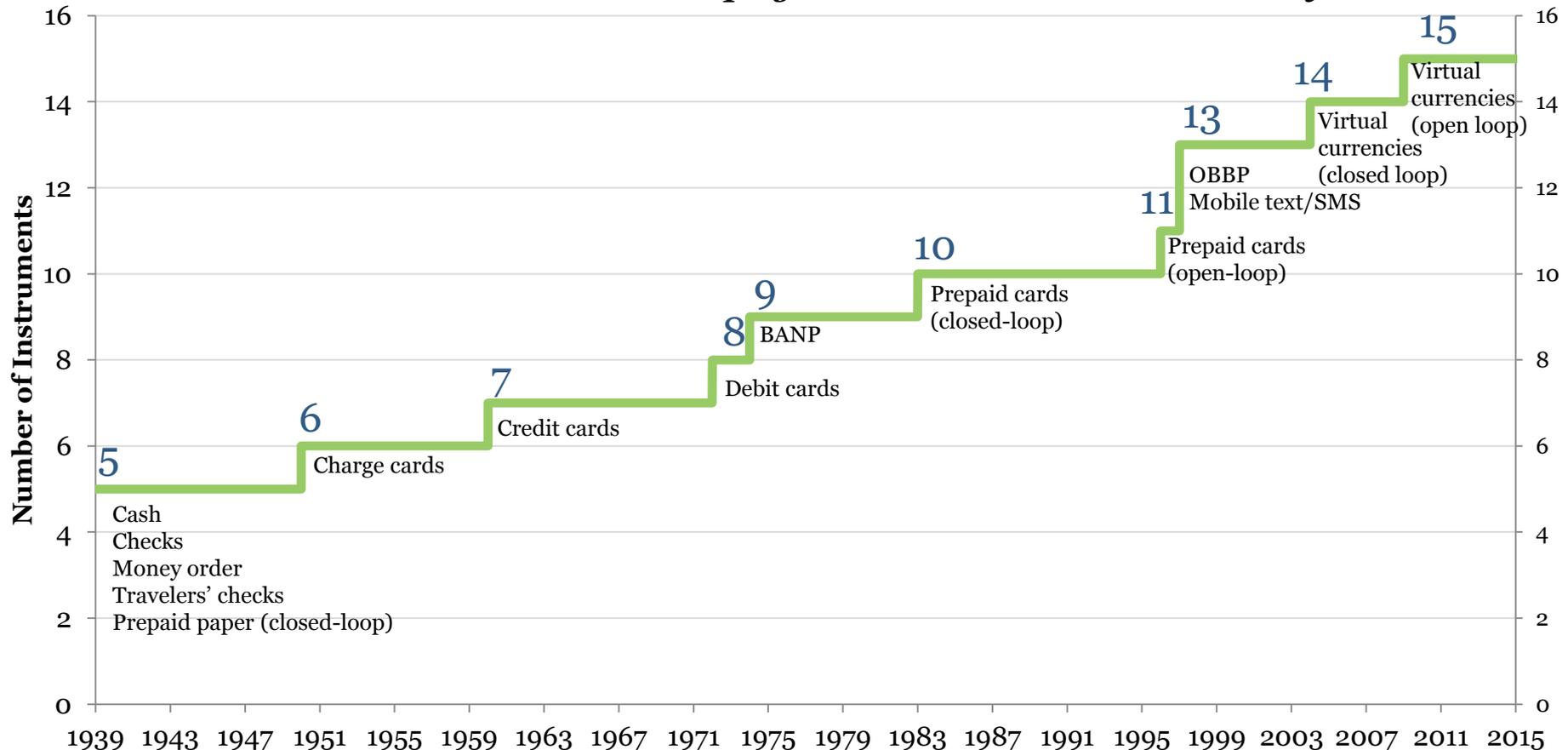
...

... OR



Availability of payment instruments

U.S. consumers have more payment instruments to choose from



Source: Author's research.

Money and Payments Today

Relationship between money and payments

Macro/monetary view

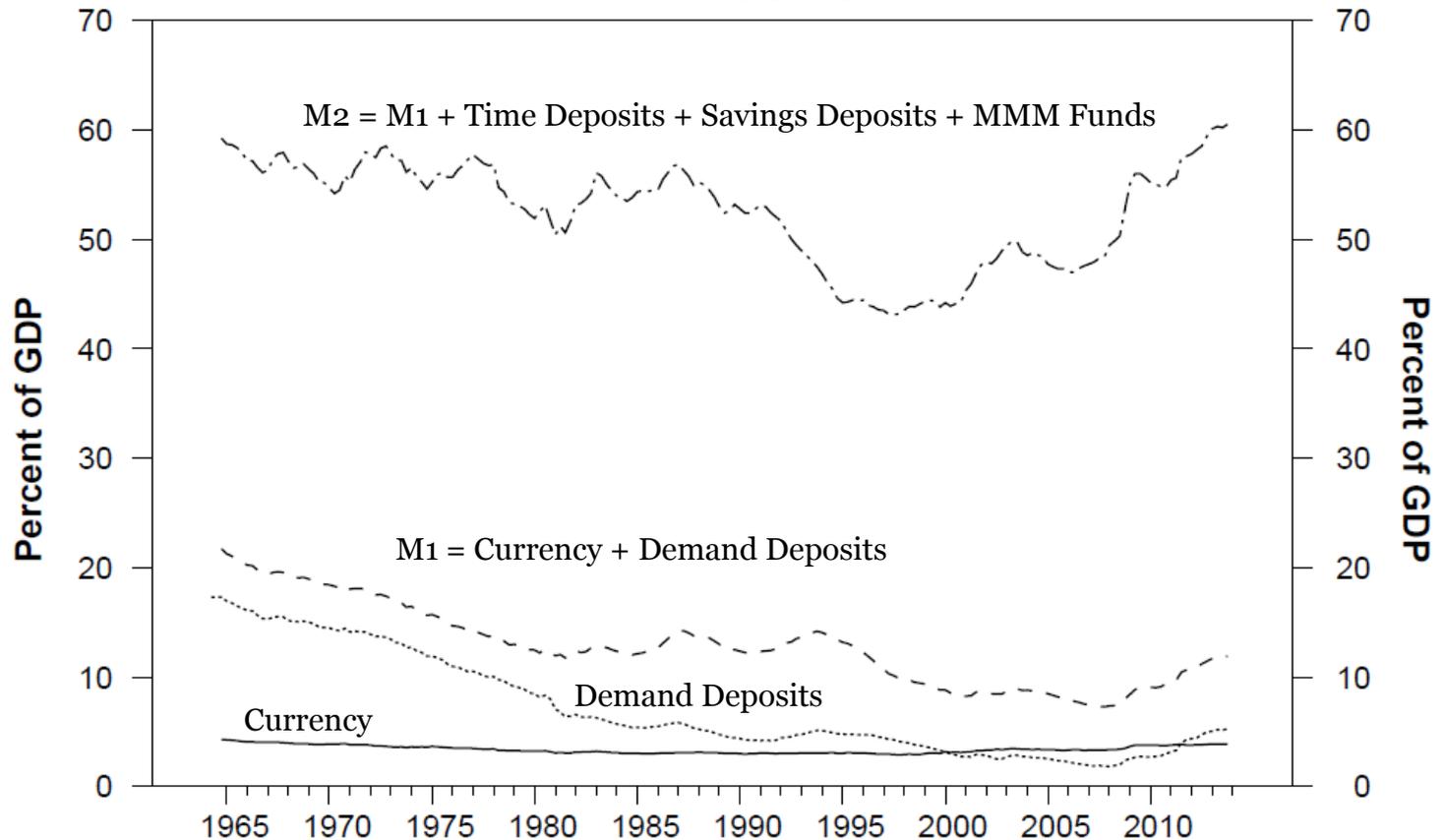
Micro/IO view

Asset or Liability	Basic Money or Debt	Instrument (derivative media)	Physical trait	
Money (M1)	Currency in circulation	Currency	Paper / metal	
	Travelers check	Travelers check		
	Demand deposit accounts & Other checkable deposits	Checks (Personal, Certified, Cashiers)		
		Money order		
		Online banking bill pay (OBBP)	Electronic	
		Bank account number payment (BANP)		
	Direct deduction from income			
	Credit	Revolving	Debit	Card
Prepaid				
Nonrevolving		Credit		
Unknown/unspecified	???	Charge	Electronic	
		Text/SMS		
		Nonbank money order or prepaid card; virtual currencies	Mixed	

Source: Author's analysis.

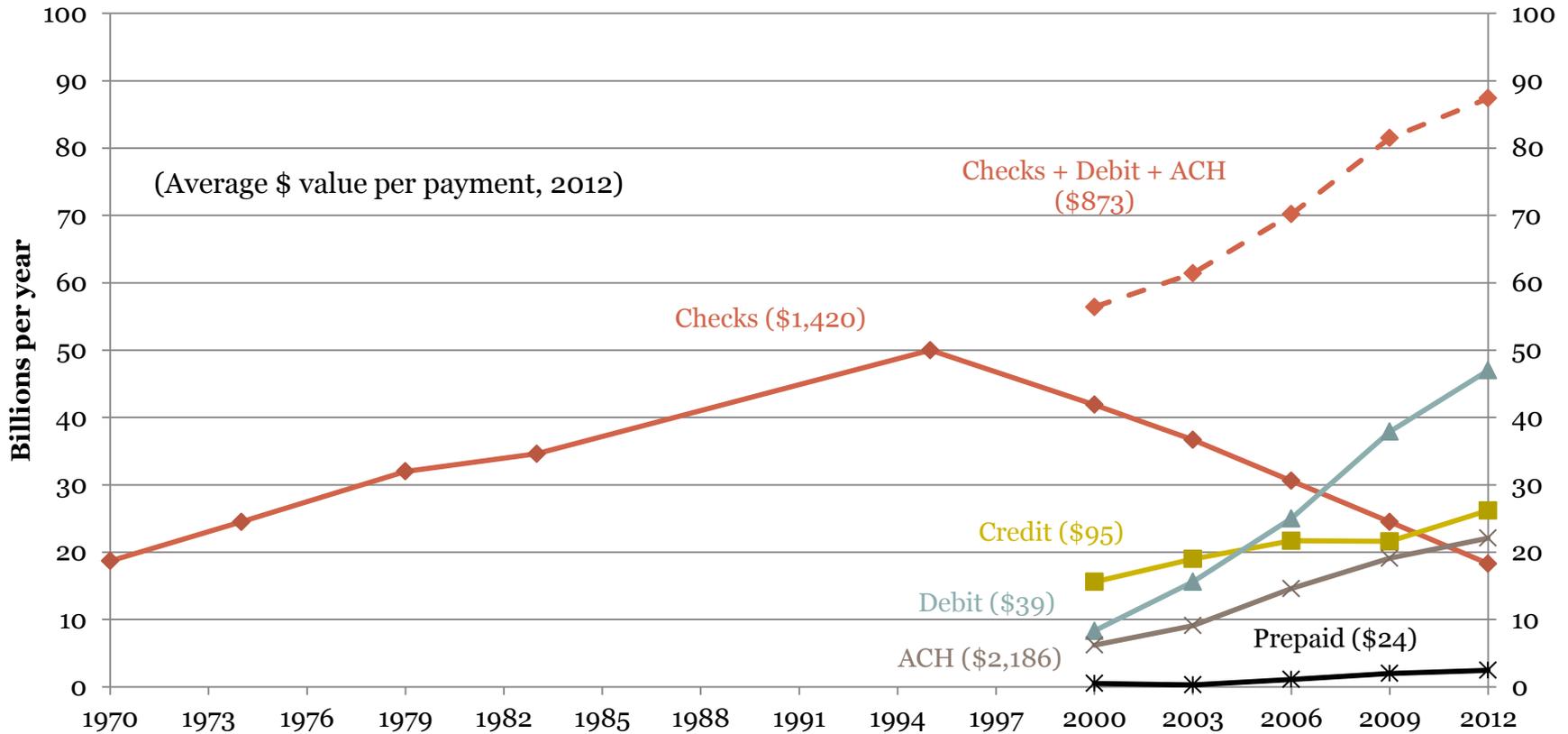
U.S. money supply

Monetary aggregates

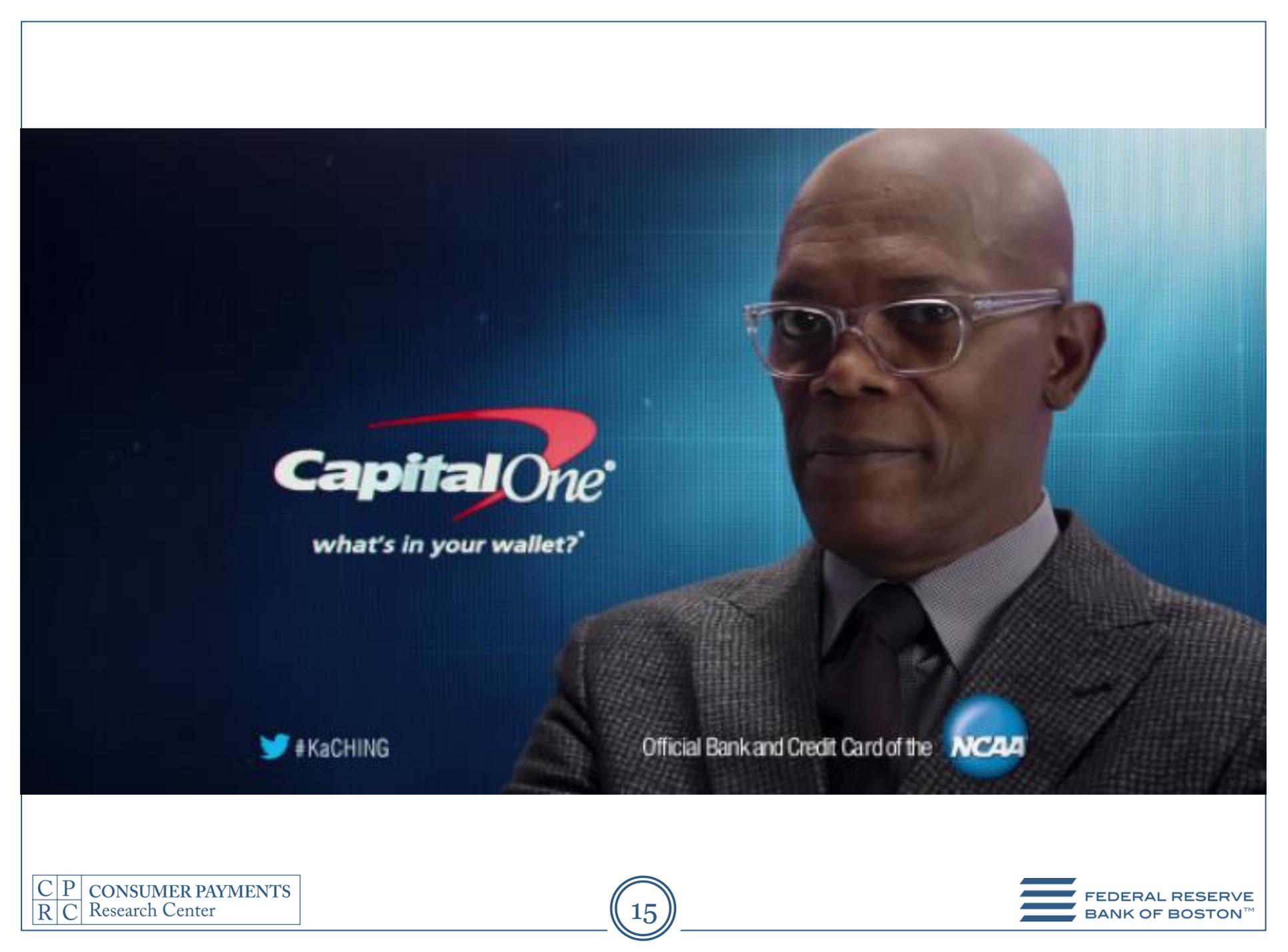


Transformation of U.S. **noncash** payments: Paper to electronics (#)

Number of US payments by all sectors (household, business, government)



Source: Federal Reserve Payment Study (FRPS).



Capital One
what's in your wallet?

 #KaCHING

Official Bank and Credit Card of the 

Consumer cash holdings and withdrawals

Dollars per consumer, except as noted

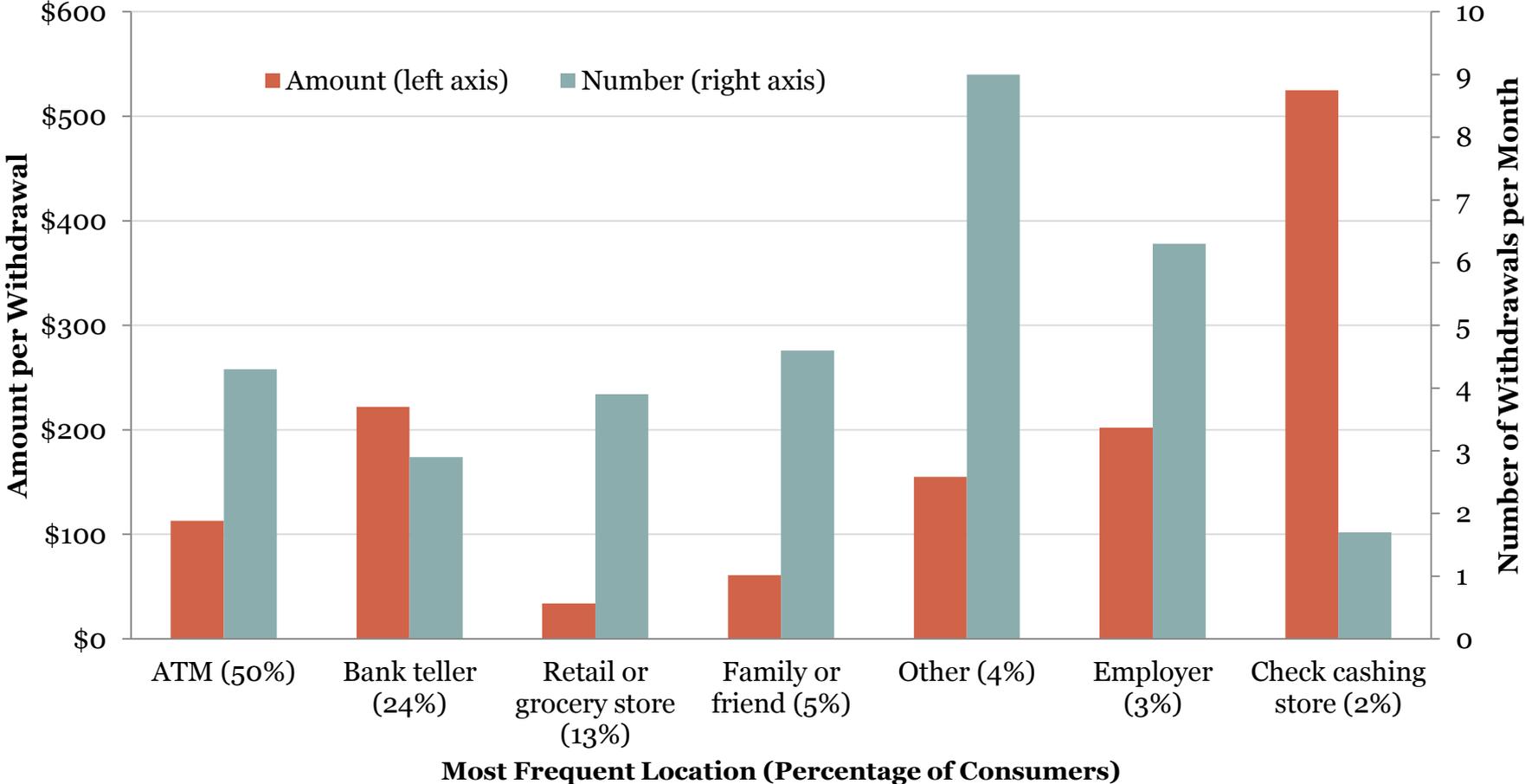
	Mean			Median		
	2011 ^r	2012 ^r	2013	2011 ^r	2012 ^r	2013
Cash holdings	337	464	508	70	69	65
On person.....	73	73	64	31	29	29
On property.....	278	401	461	13	10	9

Dollars per consumer per location, except as noted*

Total	Mean			Median		
	2011 ^r	2012 ^r	2013	2011 ^r	2012 ^r	2013
Cash withdrawals per month†	526	655	686	261	280	237
Amount per withdrawal.....	129	131	124	70	74	64
Withdrawals (number per month).....	5.4	6.4	6.5	4	4	4

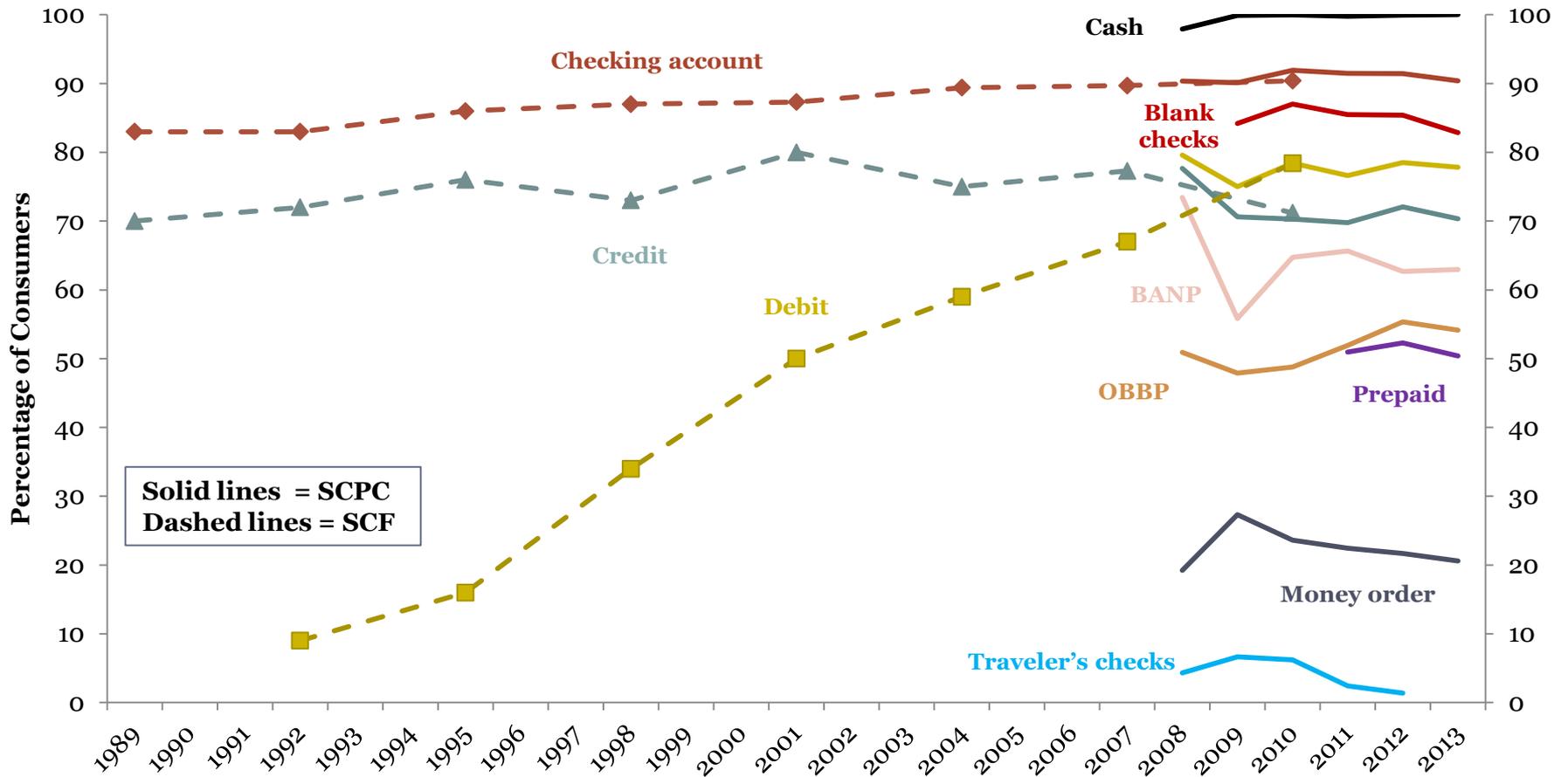
Source: 2011-20123 Survey of Consumer Payment Choice

Sources of consumer cash withdrawals



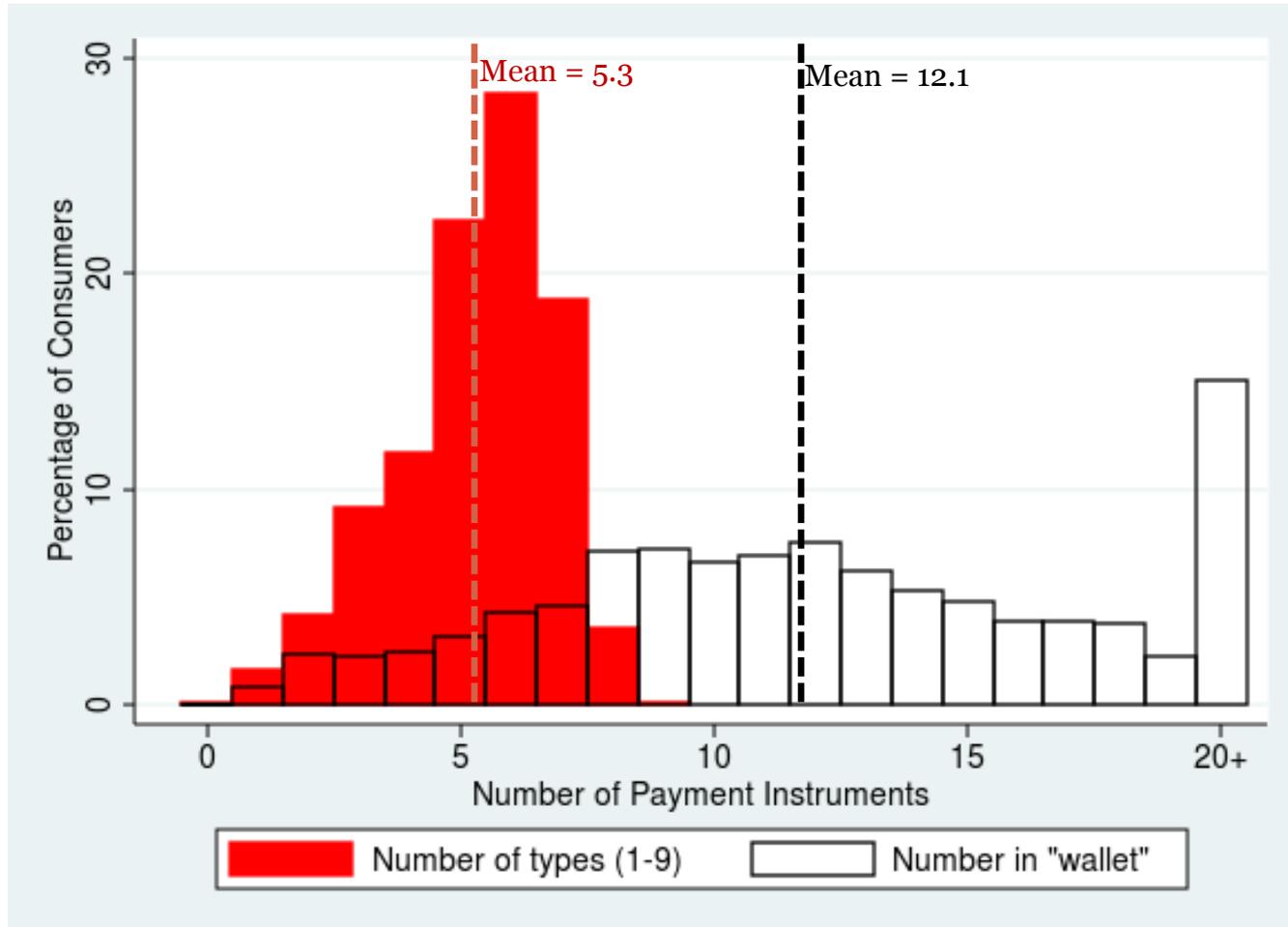
Source: 2012 Survey of Consumer Payment Choice

Consumer adoption of payment instruments



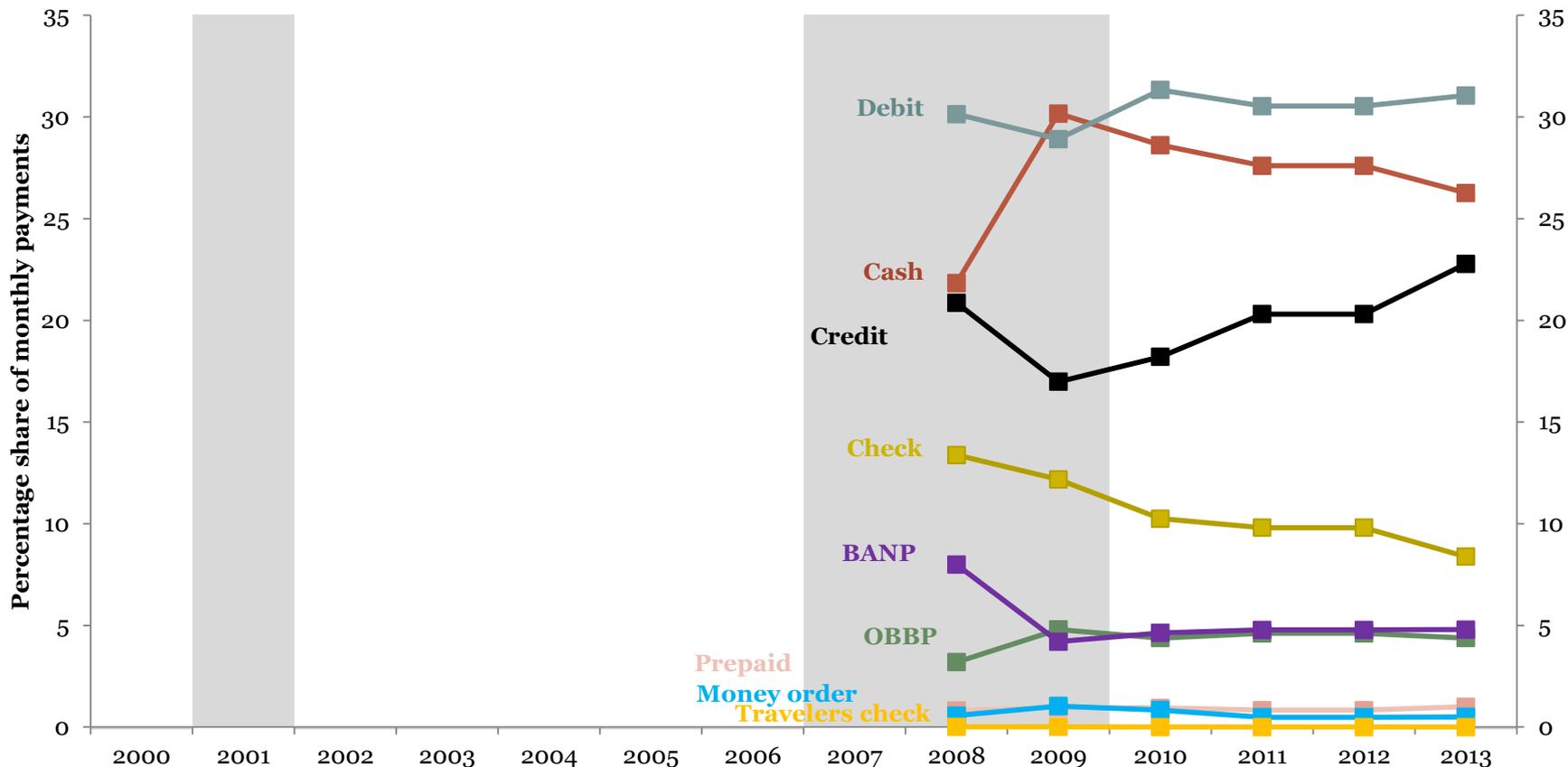
Source: Survey of Consumer Payment Choice;
Survey of Consumer Finance

Number of instruments held by consumers



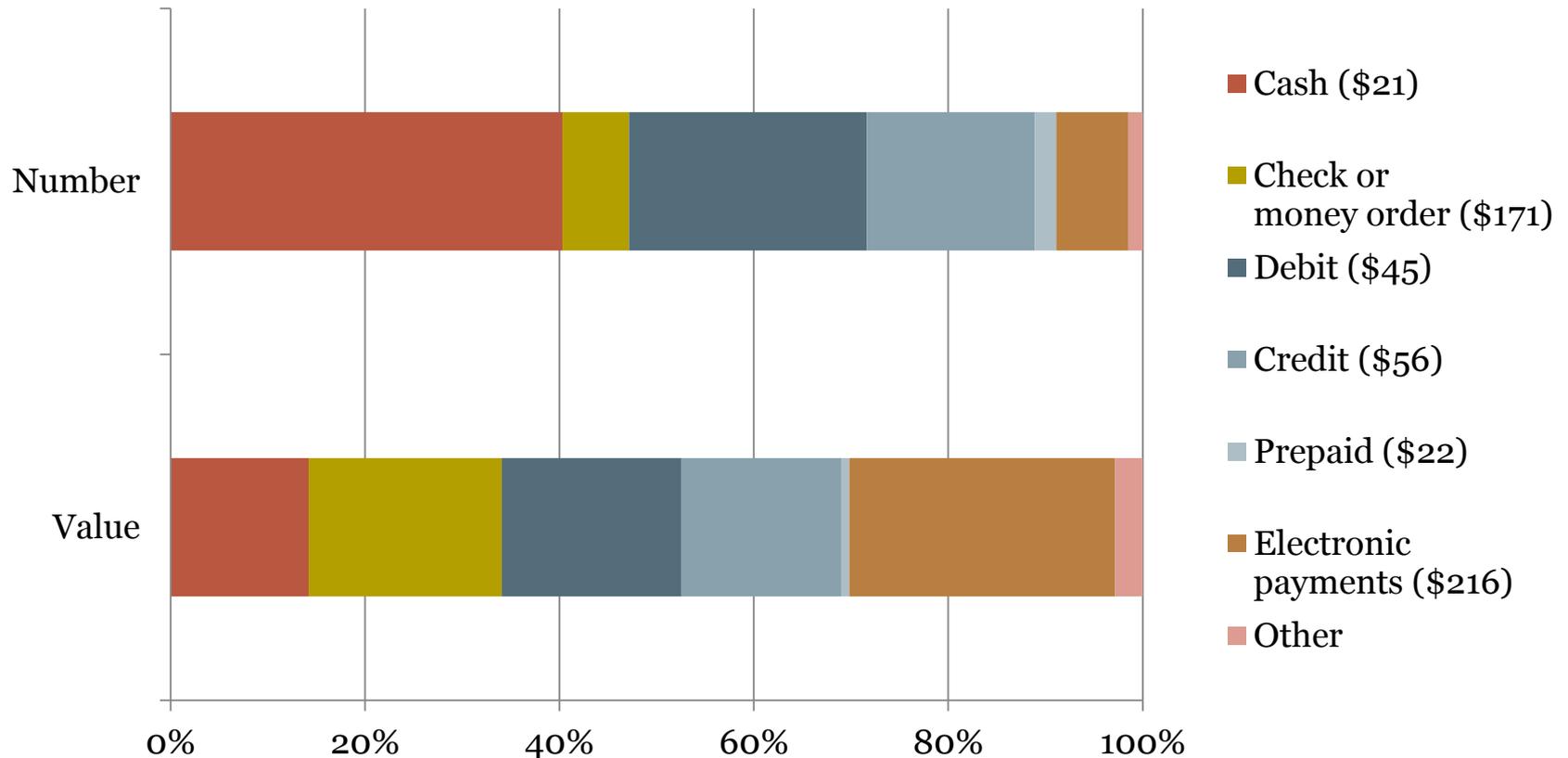
Source: 2012 Survey of Consumer Payment Choice

Consumer payments (from Survey)



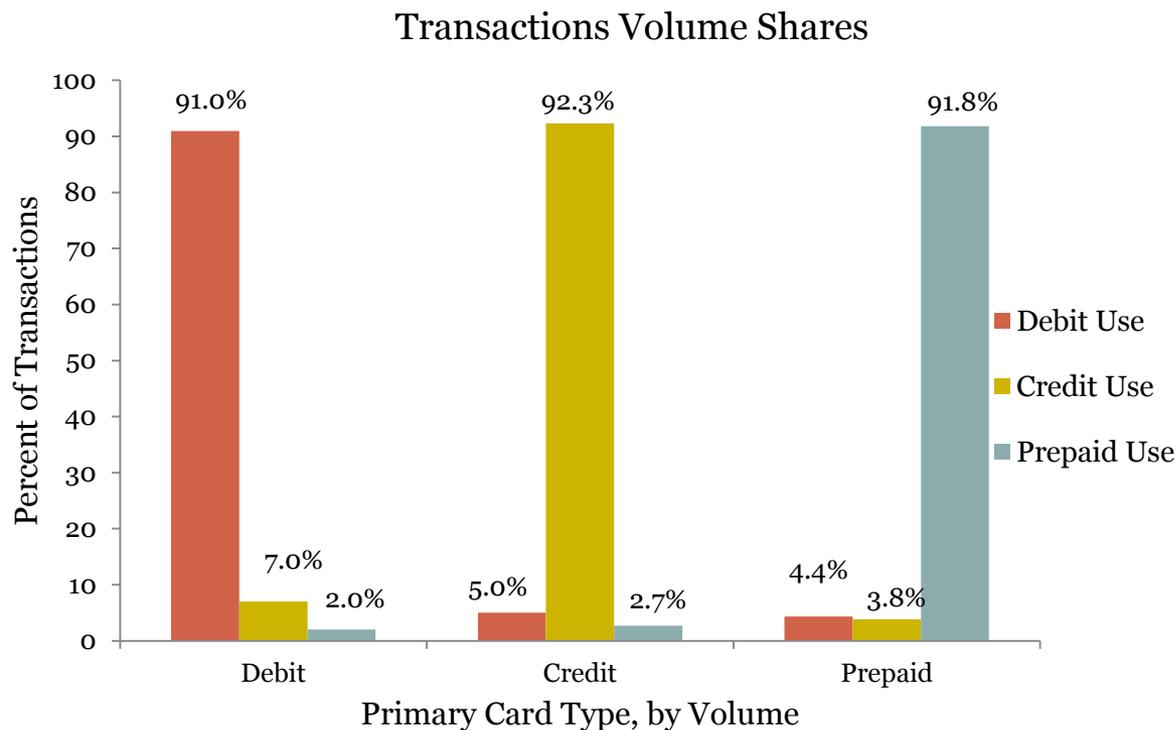
Source: 2008-2012 Survey of Consumer Payment Choice

Consumer payments, 2012 (from Diary)



Source: 2012 Diary of Consumer Payment Choice (DCPC)

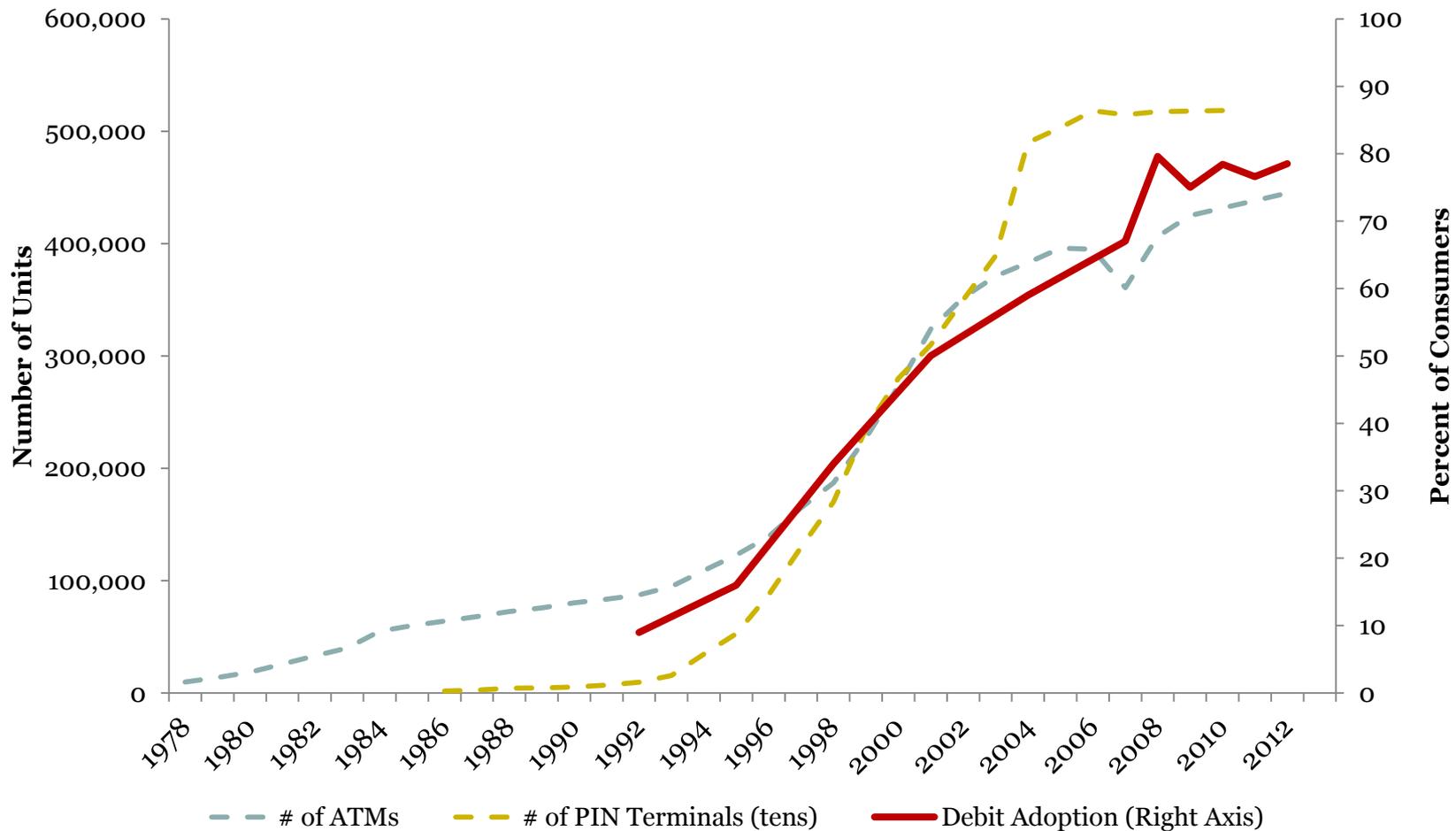
Consumer use of payment cards by type



Primary cards (3-day period) as defined by highest number of transactions. *Left:* Transaction volume shares of the three cards. *Right:* Average transaction value of each card type, by primary card.

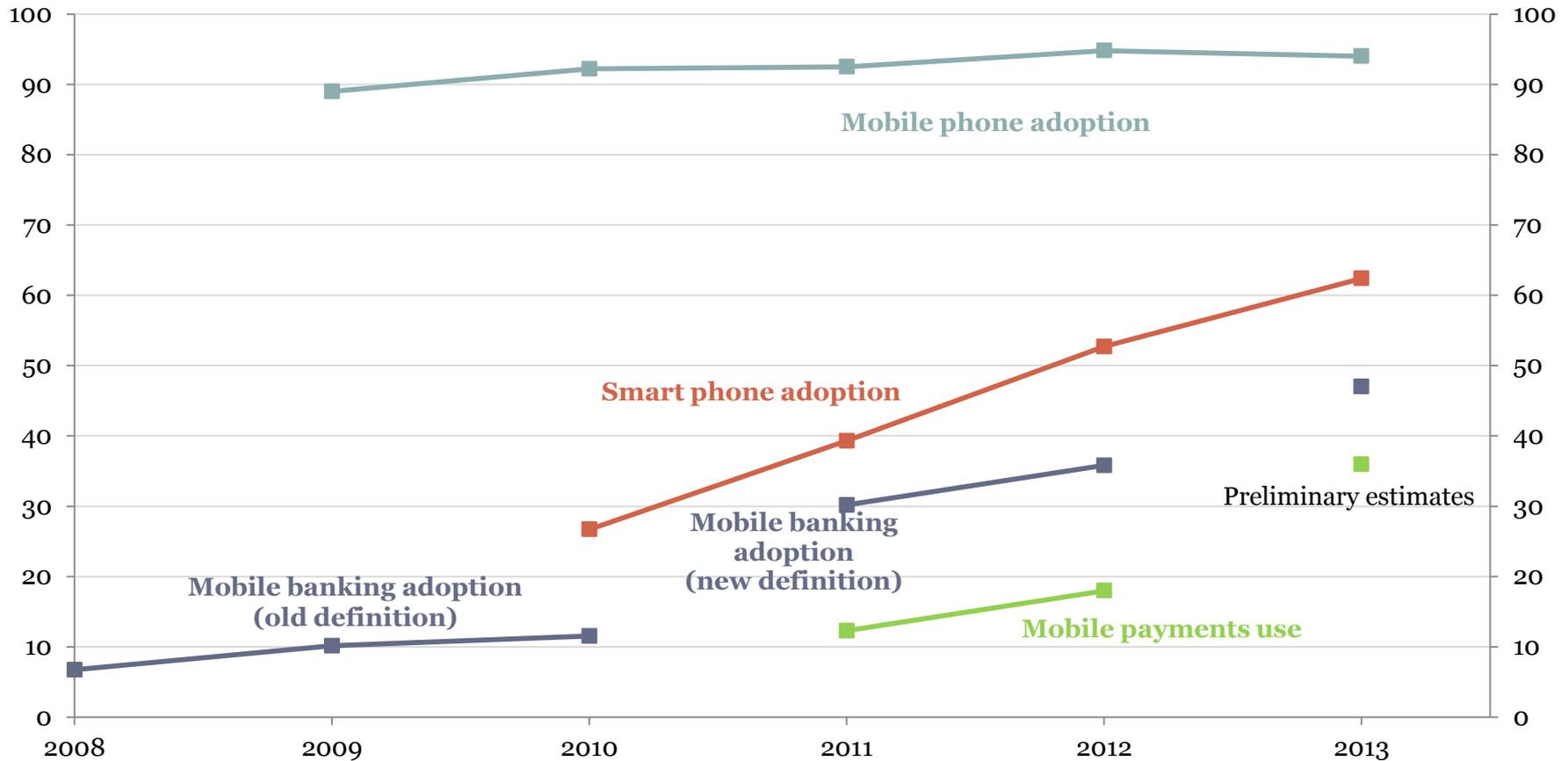
Source: Shy, Oz, 2013. "How many cards do you use?," Working Papers 13-13, Federal Reserve Bank of Boston.

Diffusion of payment technology #1: ATMs, PIN terminals, and debit cards



Source: BIS Redbook; IBIS World; DataMonitor; Survey of Consumer Finances; Survey of Consumer Payment Choice

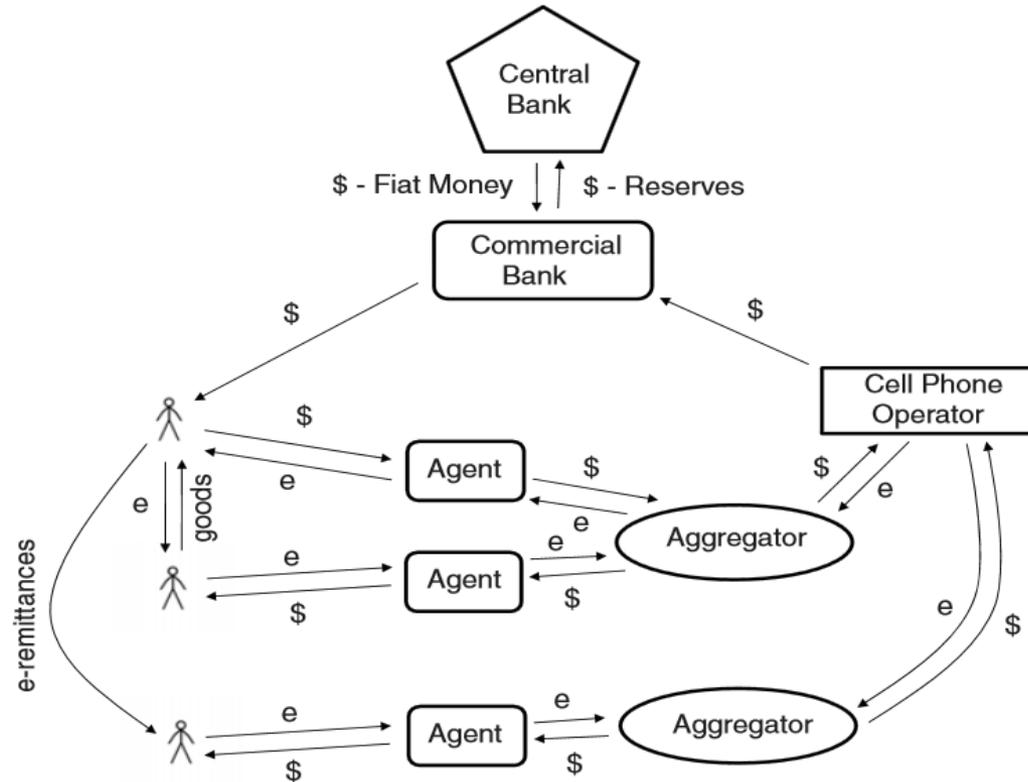
Diffusion of payment technology #2: Mobile banking and payments



Source: 2008-2012 Survey of Consumer Payment Choice

MPESA system (Kenya, Africa)

Figure 6 Flows of Fiat Money and E-Money



Source: Jack, William, Tavneet Suri, and Robert Townsend. "Monetary Theory and Electronic Money: Reflections on the Kenyan Experience." *Economic Quarterly* 96.1 (First Quarter 2010) pp. 83–122.

Electronic Money and Virtual Currencies

Definitions

- **Electronic money (e-money)**

“...is broadly defined as an electronic store of monetary value [sovereign currency issued and controlled by the government] on a technical device that may be widely used for making payments to entities other than the e-money issuer. The device acts as a prepaid bearer instrument which does not necessarily involve bank accounts in transactions. E-money products can be hardware-based or software-based, depending on the technology used to store the monetary value.” (European Central Bank)

- **Virtual currency (VC)**

“...is a type of unregulated, digital money, which is issued and usually controlled by its developers, and used and accepted among the members of a specific virtual community.” (European Central Bank)

Modern classification of money

Table 1 A money matrix

<i>Legal status</i>	<i>Unregulated</i>	– Certain types of local currencies	– Virtual currency
	<i>Regulated</i>	– Banknotes and coins and checks!	– E-money – Commercial bank money (deposits)
		<i>Physical</i>	<i>Digital</i>
		<i>Money format</i>	

Source: ECB.

Comparison of e-money and VC

Table 2 Differences between electronic money schemes and virtual currency schemes

	Electronic money schemes	Virtual currency schemes
Money format	Digital	Digital
Unit of account	Traditional currency (euro, US dollars, pounds, etc.) with legal tender status	Invented currency (Linden Dollars, Bitcoins, etc.) without legal tender status
Acceptance	By undertakings other than the issuer	Usually within a specific virtual community
Legal status	Regulated	Unregulated
Issuer	Legally established electronic money institution	Non-financial private company
Supply of money	Fixed	Not fixed (depends on issuer's decisions)
Possibility of redeeming funds	Guaranteed (and at par value)	Not guaranteed
Supervision	Yes	No
Type(s) of risk	Mainly operational	Legal, credit, liquidity and operational

Source: ECB.

Payments with bitcoin & virtual currencies

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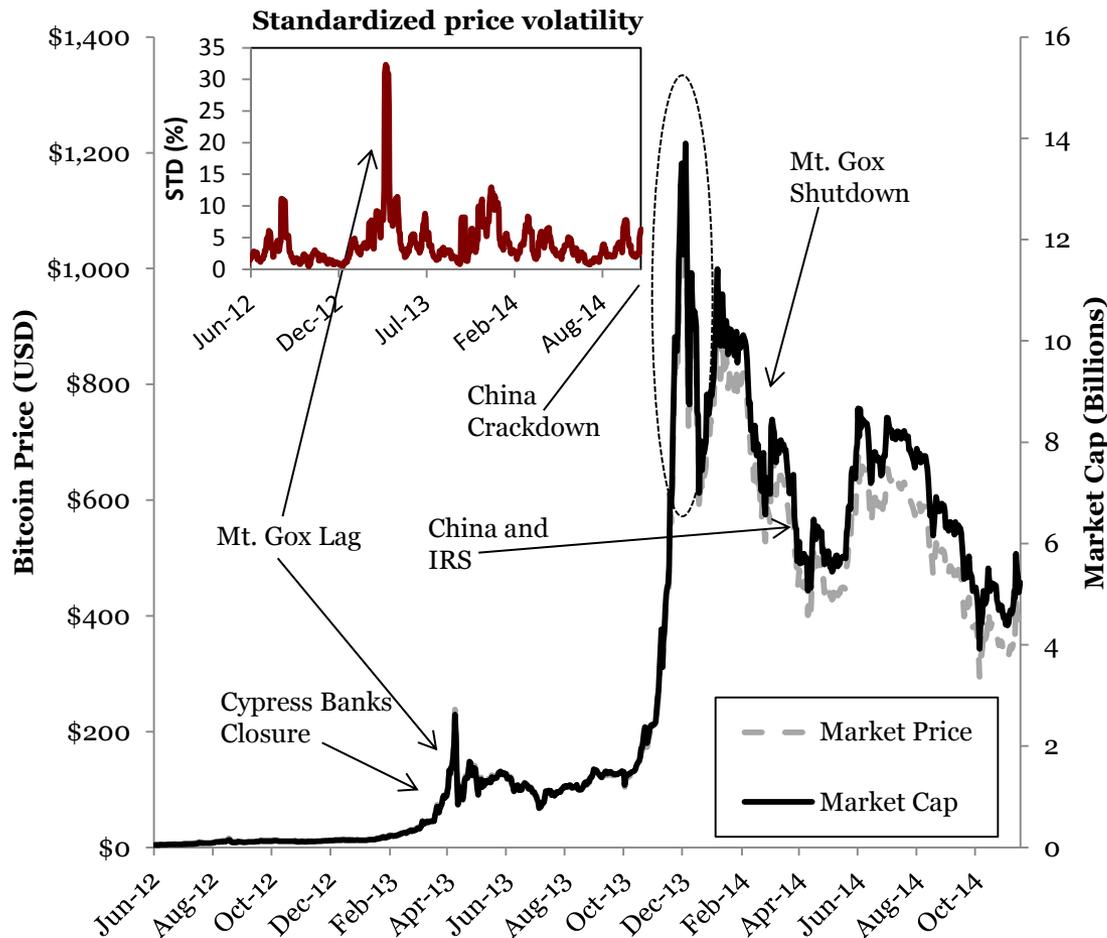
Technology/payments

- **Bitcoin** is a payment system
 - Acceptance is low but growing
 - Cost is nearly zero for each transaction
- **Bitcoin** is open source/standards based, nearly anonymous exchange, very secure, and ubiquitous (Internet)
- There are more than 300 virtual currencies, e-money, and digital payment technologies
- Canadian MintChip experiment uses similar technology for small-value Canadian payments

Money/banking

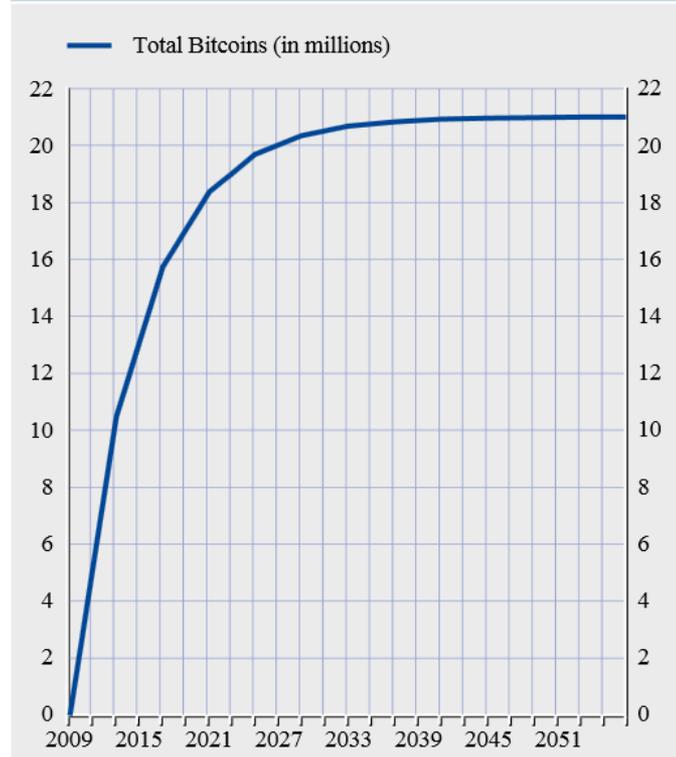
- **bitcoin** is money – “collaborative,” private, and electronic (“virtual”); called currency but NOT legally (yet)
- **bitcoin/VC** payments are low-cost but offer new revenue opportunity
- Money has value and risk of theft so new banks are emerging to store and manage **bitcoins/VCs**
- Traditional banks are constrained in holding VCs by BSA/AML regs
- If VCs take hold, they will provide new incentives to create money (despite promises not to)

Data on bitcoin price and quantity



Source: <http://blockchain.info/charts>

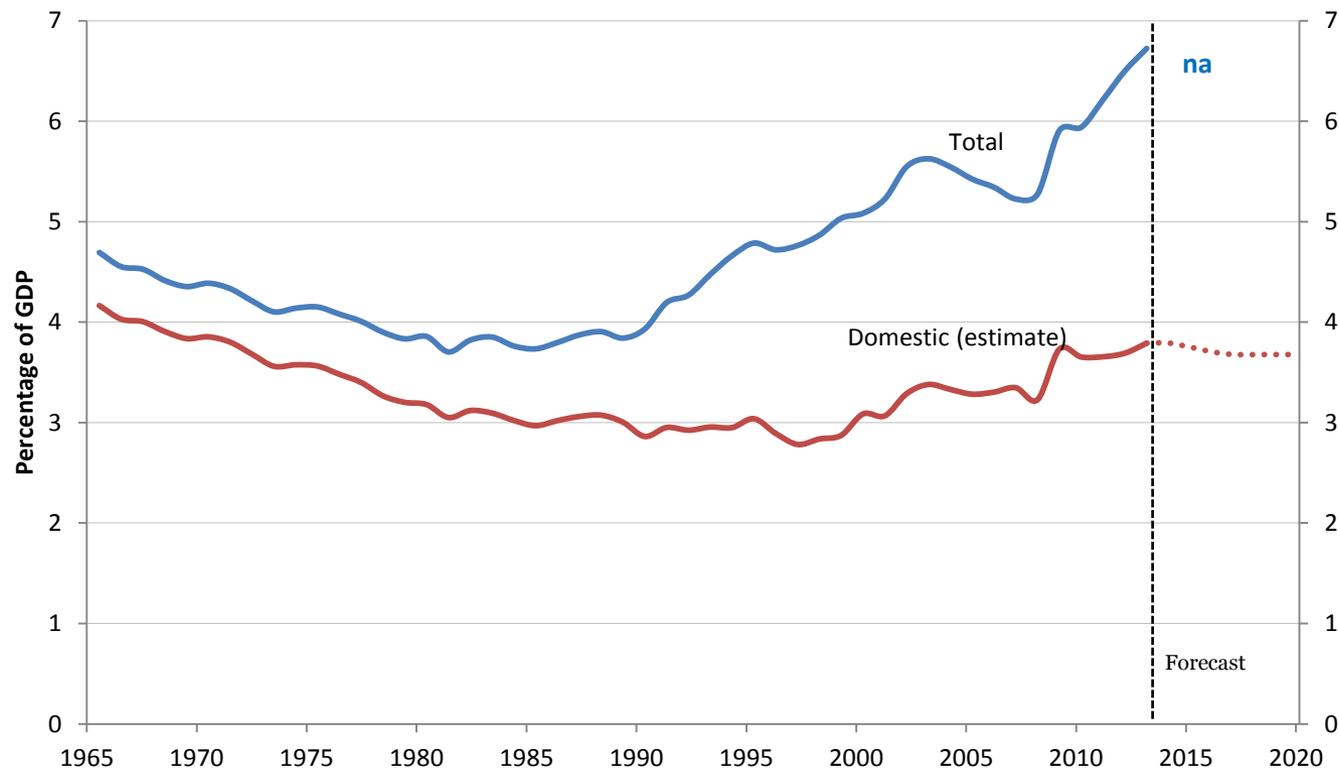
Chart 5 Total Bitcoins over time



Source: ECB

The Future of Money, Payments, and Banking

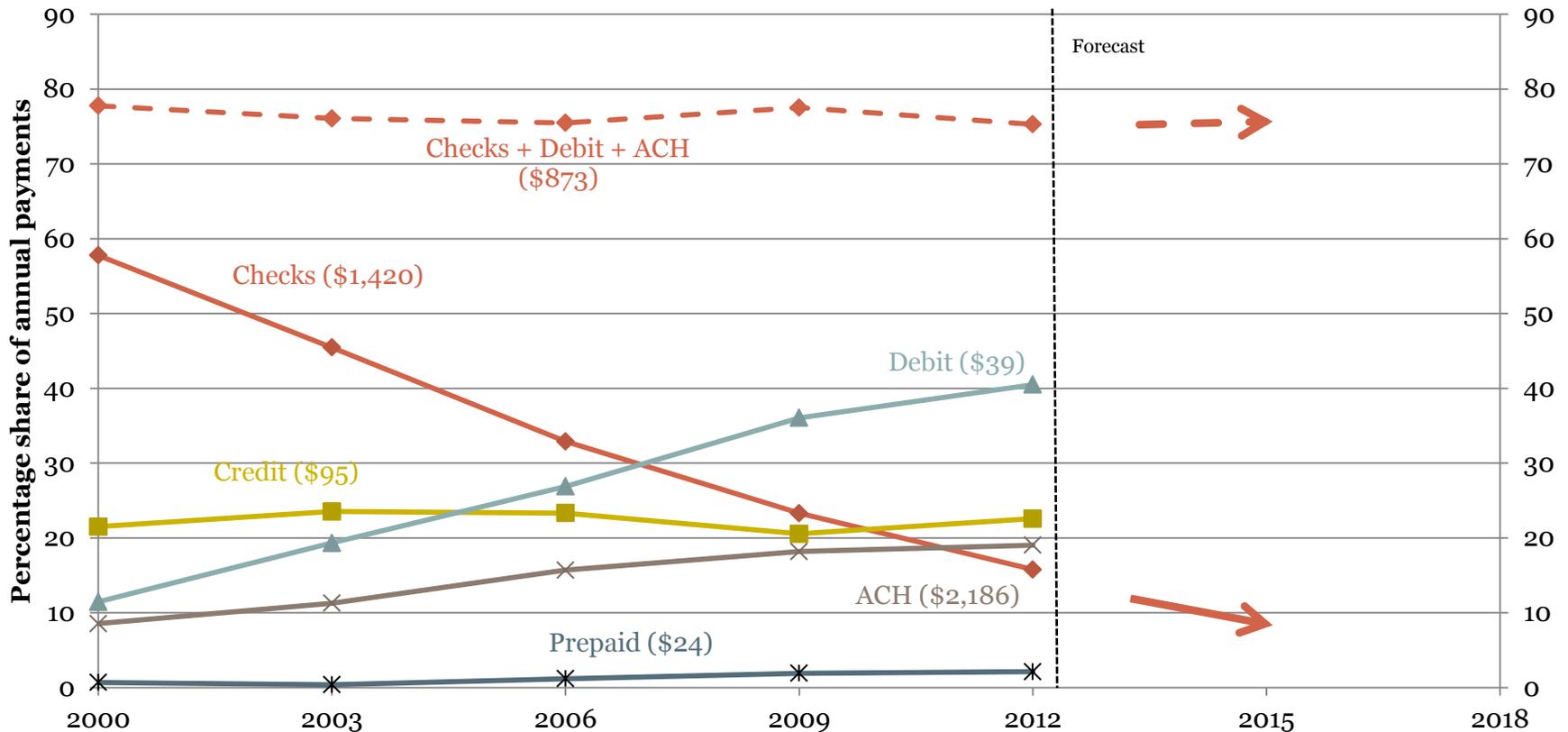
U.S. domestic demand for cash should moderate as interest rates rise



Source: Bureau of Economic Analysis / Haver Analytics, Federal Reserve Board / Haver Analytics, authors' calculations.

Forecasts of U.S. **noncash** payments: Paper to electronics (shares)

Share of US payments by all sectors (household, business, government)



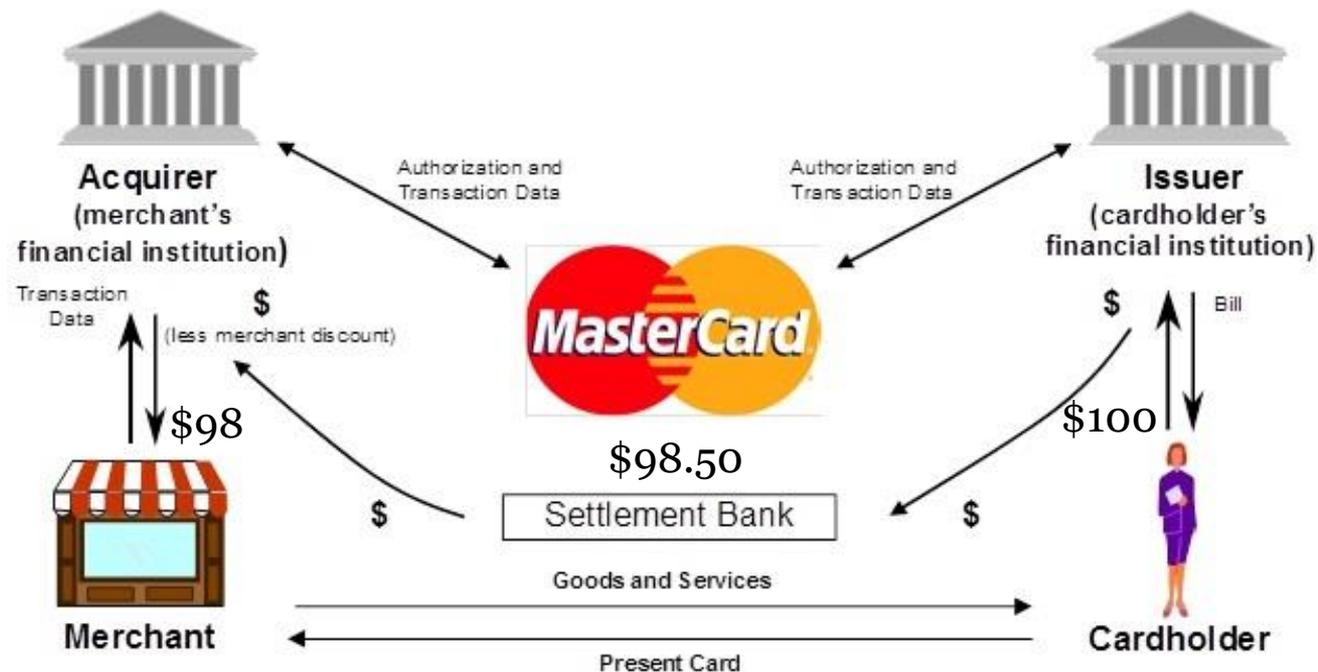
Source: Federal Reserve Payment Study (FRPS); values in parentheses are from 2012.

Federal Reserve 2012-2016 strategic plan

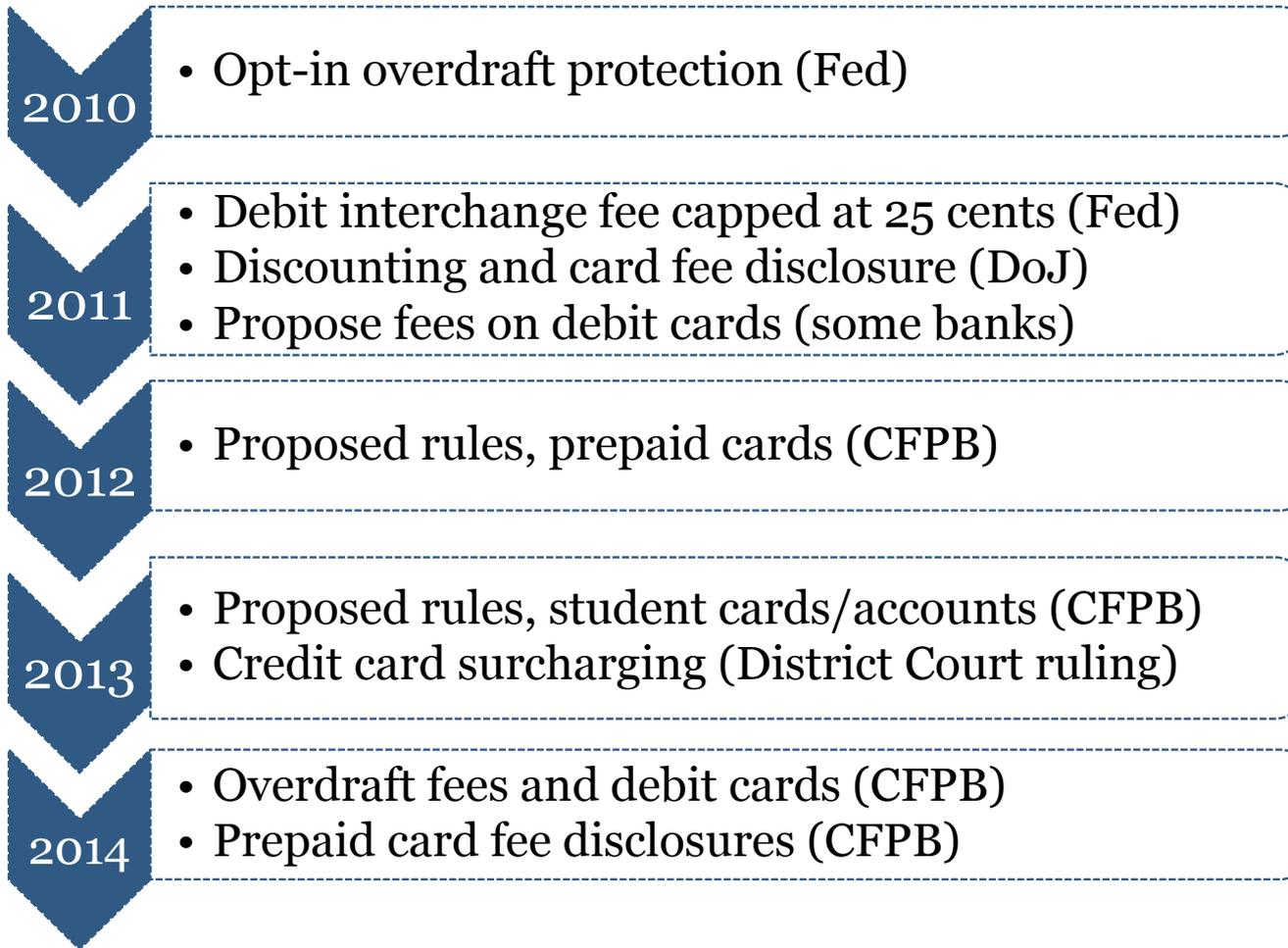
- *Planned improvements to U.S. payment system*
 - **Faster** – reductions in ACS and notification times
 - ✦ To legacy payment systems?
 - ✦ And/or a new system like U.K. Faster Payment Service?
 - **Safer** – reductions in fraud, loss, and data breaches
 - ✦ EMV finally implemented?
 - ✦ Improved cyber security?
 - **More attentive to preferences of end users**
 - ✦ Consumers, businesses, nonprofits

Large revenues in payment card networks

Typical Point of Interaction Card Transaction



New policies affecting payment cards



Traditional banking faces strong competition

Market for Payment Services

Market for Lending Services

Nonbank payment services

TRADITIONAL BANKS

Nonbank loan services

PayPal,
NetSpend,
Bluebird,
Google
Wallet,
Amazon
Payments,
Square

Take
Deposits

Make
Loans

(fractional reserve)

Peer-to-peer brokers
Prosper, Lending Club, SoFi,
Funding Circle, ZOPA

Microfinance
Kiva, Microplace, Micro
Credit Enterprises, Accion

Payment Card
Networks and
Processors

“Narrow” Banks
Green Dot
(full reserve) none?

PUBLIC MONEY (\$)

VC DI's

PRIVATE MONEY (?)

VC payment
networks
(Bitcoin, etc.)

Ripple, Circle,
Coinbase, etc. none?