

Falling Use of Cash and Demand for Retail CBDC ¹

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Policy Issue and Goals ₂

Policy Issue: Assess the competitive environment and demand for retail CBDC.

Three Goals:

1. Develop an indicator of cash use for payments. Should show the current level and trend in cash use vs. substitutes. Low use of cash suggests greater first mover advantage for cash substitutes.
2. Explain why cash use is falling. If sources of demand for cash are “stable”, then cash will continue to fall at a slow but generally predictable rate.
3. Identify incentives to adopt and use retail CBDC. This adds to current discussions of CBDC, if issued.

Three Measures of Cash Use (1) ₃

1. Standard measure of cash use: CIC/GDP

where: CIC = value of all coin and currency in circulation. Same as used by: Bech, et al. (2018); Ashworth and Goodhart (2020); and almost all papers assessing cash use.

Problem: Ratio of CIC to GDP compares the stock of cash used for payments to the various wire transfer, ACH, giro, check, card, and mobile phone payment transactions that underly the flow of GDP . Except for cards, these payment instruments do not compete with cash nor are they used where cash is normally used—at the POS. Not relevant for assessing competitive environment for retail CBDC.

2. More focused measure of cash use: $small\ CIC/HC$

where: $small\ CIC$ = value of all coin and small denomination currency in circulation; and HC = value of household consumption.

Small CIC previously used by Amromin and Chakravorti (2009) PPP adj. \$37; Bech, et al. (2018) PPP adj \$75; and Arango-Arango and Suarez-Ariza (2020) PPP adj. \$31. We used \$35 as the small currency denomination cutoff. Using HC makes more sense than using GDP as is closer to what cash is used for.

Three Measures of Cash Use (2) ⁴

3. Cash used for payments: $\text{Cash}/(\text{Cash} + \text{Cards} + \text{e-money})$

where: Cash = value of cash withdrawals from ATMs; e-money = stored value.

A market share measure, as in competition analysis. Reflects the “market for cash” and why cash use rises or falls due to substitution with other payment instruments.

Problem: Have data on cash withdrawals at ATMs but incomplete data on:

Cash withdrawals by depositors over the counter (OTC) at banks & “cash-back” at POS.

Found OTC data for 6 European countries. This includes OTC value of business use of cash to make change. But making change is not part of the value of a card transaction. Only want OTC consumer cash withdrawals, not business use of cash.

Using this data would make our fitted cash share level results “too low” for Germany and Spain by 7-6 pp. It would also be “too low” for Italy and France by 2-1 pp, and by < 1 pp for Belgium and Netherlands. This seems associated with over-branching (Germany, Spain), which may/may not occur in many other countries.

Importantly, the trend in cash use is little affected.

Percent Reductions in Cash Use ⁵

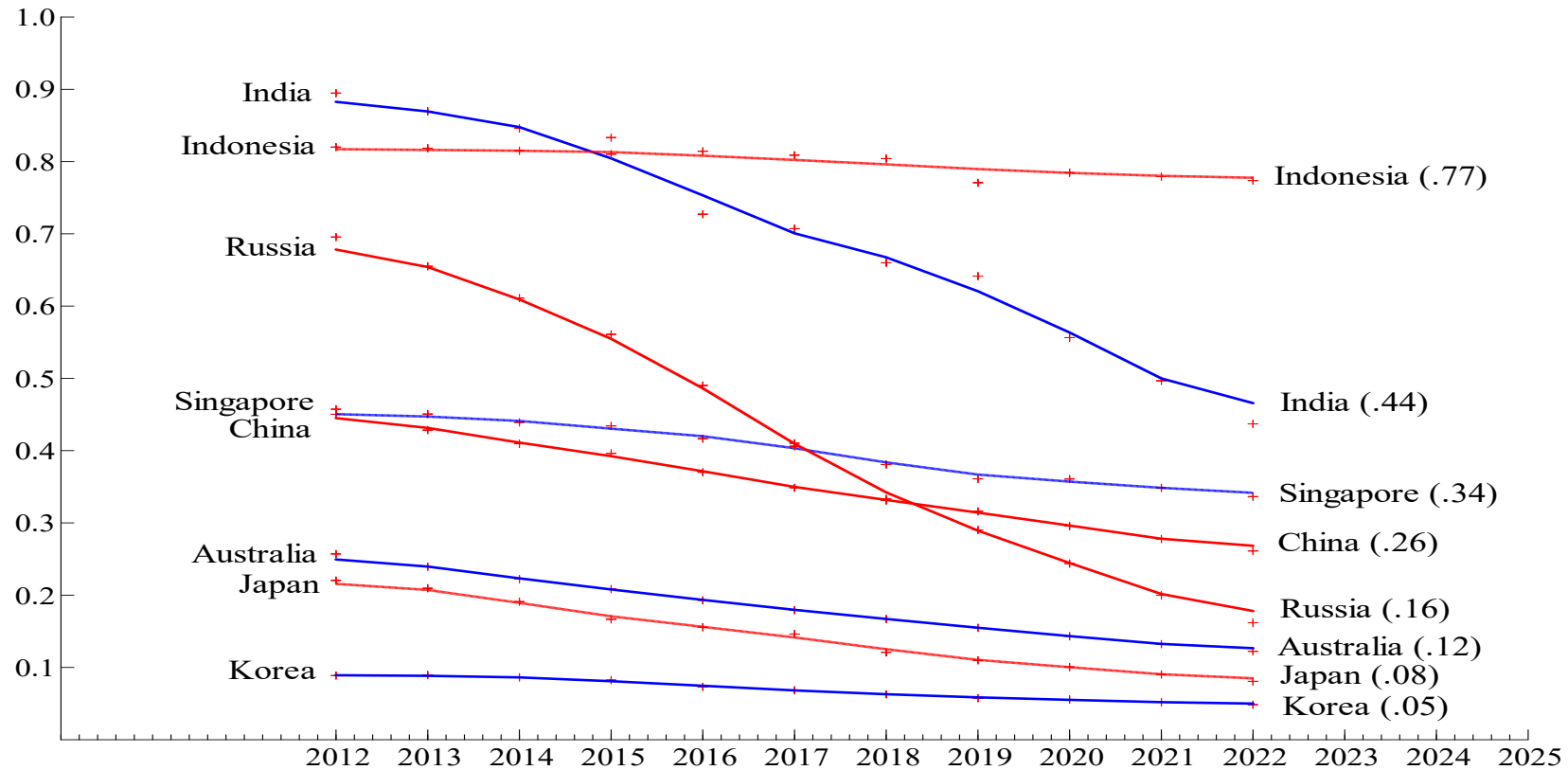
	8 Countries Fell	13 Countries Fell	24 Countries Fell
	All CIC to GDP	Small CIC to HC	Cash to Cash plus Cards & e-money
1. Argentina	-0.40	-0.82	-0.30
2. Australia	0.08	0.00	-0.40
3. Belgium	na	na	-0.43
4. Brazil	-0.01	-0.29	-0.45
5. Canada	0.14	0.00	-0.02
6. China	-0.23	-0.30	-0.31
Euro area	0.16	0.15	na
7. France	na	na	-0.19
8. Germany	na	na	-0.19
Hong Kong SAR	0.25	0.03	na
9. India	0.01	0.16	-0.28
10. Indonesia	-0.02	-0.21	-0.06
11. Italy	na	na	-0.13
12. Japan	0.15	0.06	-0.50
13. Korea	0.74	-0.26	-0.35
14. Mexico	0.33	-0.06	-0.14
15. Netherlands	na	na	-0.40
16. Russia	-0.14	-0.51	-0.58
17. Saudi Arabia	0.33	-0.05	-0.13
18. Singapore	0.31	0.01	-0.20
19. South Africa	-0.05	-0.25	-0.11
20. Spain	na	na	-0.28
21. Sweden	-0.51	-0.30	-0.53
22. Switzerland	0.21	0.12	-0.02
23. Turkey	-0.07	-0.35	0.00
24. United Kingdom	-0.05	-0.12	-0.40
25. United States	0.17	-0.06	-0.28
Legend	Rising	Stable	Falling

Share of Cash in Market for Cash (1) ₆

Annual data for 2012-2019 plus an illustrative projection for 2020-2022 (sans Covid).

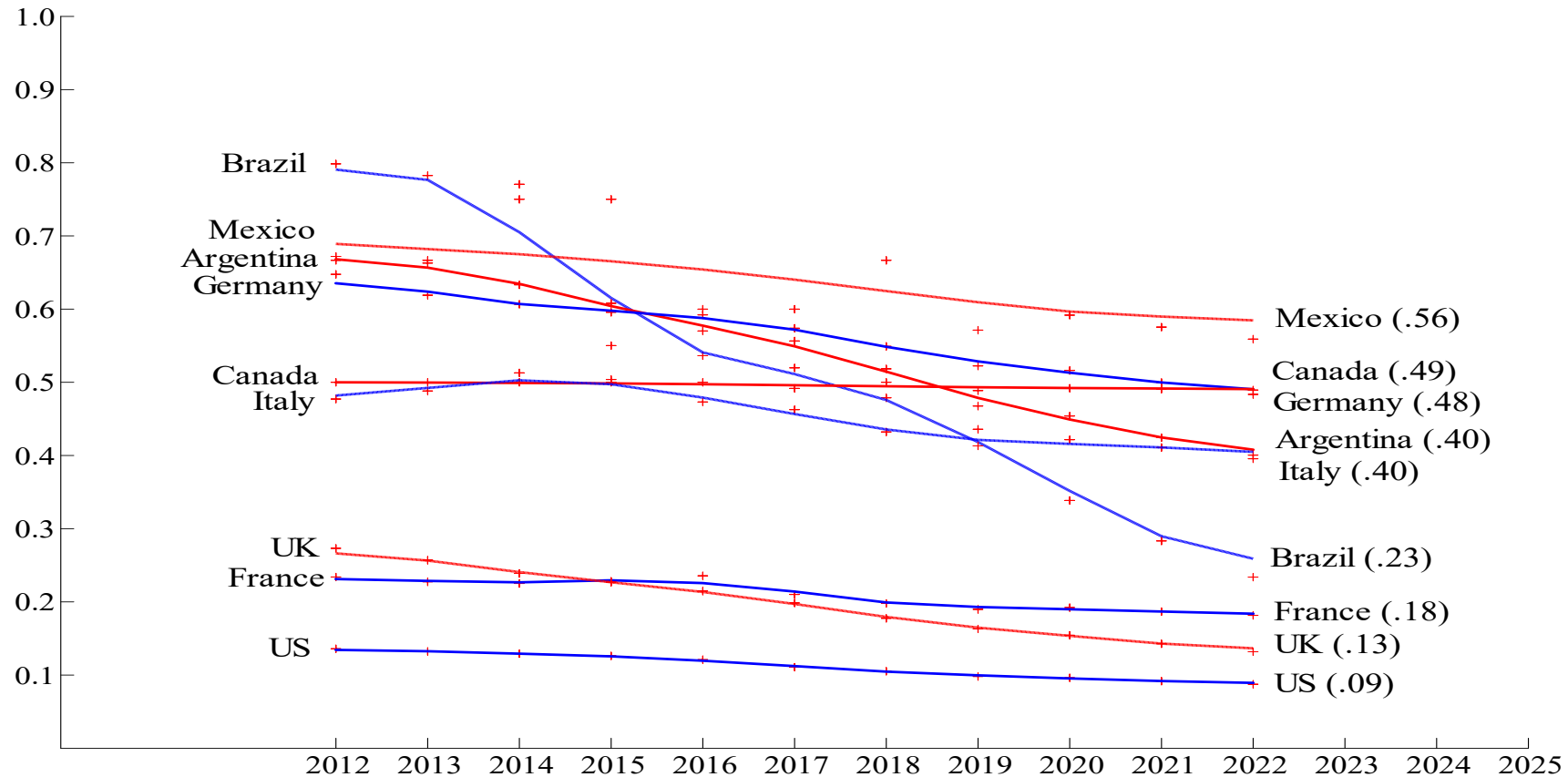
Projection based on estimated inverse logistic curve. Observations fitted by cubic spline.

India and Russia have largest decrease in cash use. RHS values show percent cash use level.



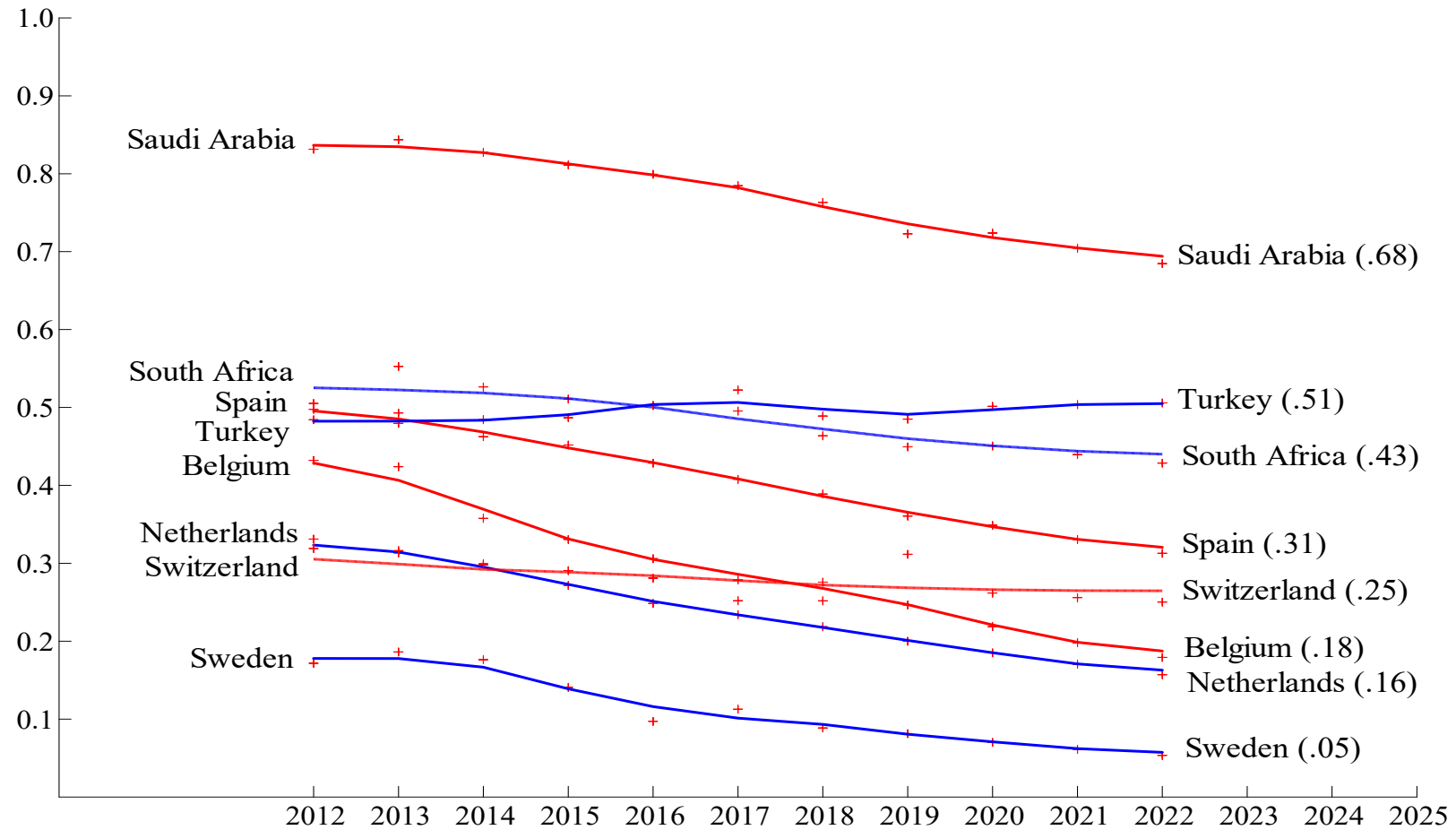
Share of Cash in Market for Cash (2) ₇

Economic crisis in Brazil altered share of cash use. India declared 86% of its currency “illegal” and slowly replaced it. Western sanctions led Russia to issue its own card (Mir).



Share of Cash in Market for Cash (3) ₈

Only Turkey has rising/stable cash use. Most experienced a slowly falling use of cash.



Falling Use of Cash for 25 Countries 9

The average percentage point (pp) reduction in our cash use measure is 1.7 pp a year.
From: $(2012 \text{ level} - 2019 \text{ level}) / 7$. The average percent reduction was 3.8% annually.

8 countries have a cash share ranging from 6% to 20% in 2019 (Table 2 in paper).
They are: Korea, Sweden, US, Japan, Australia, UK, France, and Netherlands.
Their average reduction in cash share level is 1.2 pp a year.

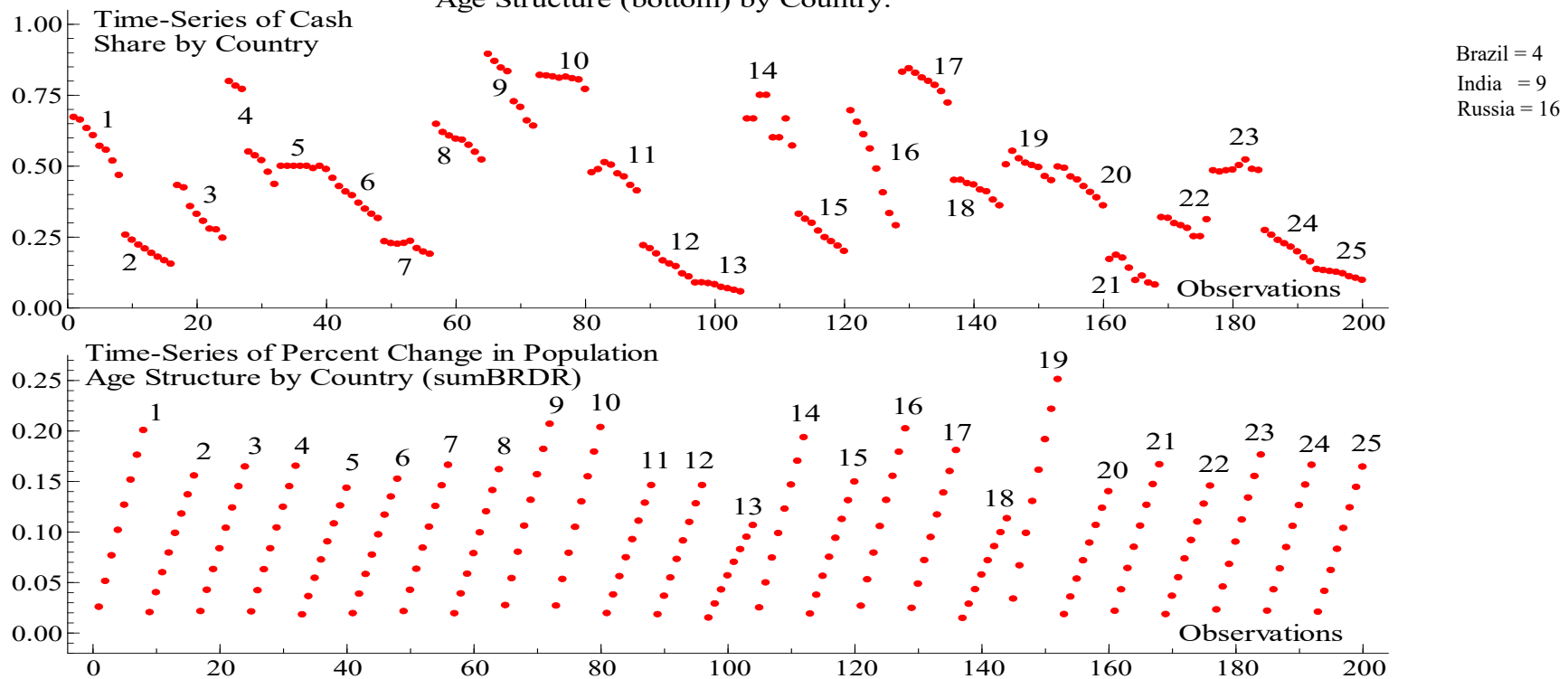
The more important point is that cash substitutes have a market share of from 80% to 94%.
If issued, CBDC would likely face a competitive market.

Why is Cash Use Falling? ₁₀

Payment diary studies show cash transaction share and cash value share results by age. This suggests younger adults use less cash than older adults (Kim, et al., 2020; Bagnall, et al., 2016). Recalculating data for three US diary studies for 2017-2019 gives total cash transactions and total cash values spent:

	<u>Younger Adults: 18 to 44</u>	<u>Older Adults: 45 and older</u>
Total Transactions:	3,119	6,684
Total Value Spent:	\$94,541	\$153,988

Figure 2: Cash Share Values (top) and Change in Population Age Structure (bottom) by Country.



Source of the Demand for Cash ₁₁

The relationship between a country's cash share and the revealed preference embedded in a measure of the change in its population age structure is supported by the following pooled regression (N = 200):

$$\text{CASHSHARE} = \beta_0 + \beta_1 * \text{sumBRDR} + \beta_2 * \text{HC} + \beta_3 * \text{iRATE} + v$$

where: CASHSHARE = cash share values of 25 countries over 2012-2019 (top of last graph)
 sumBRDR = BRDRyr1; BRDRyr1+BRDRyr2; BRDRyr1+BRDRyr2+BRDRyr3 and so on, giving the intergenerational change in population age structure (bottom of last graph);
 HC = PPP adjusted US dollar value of household consumption in each country; and
 iRATE = percent interest rate in each country (some rates are negative).

Table 3: Pooled Regression Results, 2012-2019

Variable:	Fixed Effects (Within)		OLS on Means (Between)	
	Parameter	t-Statistic	Parameter	t-Statistic
Intercept			-.104	-.46
sumBRDR	-.874	-12.26	5.57	2.28
HC	.176E-14	.20	-.120E-13	-.83
iRATE	.253E-03	.32	.555E-02	.82
	$R^2 = .97$		$R^2 = .24$	

Result: Intergenerational change in a population's age structure is associated with a lower cash share. On average, most cash shares are seen to fall at a relatively stable and slow pace.

Incentives for Payment Users to Demand CBDC ¹²

The how and why to supply CBDC has been covered. We focus on demand issues for users.

User Fees/Convenience.

No user fees for cash. Cash is inconvenient to obtain. Some countries offer rewards for using cards. Cards have no user fee. Current incentives are to use cards over cash.

If CBDC has a user fee, as may occur in the US due to the Monetary Control Act of 1980, this could disadvantage CBDC. Advantage cards.

Risk of Loss/Fraud.

Retail CBDC would likely adopt similar fraud/loss controls. No advantage for cash, cards, or CBDC.

Universal Acceptance/Privacy/Anonymity.

All would have universal acceptance. Cash has privacy, due to anonymity. Cards have neither. CBDC could have anonymity for a limited amount of stored value, separate from regular CBDC. No advantage for cash, cards, or CBDC.

Incentives for Payment Receivers to Demand CBDC ¹³

Cost of Accepting Payments.

There are substantial costs to accepting cash (internal controls, vault expense, armored couriers) and accepting cards (interchange fees). Credit cards have higher costs than accepting cash. If CBDC is free (like cash) merchants would not have to offset this cost to attract CBDC.

Advantage for CBDC if, like cash, it is free.

Quick Access to Funds Received.

Cash needs to be deposited to be reused. Large retailers do not use daily armored couriers (too costly). Cash is 1-day or 2-day money.

Receivers of card payments wait 1 to 3 days for clearing and interbank settlement before funds are available for reuse. Currently, cards are 1-day, 2-day, or 3-day money.

Retail CBDC would be final payment. No clearing/settlement needed. 24/7 Fast Payments also have immediate use (same day, maybe later settlement). CBDC may save 1 to 3 days in working capital due to faster access to funds, plus no interchange fee. Advantage CBDC.

Summary of Incentives ¹⁴

If all US retail sales in 2018 (\$5.27 trillion) were paid for by cards with an average interchange fee and other expenses of 1.5%, receivers would have paid \$79 billion in fees but would still have to wait one to three days to use their sales revenues. Replacing cards with retail CBDC or Fast Payments could save receivers \$79 billion, plus one to three days waiting to use their sales revenues.

In addition, with immediate access to sales revenues, receiver working capital costs could be reduced by \$505 million if one day is saved: $\$5.27 \text{ trillion} \times 1/365 \times .0350$ (where .0350 is borrowing rate).

User Fee: Advantage Cards. Receiver Cost Savings: Advantage CBDC.

- Net static advantage is for CBDC when interchange fees are high and receivers do not surcharge.
- Possible Card response: lower interchange fees (c.f., Durbin Amendment) and offer immediate availability of funds (c.f., The Clearing House Real Time Payments). Lost revenue made up with possible fees on consumer deposit accounts (as occurs with business accounts).
- If issued, retail CBDC may face a competitive market.

Share of Cash in the Market for Cash:

The share of cash in the market for cash is more appropriate than CIC/GDP in describing the competitive environment facing retail CBDC. Cash shares are falling for 24 of 25 countries. For 8 countries cash substitutes already have an 80% to 94% market share.

Revealed Preference for Cash Substitutes:

Revealed preference of older adults for cash, relative to younger adults, leads to a slow and steady reduction of the share of cash averaging 1.7 pp per year. Revealed preference is tied to changes in the age structure of a population (economic expansion, interest rates not significant).

Market for Cash, Cards, and Retail CBDC:

Cards would be the main competitor to CBDC. Cards' advantage is that they don't charge the user—they charge the receiver. CBDC (and Fast Payments) provide immediate access to revenues received, saving working capital costs, and card interchange fees. This may be reduced if countries have already lowered interchange fees and/or have widespread surcharging.