

The Transformation of Money from Physical to Electronic

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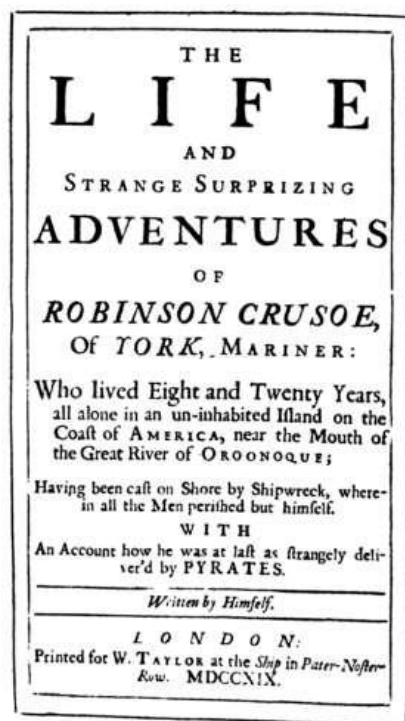
Overview

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

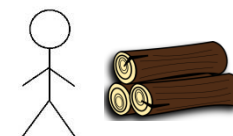
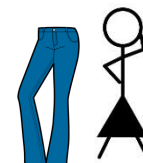
History of Money

Transition #1

From “Robinson Crusoe” economy to exchange



???

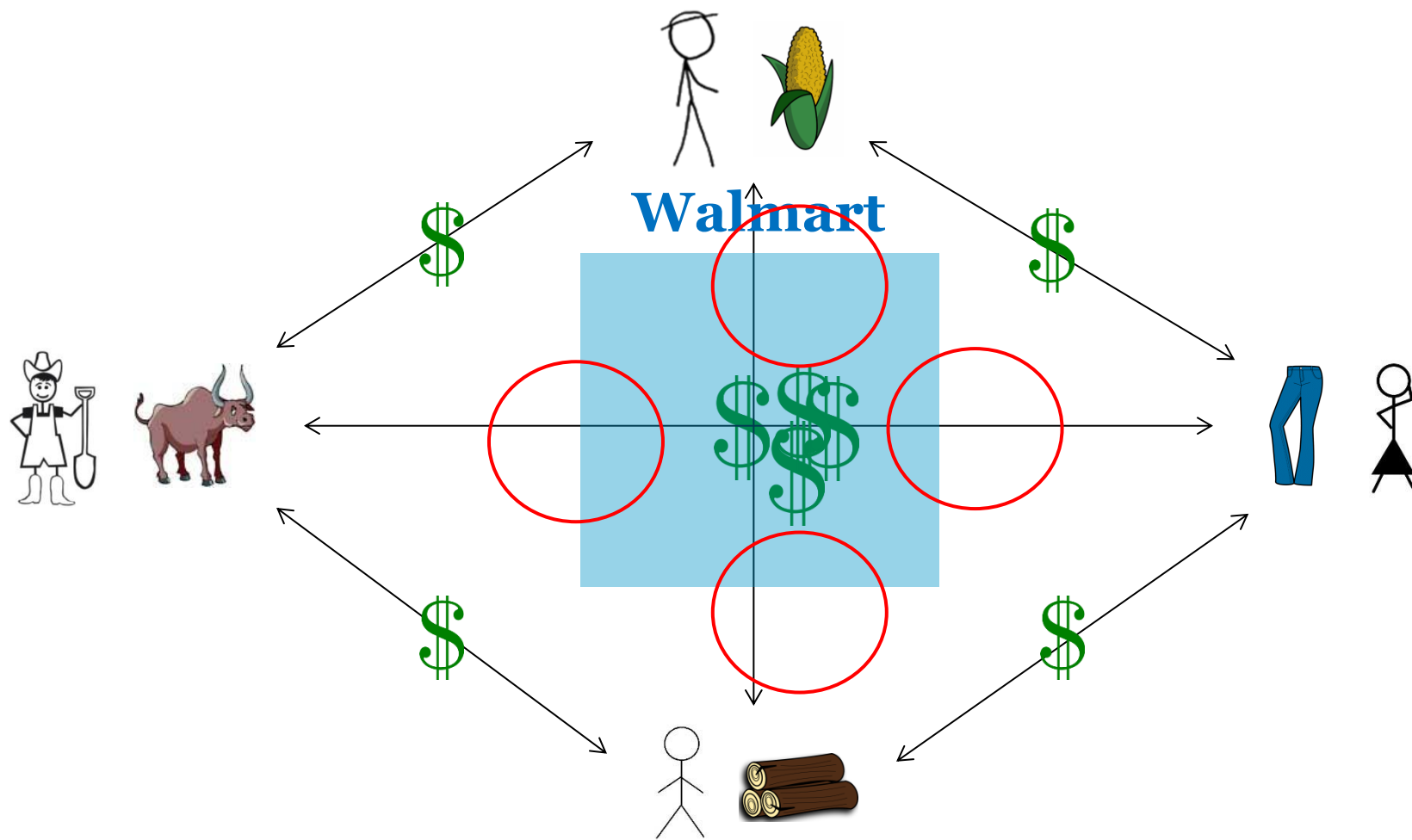


Producer = consumer

Exchange (barter) = “double coincidence of wants”

Transition #2

From barter to monetary economy



Three main functions of money

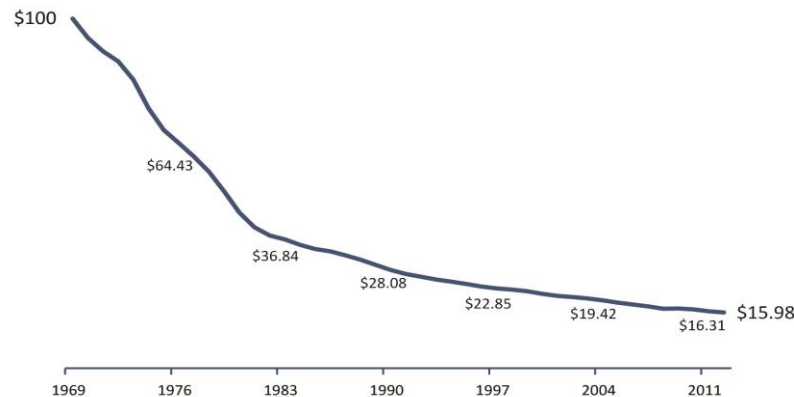
- **Unit of account**

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

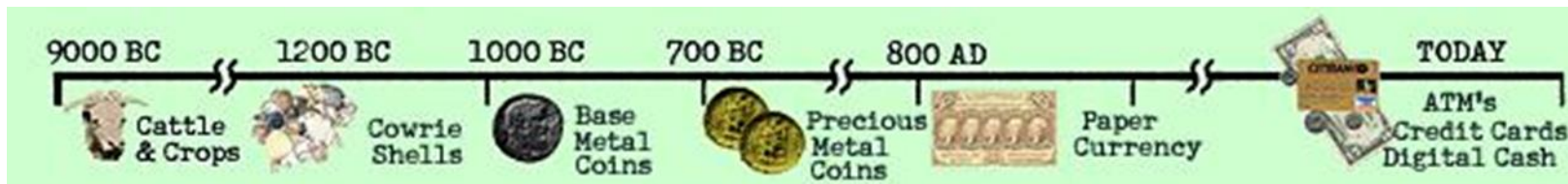
- **Medium of exchange**

- Coins, bills, checks, debit cards,....

- **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)

Money and Payments Today

Transition #3

From physical to electronic money

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“Yesterday”

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.

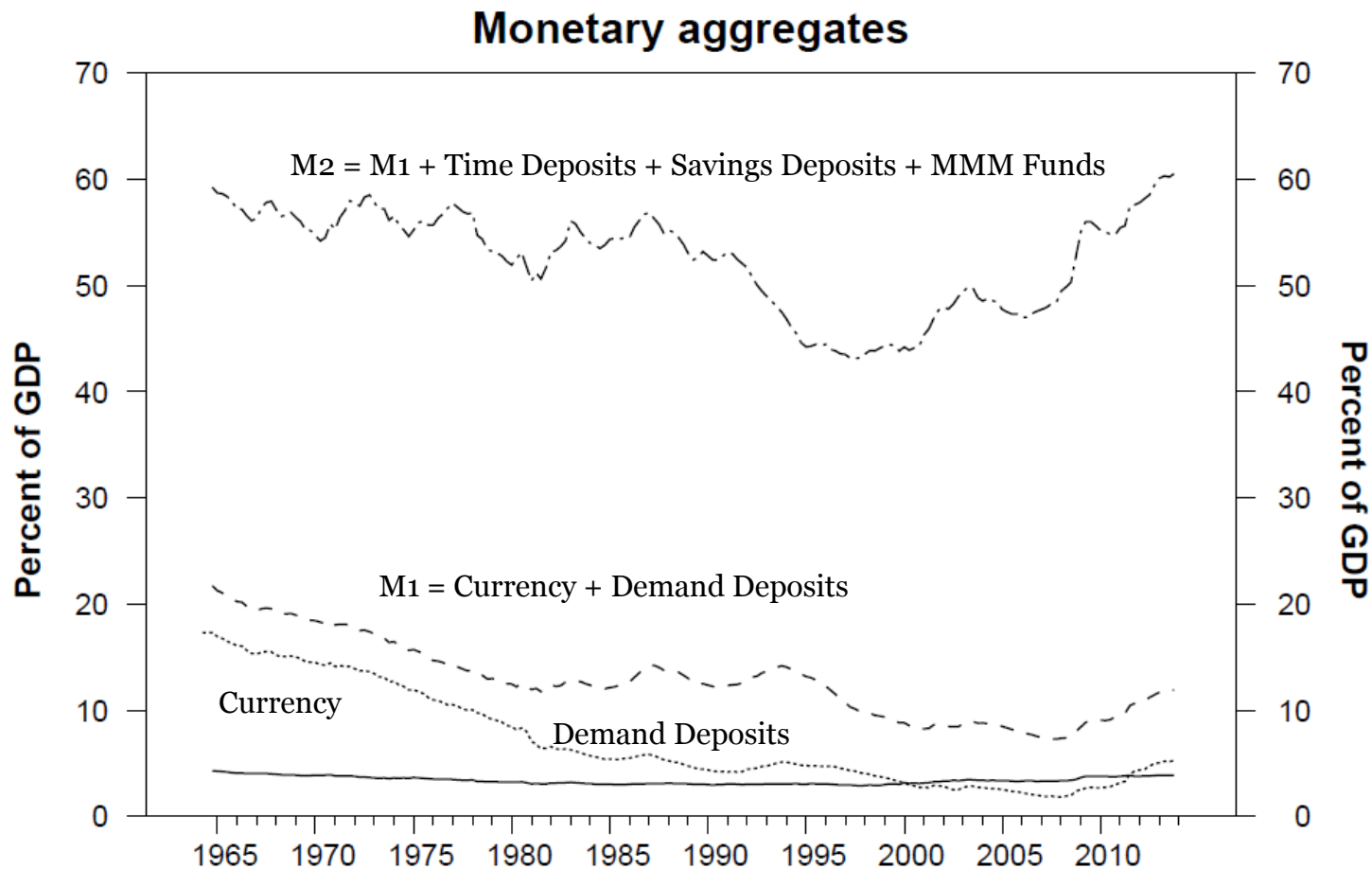
...

“Today”

... OR



The U.S. money supply

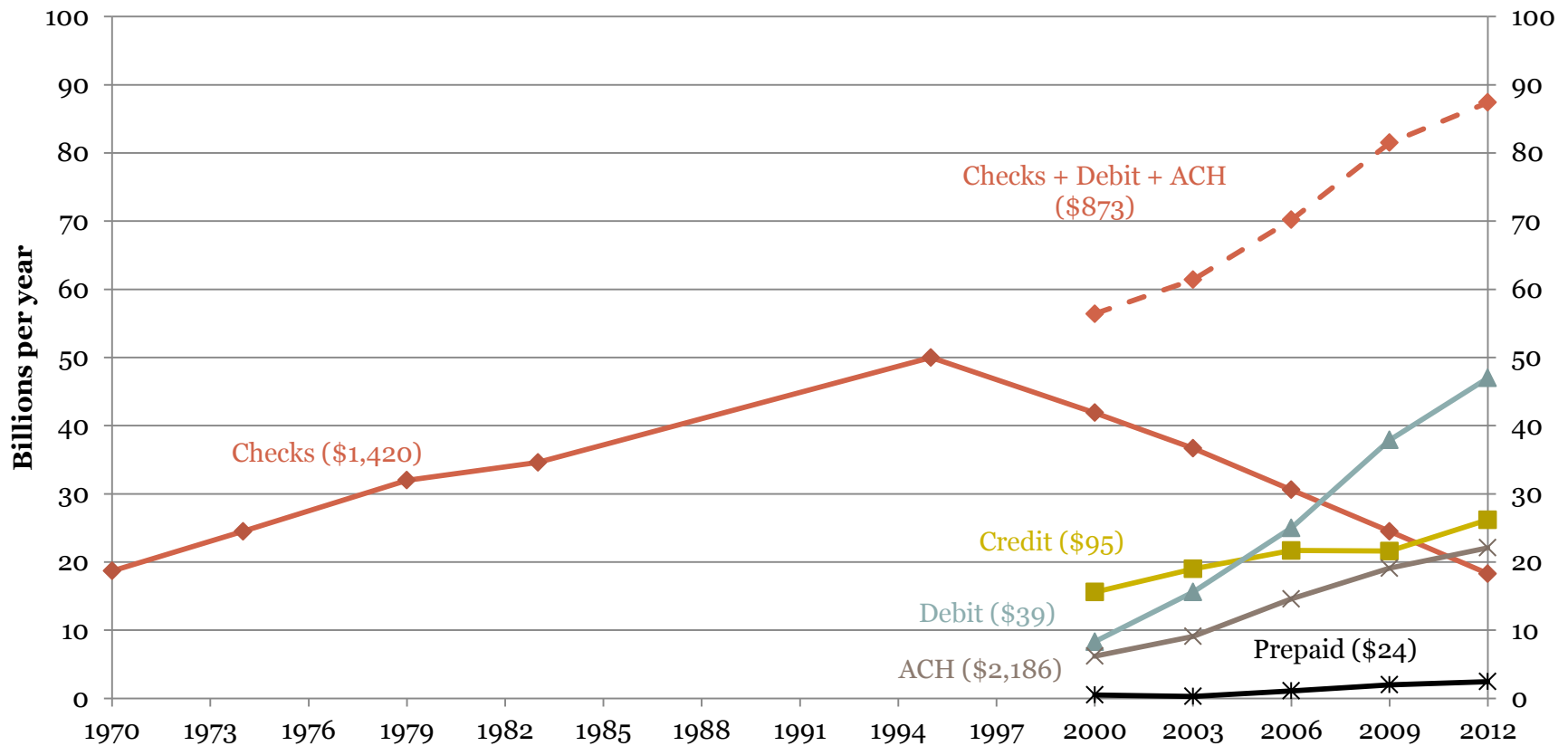


Money and payment instruments

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	
		Debit	Card
		Prepaid	
Credit	Revolving	Credit	
	Non-revolving	Charge	Electronic
		Text/SMS	
Unknown/unspecified	???	<u>Nonbank</u> money order or prepaid card; virtual currencies	Mixed

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

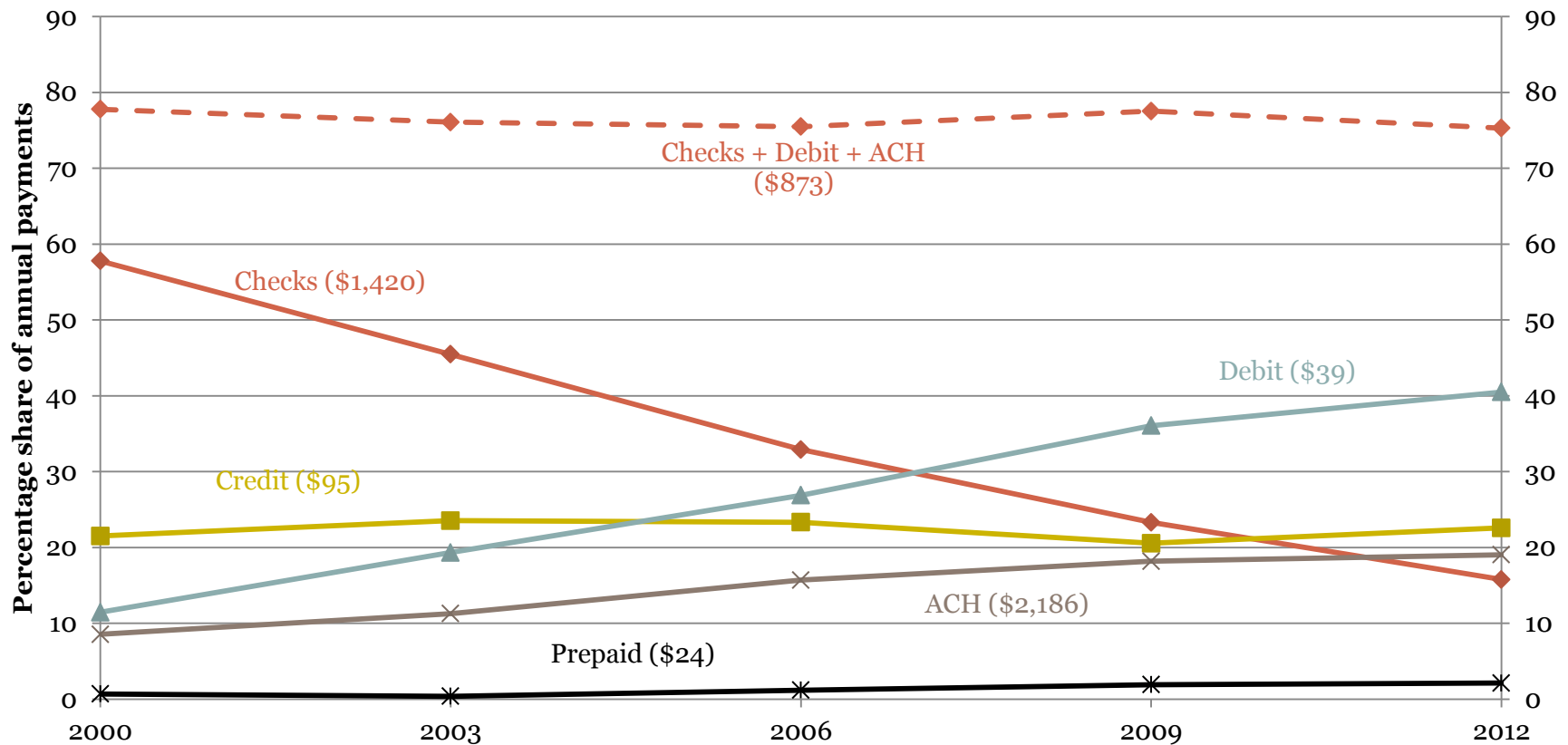
Number of US payments by all sectors (household, business, government)



Source: Federal Reserve Payment Study (FRPS)

Transformation of U.S. **noncash** payments: From paper to electronics (shares of #)

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



Source: Federal Reserve Payment Study (FRPS)

Consumer cash holdings and withdrawals

Dollars per consumer, except as noted

	Mean			Median		
	2010 ^r	2011	2012	2010 ^r	2011	2012
Cash holdings	340	337	464	70	70	69
On person.....	66	73	73	30	31	29
On property.....	286	278	401	15	13	10

Dollars per consumer per location, except as noted

Total	Mean			Median		
	2010 ^r	2011	2012	2010 ^r	2011	2012
Cash withdrawals per month	468	526	655	240	261	280
Amount per withdrawal.....	129	129	131	60	70	74
Withdrawals (number per month).....	4.8	5.4	6.4	4	4	4

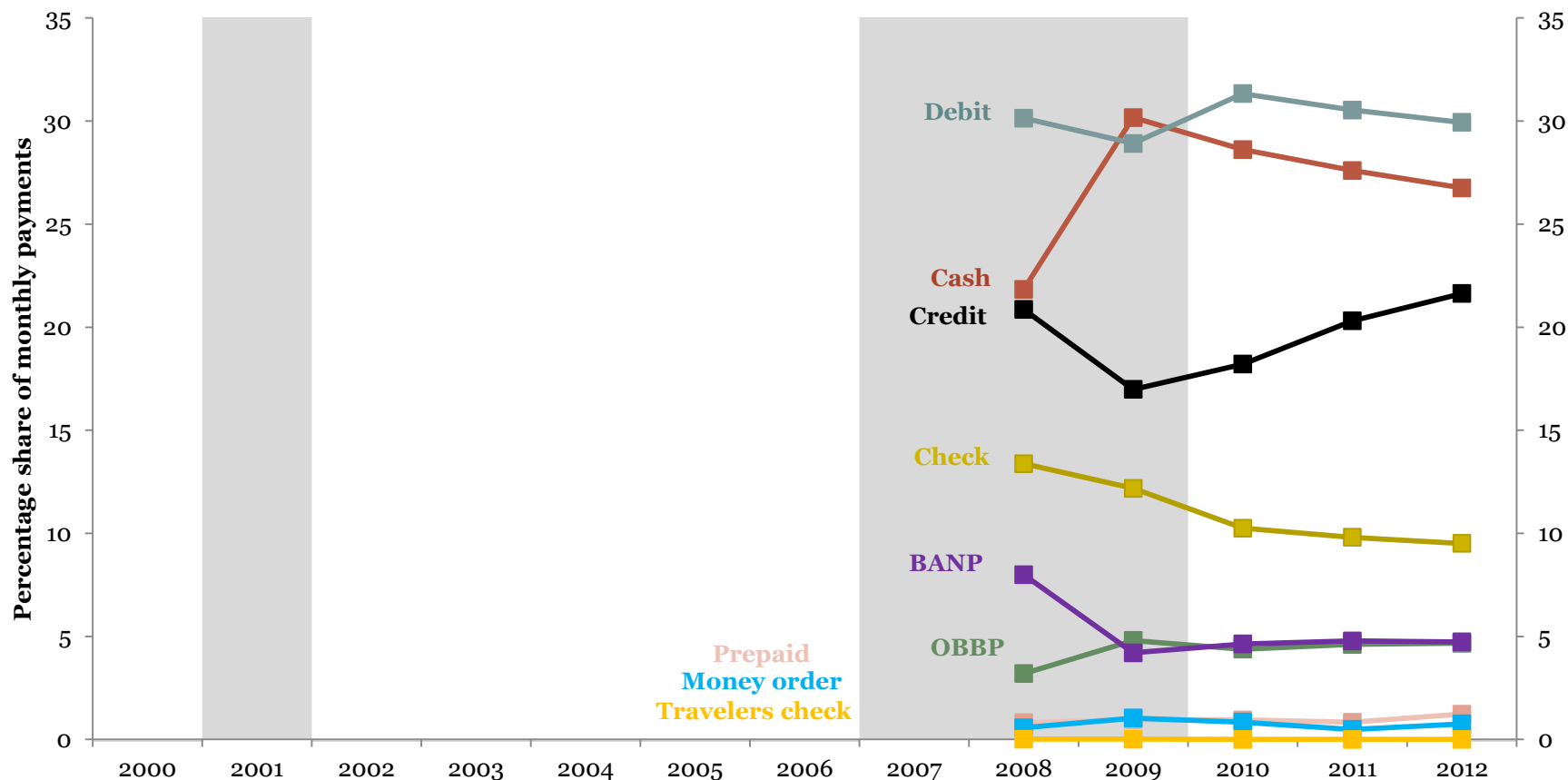
Source: 2010-2012 Survey of Consumer Payment Choice

Sources of consumer cash withdrawals



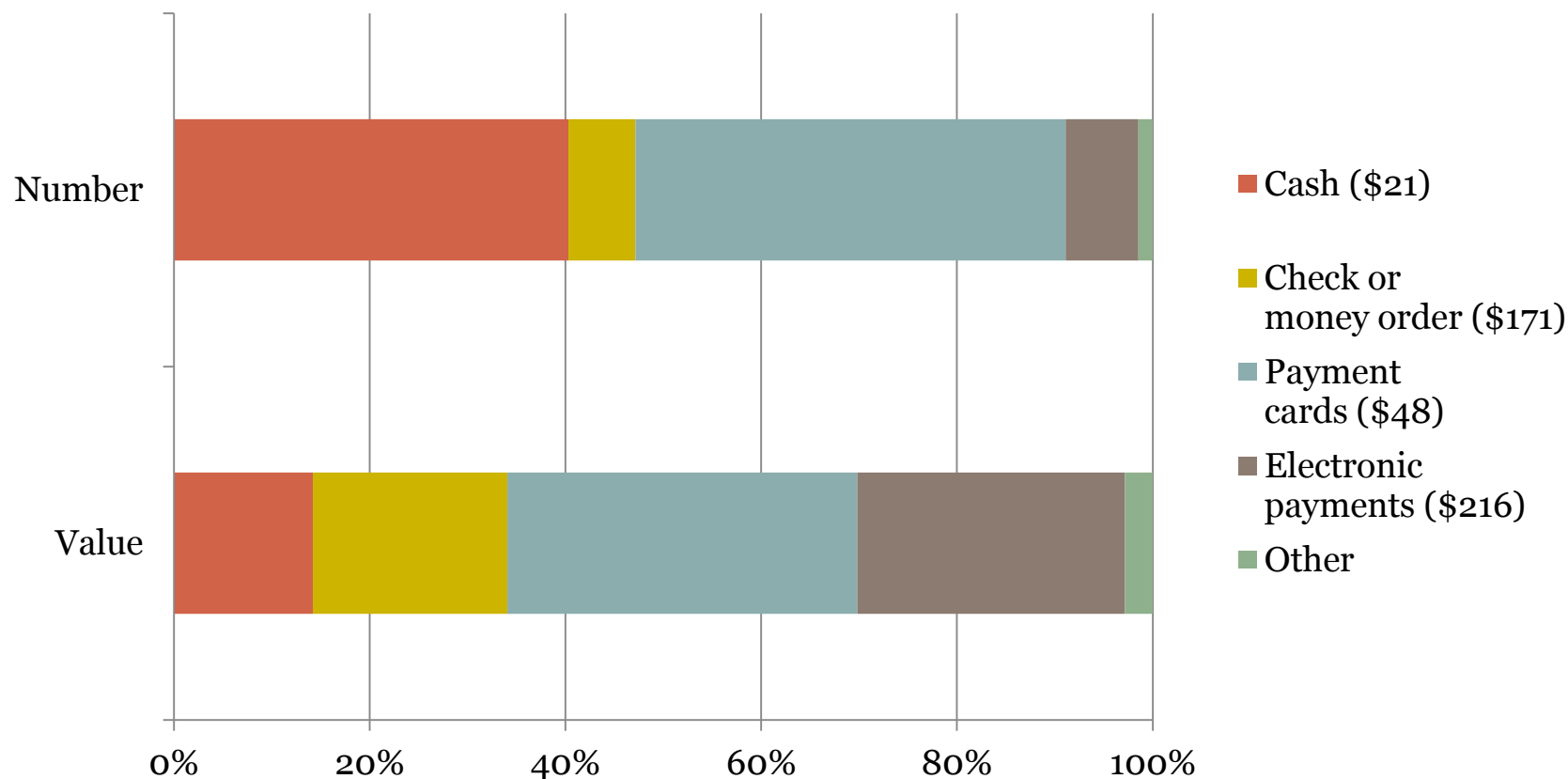
Source: 2012 Survey of Consumer Payment Choice

Consumer payments (from Survey)



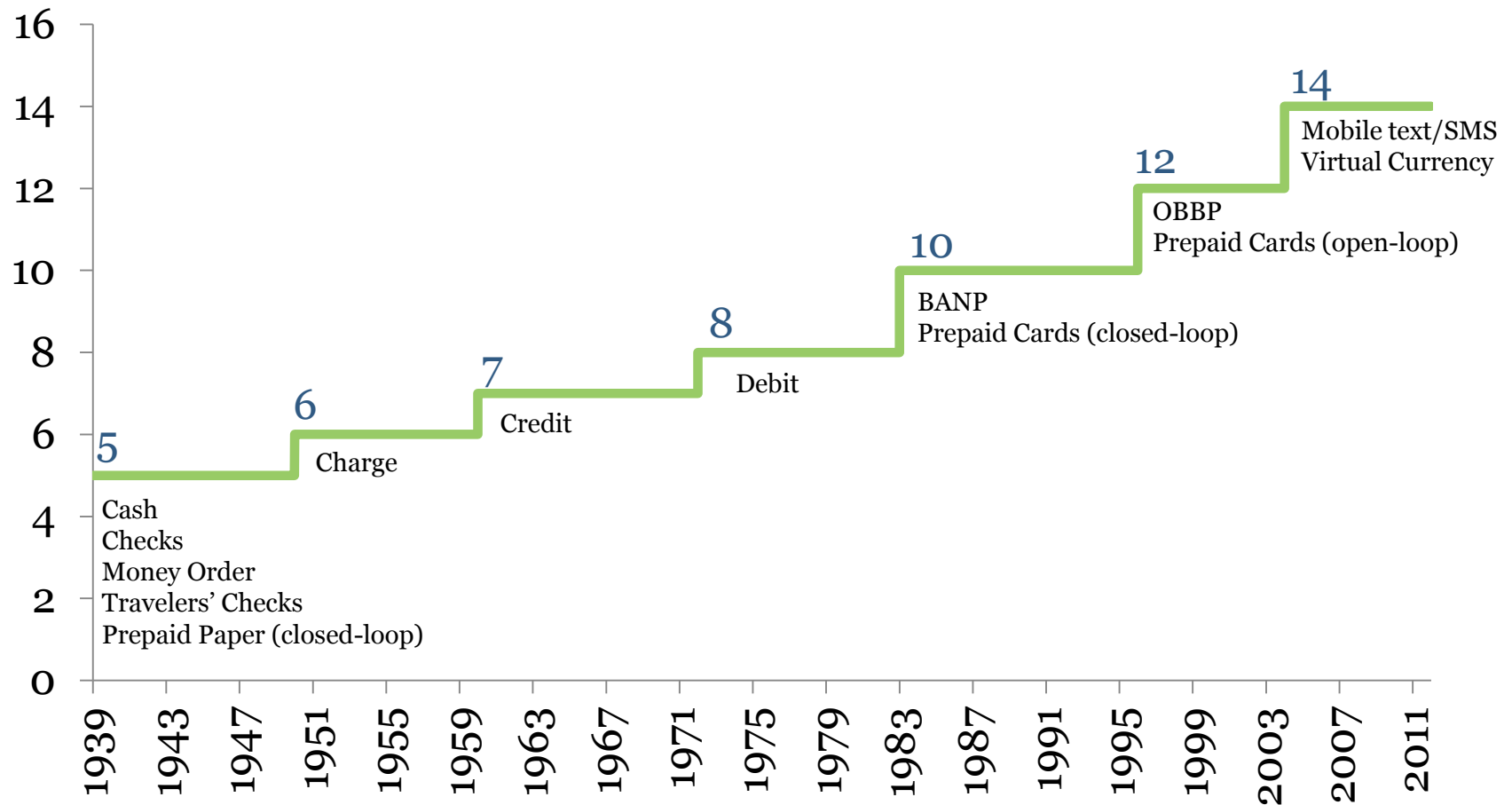
Source: 2008-2012 Survey of Consumer Payment Choice

Consumer payments, 2012 (from Diary)

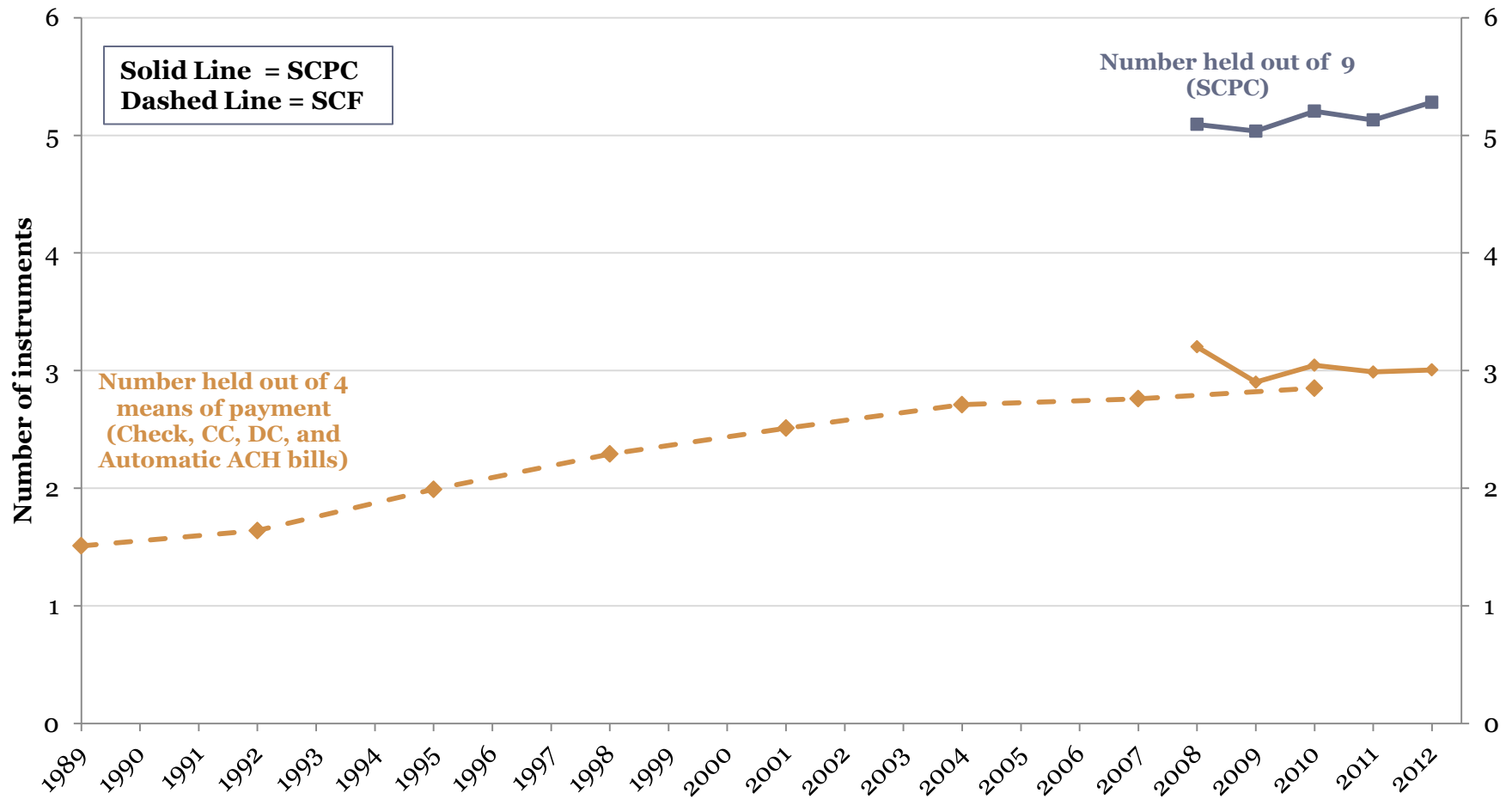


Source: 2012 Diary of Consumer Payment Choice (DCPC), preliminary results

Payment instruments available to consumers

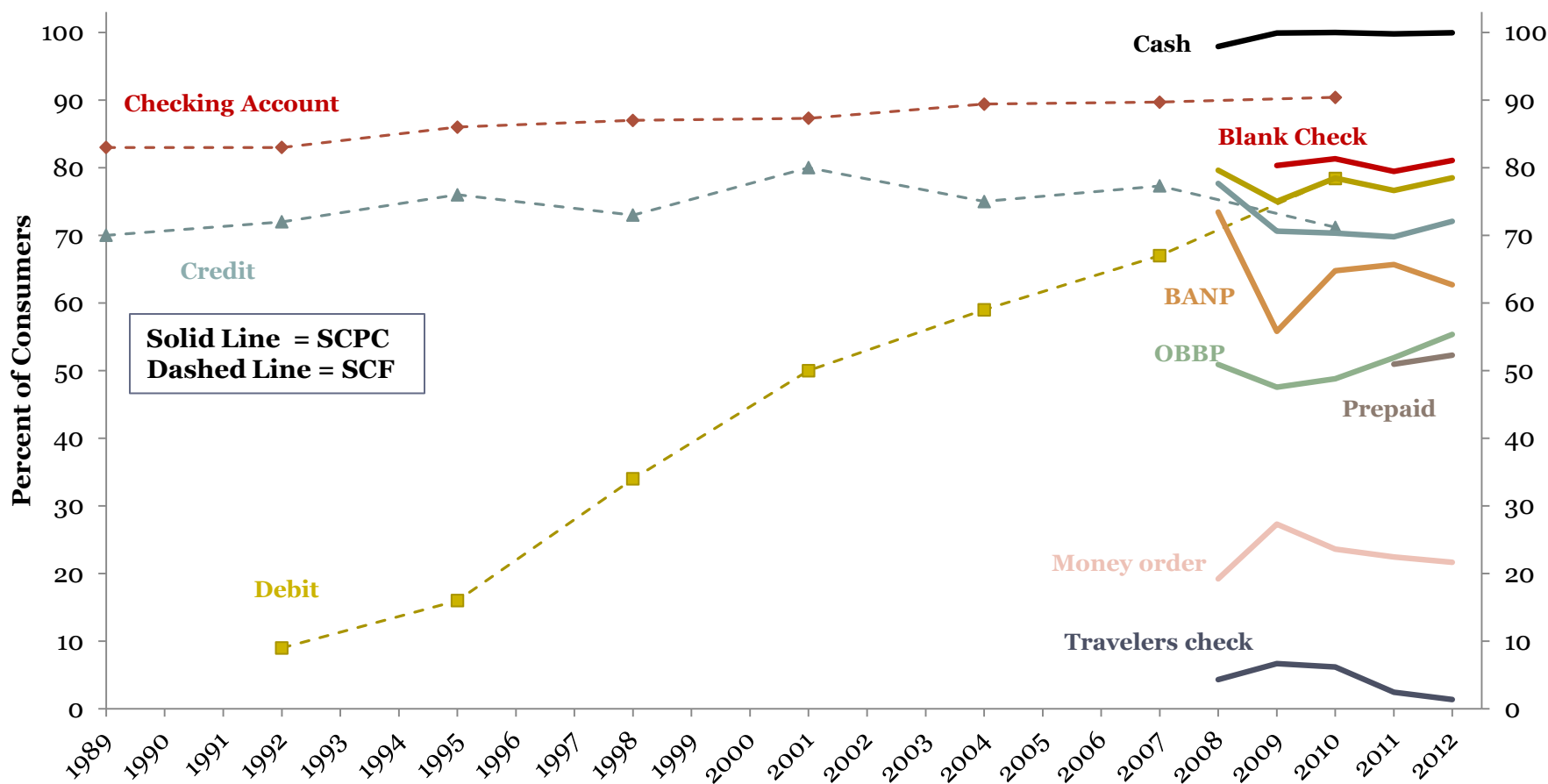


Instruments held by average consumer



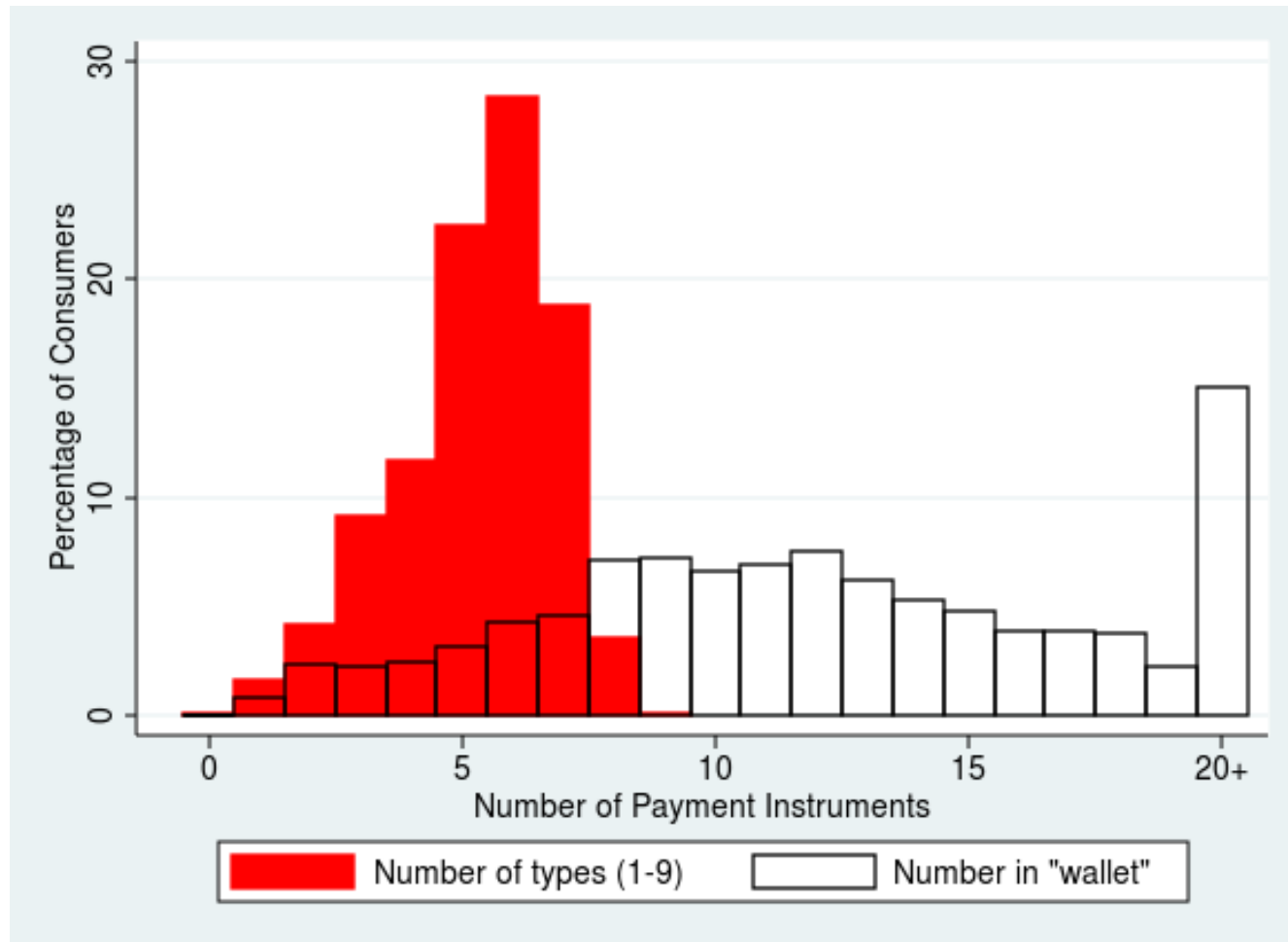
Source: Survey of Consumer Payment Choice ; Survey of Consumer Finance

Consumer adoption of payment instruments



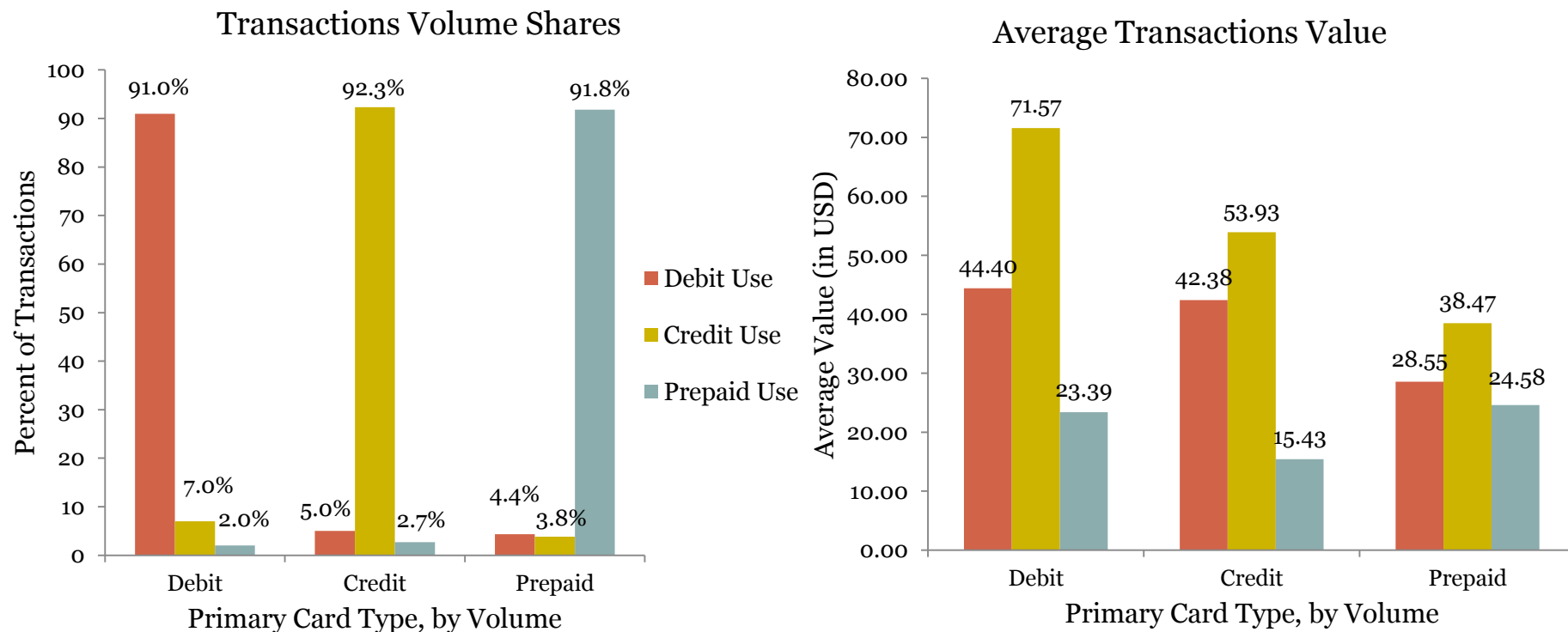
Source: Survey of Consumer Payment Choice;
Survey of Consumer Finance

Distribution of instruments held by consumers



Source: 2012 Survey of Consumer Payment Choice

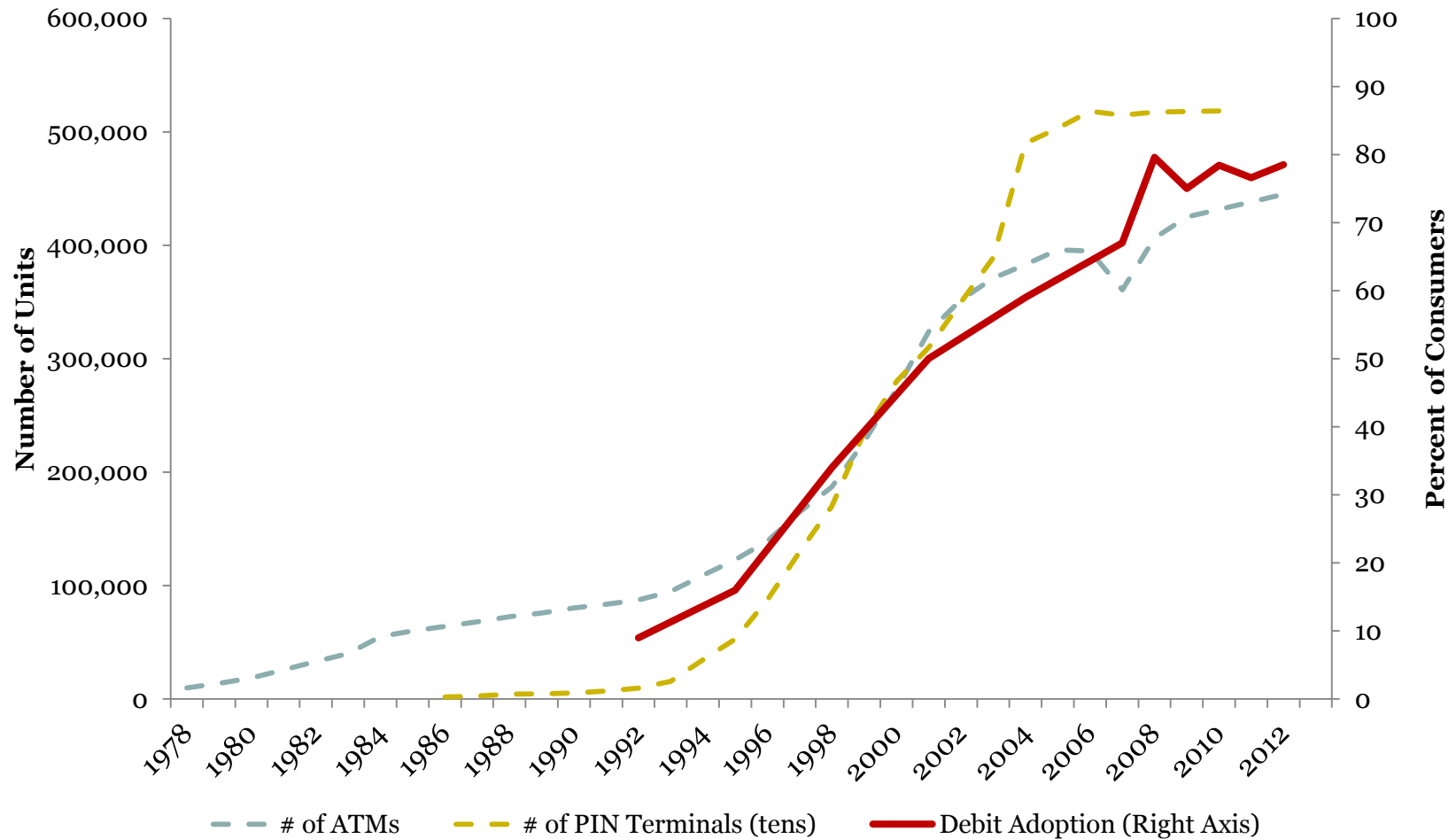
Consumer use of payment cards by type



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.

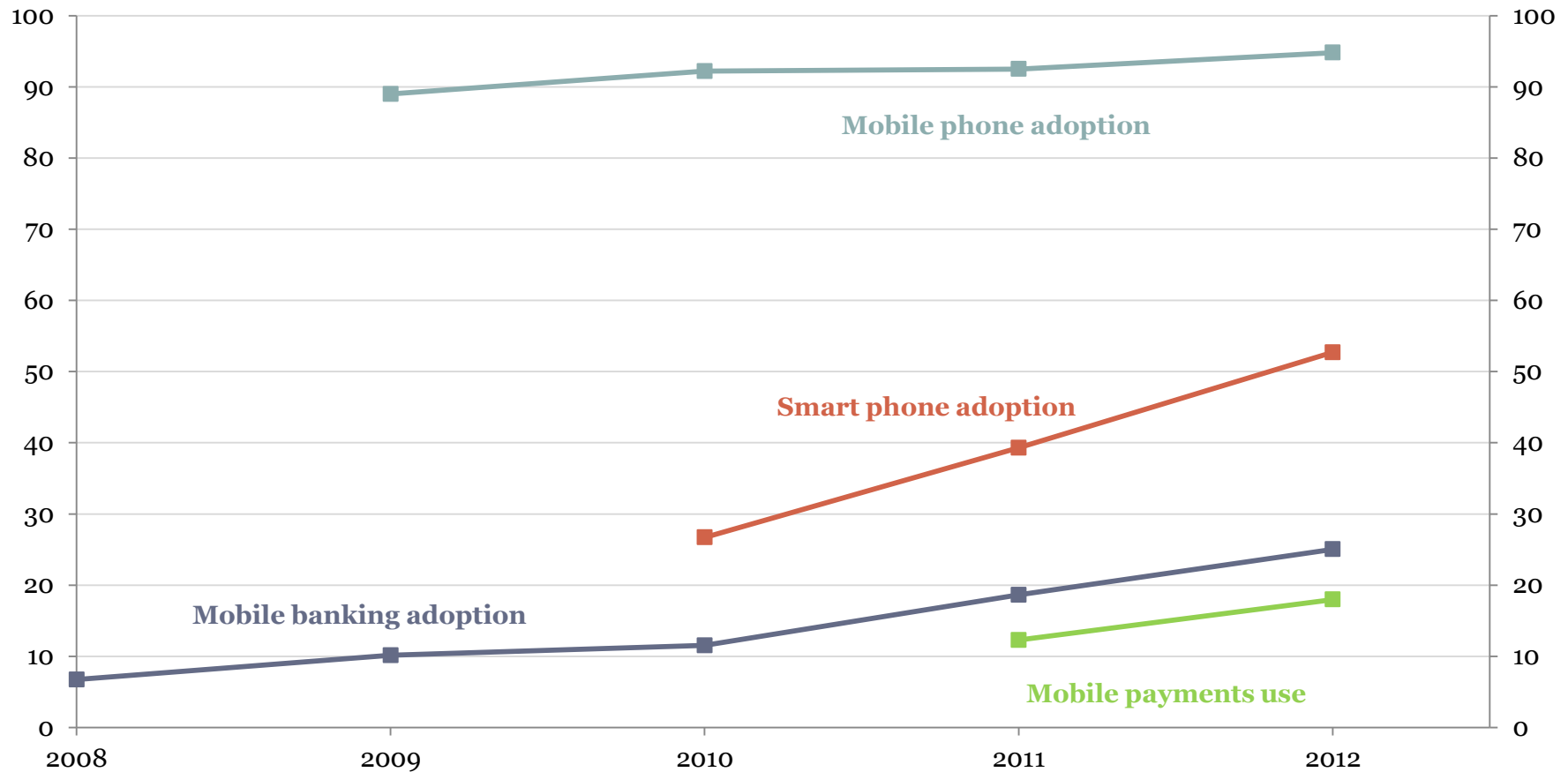
Source: Shy, Oz, 2013. "How many cards do you use?," Working Papers 13-13, Federal Reserve Bank of Boston.

Diffusion of payment technology #1: ATM/POS and debit cards



Source: BIS Redbook; Survey of Consumer Finances;
Survey of Consumer Payment Choice

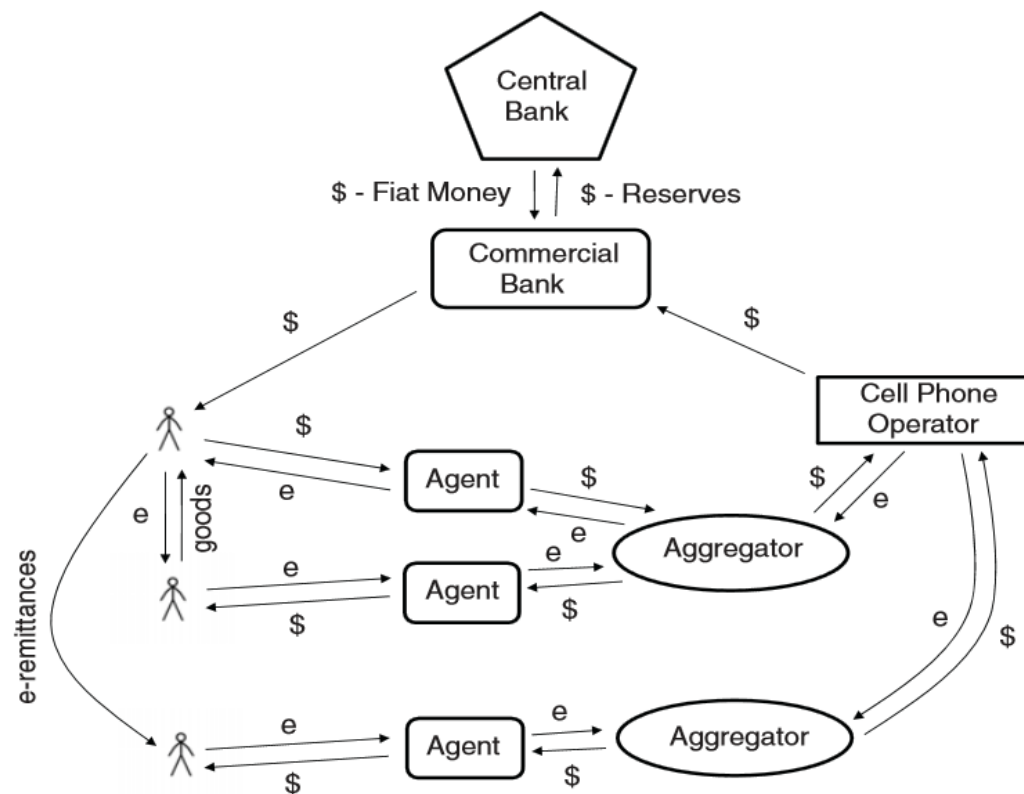
Diffusion of payment technology #2: Mobile banking and payments



Source: 2008-2012 Survey of Consumer Payment Choice;
2011- 2012 Consumers and Mobile Financial Services, Federal Reserve Board.

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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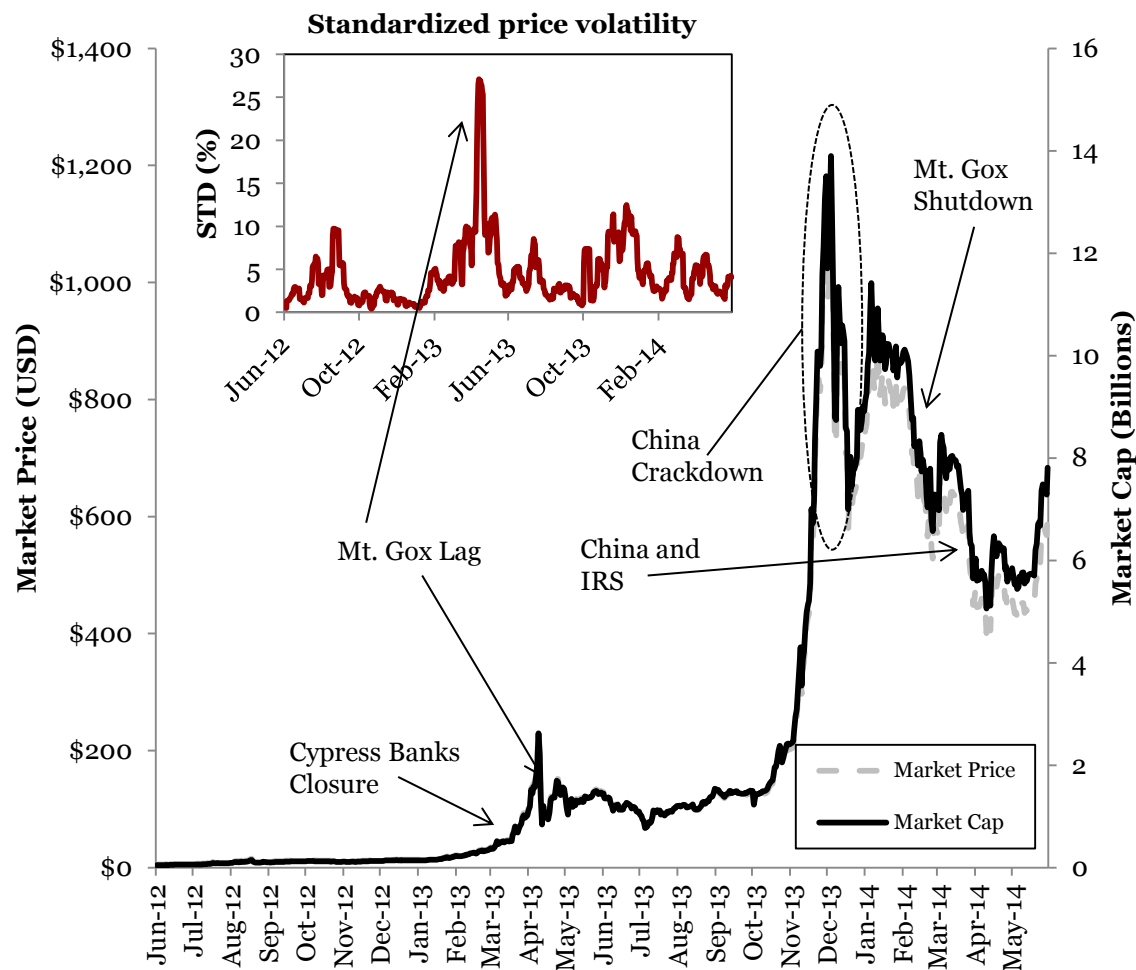
Technology/payments

- **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

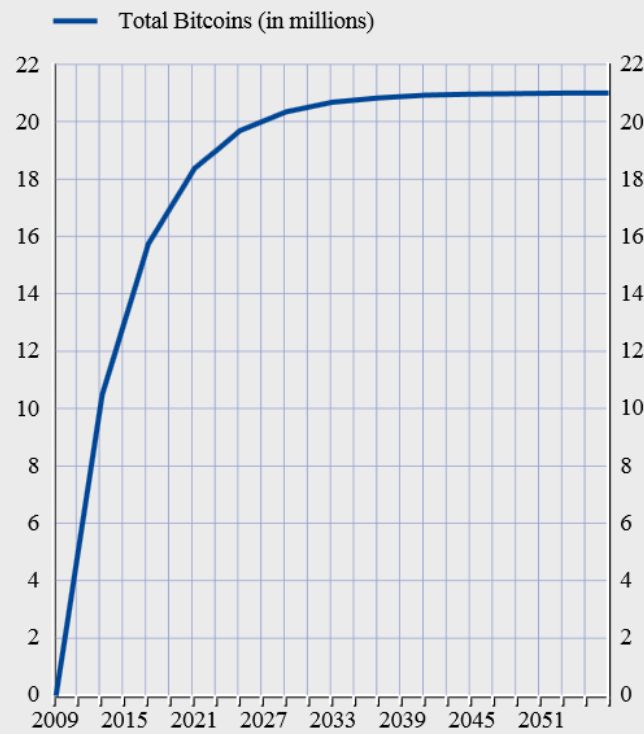
- **bitcoin** is money – “collaborative,” private, and electronic (“virtual”); called currency but NOT legally (yet)
- **bitcoin/VC** payments are low-cost but offer new revenue opportunity
- Money has value and risk of theft so new banks are emerging to store and manage **bitcoins/VCs**
- Traditional 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

Policy issues for money and payments

- **Checks should continue trend decline**
 - Check 21 legislation may have slowed use by consumers
 - Much motivation to encourage reduction of B2B checks
- **Currency demand should be relatively stable**
- **A2A & P2P payments should improve**
- **Payment card markets are in the spotlight**
- **Traditional banking is at a crossroad**

U.S. consumer demand for cash depends on interest rates (monetary policy)

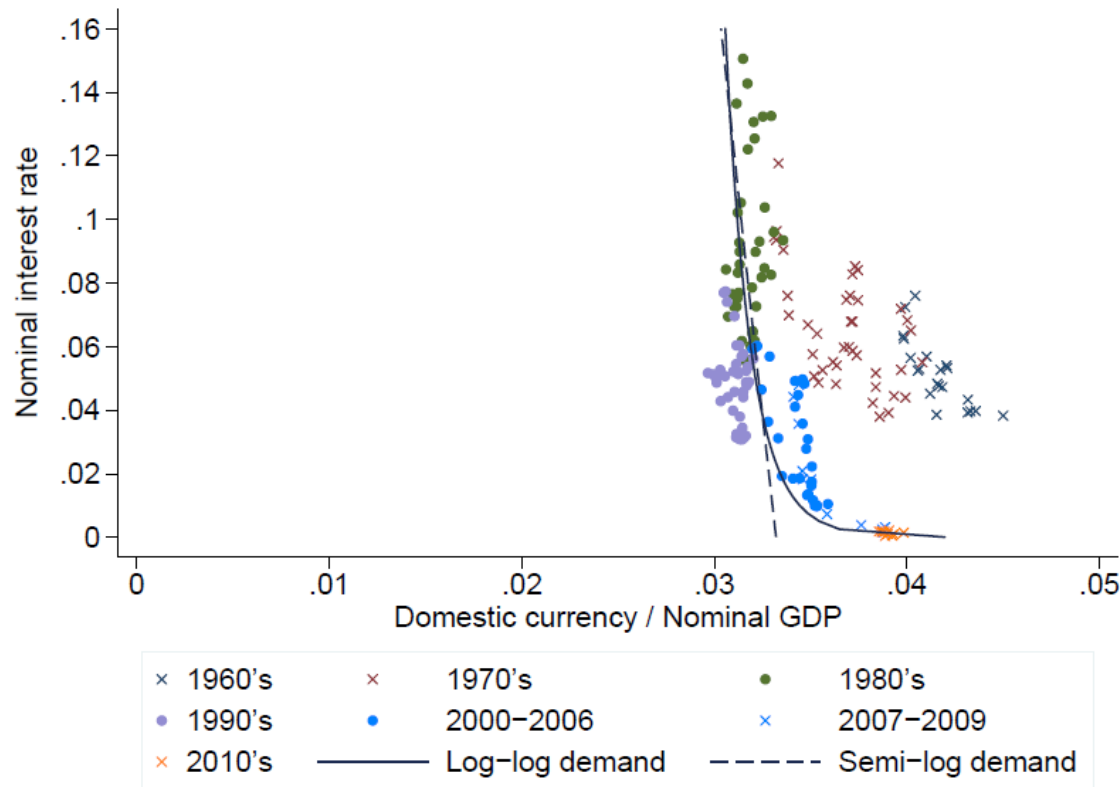


Figure 5: U.S. domestic currency demand 1964–2012

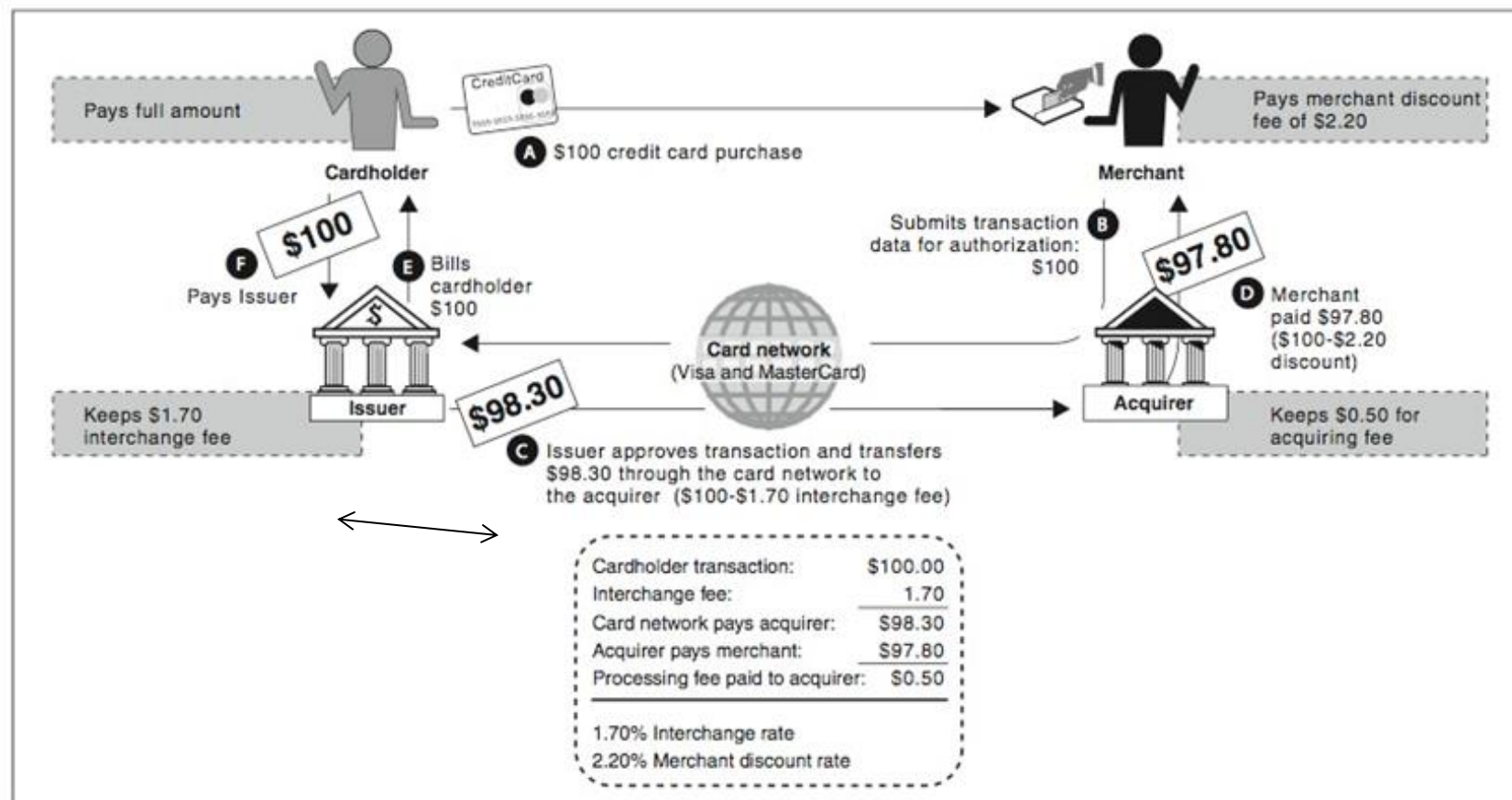
Source: Briglevics, Tamas and Scott Schuh. "U.S. Consumer Demand for Cash in the Era of Low Interest Rates and Electronic Payments," Federal Reserve Bank of Boston Working Paper 13-23.

Federal Reserve 2012-2016 strategic plan: 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?
- Federal Reserve **more attentive to preferences of end users** (consumers, business)

Revenues in a payment card network

Figure 2: Transfer of Fees in a Credit Card Transaction



Sources: GAO (analysis); Art Explosion (images).

New public policies affecting payment cards

2010

- Opt-in overdraft protection (Fed)

2011

- Debit interchange fee capped at 25 cents (Fed)
- Discounting and card fee disclosure (DoJ)
- Propose fees on debit cards (some banks)

2012

- Proposed rulemaking, prepaid cards (CFPB)

2013

- Proposed rulemaking, student cards/accounts (CFPB)
- Credit card surcharging (District Court ruling)

Traditional banking faces strong competition

Market for Payment Services

Market for Lending Services

Non-bank services

TRADITIONAL BANKS

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

Take
Deposits

Make
Loans

(fractional reserve)

Peer-to-peer brokers

Prosper, Kiva, etc.

Payment Card
Networks and
Processors

“Narrow” Banks

Green Dot,
Moven Bank
(full reserve)

???

PUBLIC MONEY (\$)

PRIVATE MONEY

VC DI's

VC payment
networks
(Bitcoin, etc.)

Ripple, Circle,
Coinbase, etc.

???