



# Measurement and Use of Cash by Half the World's Population

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# Policy issue and goals

## Policy Issue:

1. Improve the measurement of cash used for payments. This can better inform policy decisions concerning consumer access to and merchant acceptance of cash, as well retail CBDC.

## Four Goals:

1. Note current concerns with access to and acceptance of cash in low cash use countries.
2. Show differences in two measures of cash across 14 countries that produce 2/3rds of world GDP.
3. Argue that cash from ATMs better measures cash for payments than value of Currency In Circulation.
4. Show the rise and fall in cash use over 2005-2020 by country, and illustrate the aggregate effect over 16 years.

# Regulatory concerns with cash use (1)

## Access to cash:

- ❑ Falling demand for cash for purchases has led to reduced access to cash from banks in some countries.
- ❑ Banks have responded to reduced demand for cash by reducing their ATM networks to save costs.

## Preserving access to cash—some country experiences:

- ❑ **Netherlands.** The Dutch central bank has set 3,850 ATMs as the minimum number in the country to ensure adequate access to cash services. It has entered into a (non-regulatory) agreement between representatives from banks and consumers relating to cash deposits and cash withdrawals.
- ❑ **Norway.** Financial institution regulations now require banks to meet customer needs to deposit and withdraw cash, either at ATMs or banks, or through alternative means.
- ❑ **Sweden.** New rules ensure an “adequate” geographic coverage of ATMs and also require the six largest banks to ensure a minimum level of access to cash for consumers and companies.
- ❑ **Switzerland.** New rules ensure adequate geographic coverage of ATMs for cash withdrawals.
- ❑ **United Kingdom.** New legislation enables the widespread adoption of “cash-back” at the POS even without a purchase. Regulatory authorities will ensure that cash withdrawal and deposit facilities are available across the country and that there is a broad geographic coverage of free-to-use ATMs.

## Regulatory concerns with cash use (2)

### Merchant acceptance of cash:

- ❑ As consumers use less cash, the average cost of accepting it has risen. Fewer cash transactions do not lead to proportional reductions in expenses. Some merchants have refused to accept cash or try to charge a higher price when cash is used.

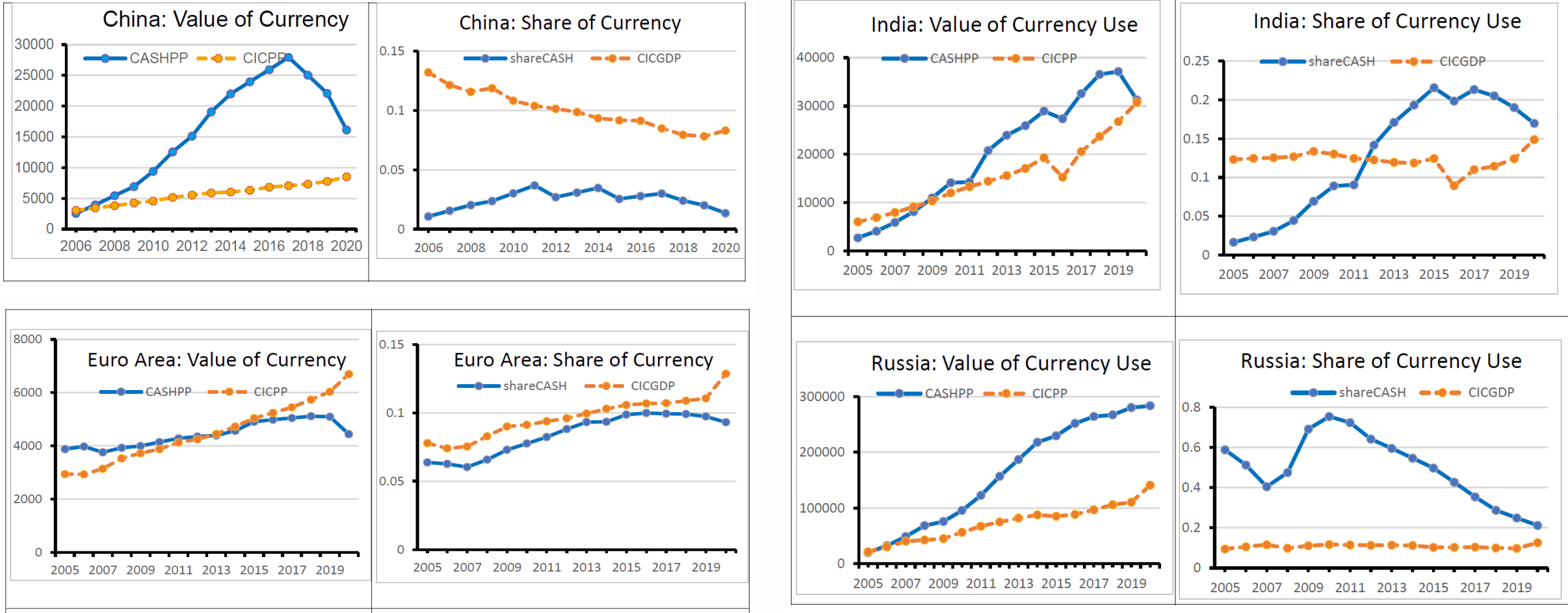
### Preserving acceptance of cash—some country experiences:

- ❑ **Netherlands.** New legislation enables the widespread adoption of “cash-back” at the POS even without a purchase. The central bank also entered into a (non-regulatory) agreement between representatives from banks, retailers, and consumers relating to the acceptance of cash by retailers.
- ❑ **Norway.** The government, with the support of the central bank, plans to assess the future role of cash in the event of natural disasters or situations where merchants may wish to only receive non-cash payments.
- ❑ **United States.** It is unlawful for retailers in some large cities to refuse to accept cash for payment and merchants can not charge cash-paying customers a higher price, compared to non-cash customers. Several states have also introduced similar pro-cash legislation.
- ❑ **Euro Area.** EC legislative proposal to safeguard role of cash, ensure it is widely accepted and remains easily accessible.

As cash positions reach low levels in other countries, similar regulations, rules, or voluntary agreements among providers and acceptors of cash payments may be implemented.

# Cash use per adult across countries 2005-2020

Note differences between **ATM cash** use or share per person (Blue Line) compared to **total currency in circulation** or share of GDP (Orange Line)

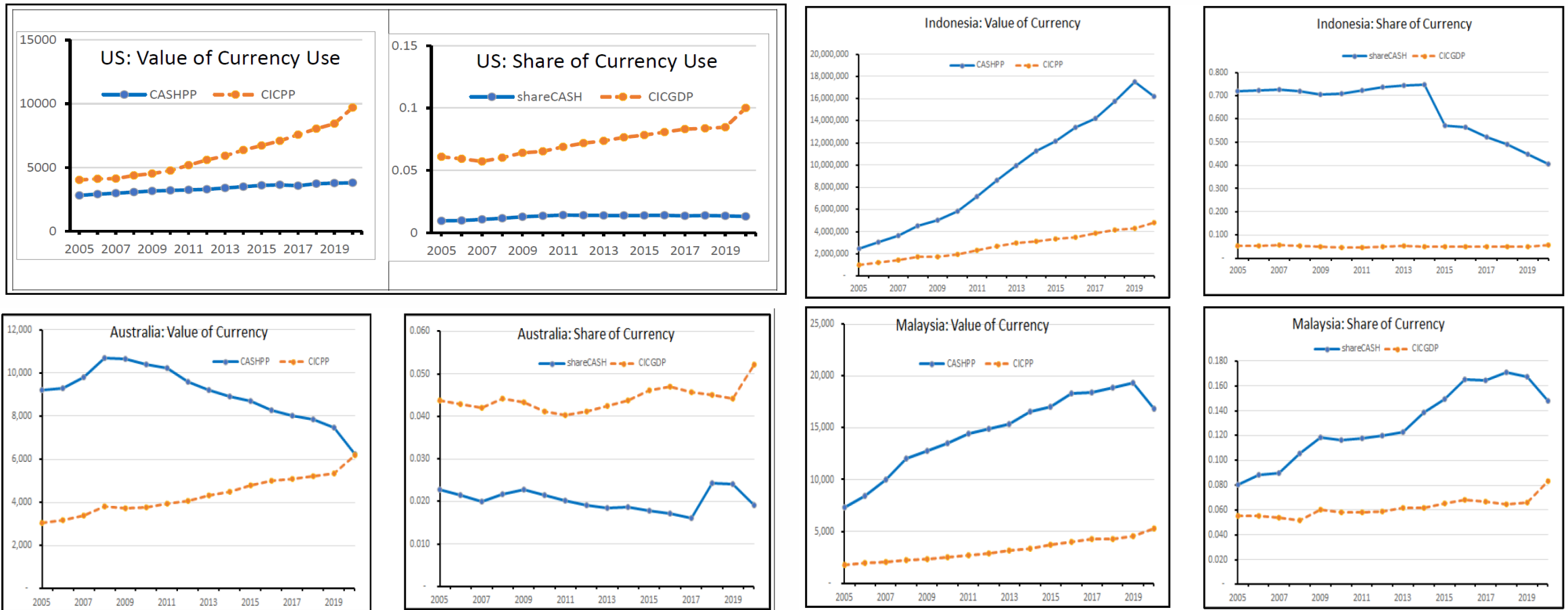


Source: Khaionarong and Humphrey (2023) [Measurement and Use of Cash by Half the World's Population](#), IMF Working Paper, WP/23/62, March.

Note: See Addendum for still other countries.

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Source: Authors' calculations, BIS, National Central Banks.

# Differences between 2 measures of cash use

Table 1. Inconsistencies Between CIC and ATM Cash

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Problem 1: One level measure is rising; the other is falling:

Australia, China

Problem 2: One level measure is rising or falling, the other is relatively stable:

Euro Area, Norway, Singapore, UK, US

Problem 3: One level measure rising or falling faster than the other one:

India, Indonesia, Malaysia, Mexico, Russia, Sweden, Thailand

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Table 2. Inconsistencies Between CIC/GDP and ATM Cash/Payment Value

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Problem 1: One relative measure is rising; the other is falling:

Australia, China

Problem 2: One measure is rising or falling, the other is relatively stable:

Euro Area, India, Indonesia, Malaysia, Norway, Russia, Singapore, UK, US

Problem 3: One measure rising or falling faster than other one:

Mexico, Sweden

Thailand (basically parallel, no problem)

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# Reasons why ATM cash is preferred to CIC (1)

- ❑ Currency in circulation (CIC) includes cash used for legal payments, hoarding, and illegal activities. We want a measure of cash for only legal payments. We could live with CIC if its time trend closely followed that of the value of cash withdrawn from ATMs. But this does not occur.
- ❑ VELOCITY: The ratio of CIC to GDP (CIC/GDP) does not well reflect the velocity of cash used for payments. The velocity here reflects the velocity of all of the types of payments used to generate GDP (cash, cards, checks, wire transfers, etc.).
- ❑ The annual value of cash withdrawn from a country's ATMs is a better indicator of the use of cash for payments since it reflects a **flow** of payments which includes both the **stock** of cash used for payments and the **velocity** of that stock. Velocity is indicated by the restocking of ATMs to replace the cash withdrawn.
- ❑ In analogy to  $M \times V = P \times T = \text{GDP}$  at the aggregate national level, where  $M$  is CIC and  $V$  is velocity, we want instead to have:

$$M' \times V' = P' \times T' = \text{value of cash used for payments} \approx \text{value of ATM cash.}$$

- ❑ While one could use  $M' = \text{CIC}$  or  $M' = \text{Small CIC}$  (Amromin & Chakravorti, 2009), this would leave both  $V'$  and  $P' \times T'$  unknown. We could set  $P' \times T' = \text{ATM cash}$  to obtain velocity from  $(\text{value of ATM cash})/\text{CIC}$ . But then we would already have the "answer" for  $P' \times T'$  and do not need either CIC or Small CIC. Also, the velocity obtained here would be incorrect since CIC includes more than just the stock of cash used for payments.

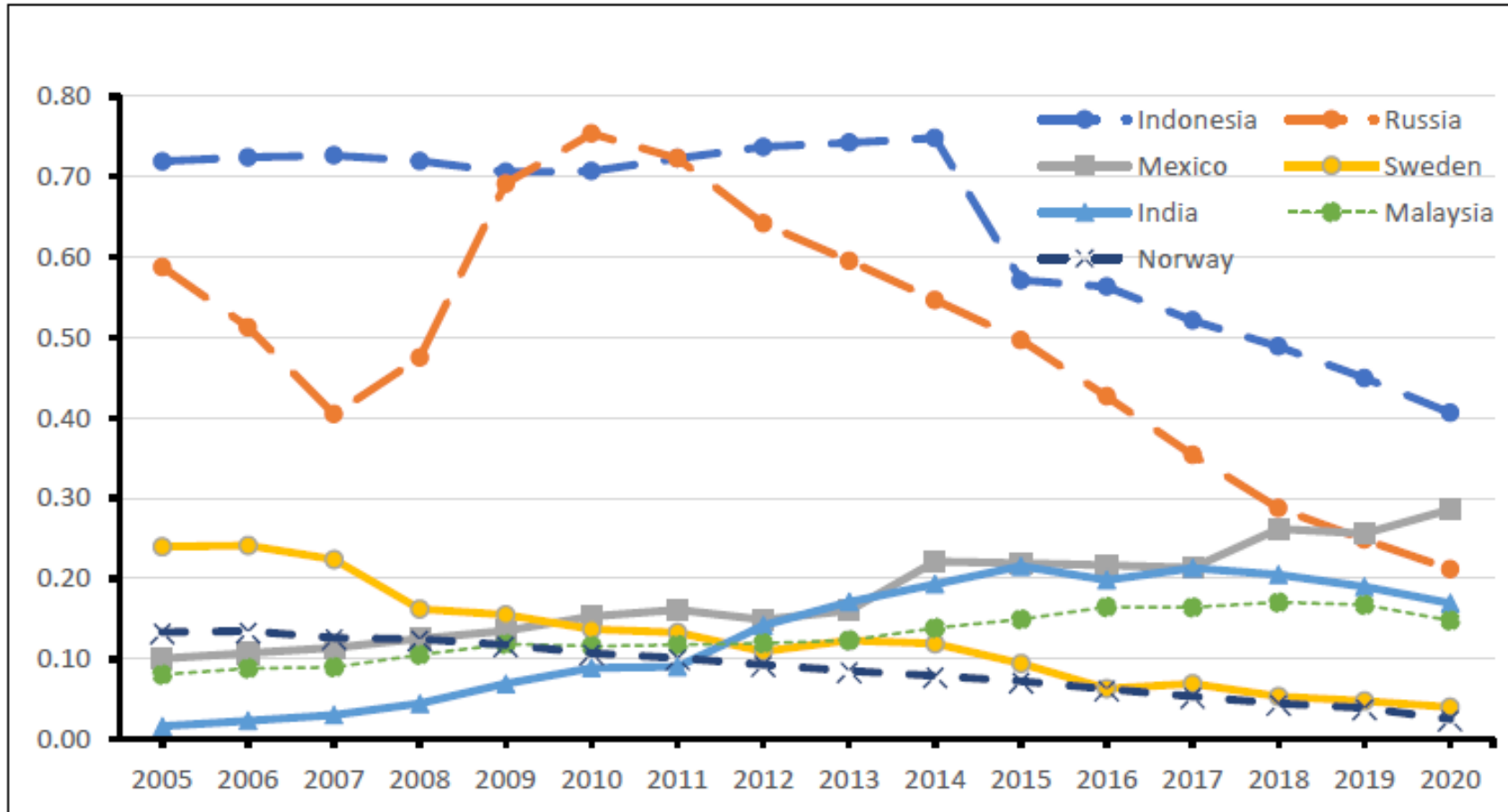


## Reasons why ATM cash is preferred to CIC (2)

- ❑ The value of Small CIC, where large value currency notes are excluded, better measures the stock of cash used for payments than CIC. Large value notes are typically used for hoarding and illegal activities. ATM cash is similar as cash stocked in ATMs typically contains middle value notes used for legal payments.
- ❑ In the US, the middle value note is \$20. Most of the \$50 and \$100 notes are held overseas and/or are used domestically for hoarding or illegal activities. Las Vegas is an exception.
- ❑ There are drawbacks to using ATM cash. Time-series data on “cash back” at the POS or cash obtained by consumers over the counter (OTC) at banks is not available for our countries. Cash obtained OTC at banks by merchants is commonly used for making change, not payments (except in some high cash-centric countries).
- ❑ The value of ATM cash + consumer OTC cash + “cash back” exists for the Euro Area in 2022 (ECB, 2022). Consumer use of ATM cash at the POS is 85% of this total. Consumer cash OTC from banks is 6% and “cash-back” is 3%. If the share of ATM cash in total consumer cash use is higher or lower than 85%, but the share of ATM cash in total cash is relatively stable, it will closely track the trend in total use of cash. If the share is unstable, most likely from OTC withdrawals (slowly) shifting to ATM withdrawals, the trend in ATM cash use in the figures will overstate the actual increase, or understate the actual decrease, in total consumer cash use for payments relative to CIC.
- ❑ TO CONCLUDE: we believe that ATM cash is a more accurate and timely measure of cash used for payments than is CIC, or even Small CIC.

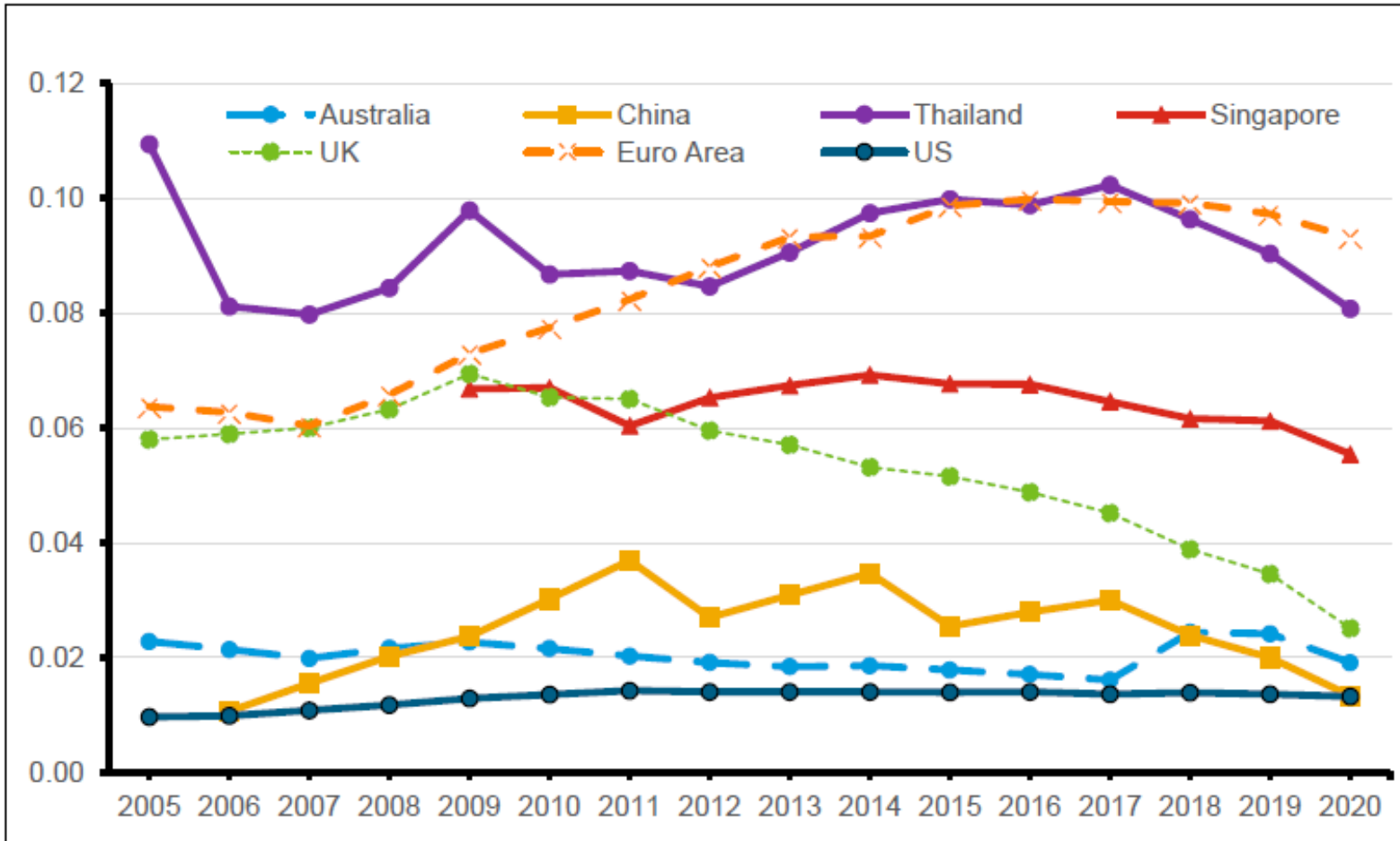
# Dispersion of cash use across countries (1)

Different levels of ATM cash use across countries is due to different countries being at a different point in the cash “life-cycle”—first rising, reaching a peak, and then falling.



All countries here have a cash share > 10% at some point in time.

## Dispersion of cash use across countries (2)



All countries here have a cash share < 10% almost all of the time.

# Share of ATM cash per adult: Peaks and declines

Column 4: shows year cash share has peaked.

Column 5: shows the percentage point decline in cash share after the peak.

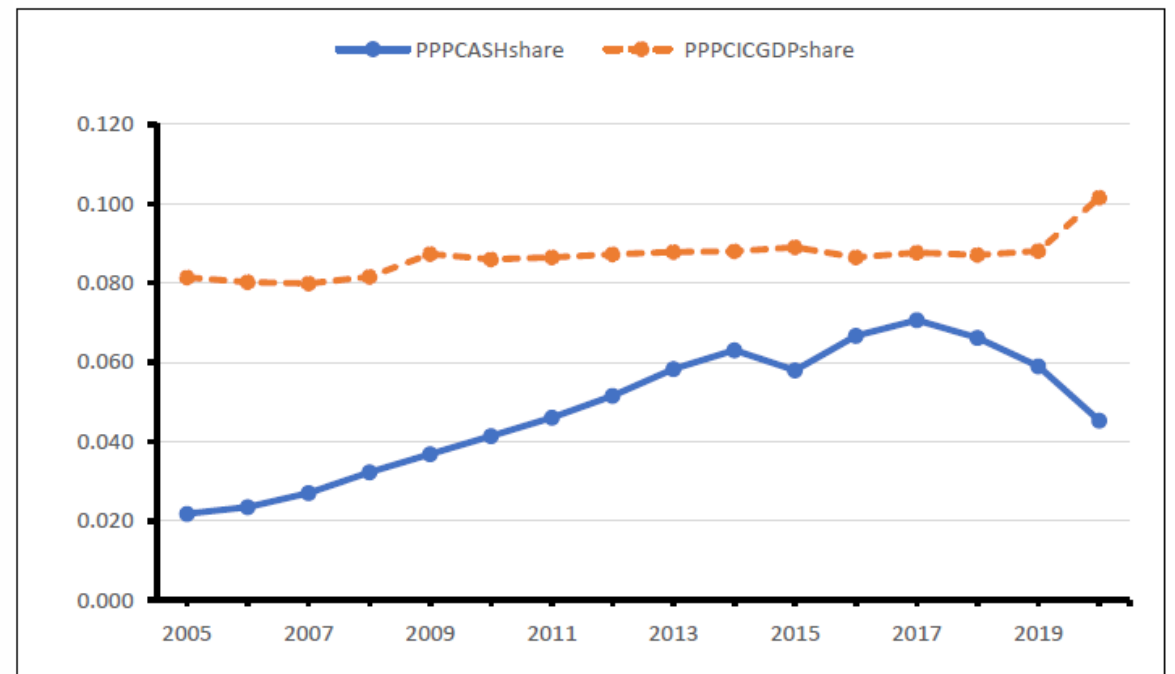
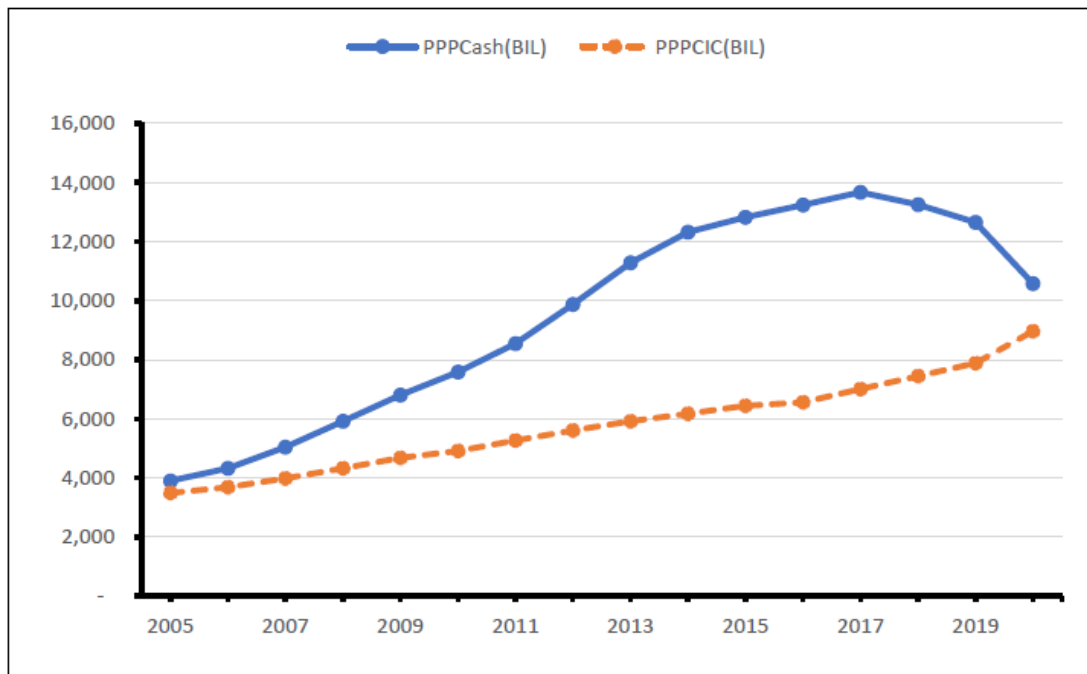
Country	Pct. Share in 2005 (1)	Pct. Share in 2020 (2)	pp change (3)	Peak Year (& Share) (4)	pp Decline Since Peak (5)
Russia	59%	21%	-38	2010 (75%)	-54
Indonesia	72	41	-31	2014 (75)	-34
Sweden	24	4.6	-19	2006 (24)	-20
Norway	13	2.5	-11	2006 (13)	-11
India	1.6	17	15	2015 (22)	-5
Thailand	11	8.1	-2.8	2005 (11)	-3
UK	5.8	2.5	-3.3	2009 ( 7)	-4
China	1.1	1.3	0.2	2011 ( 4)	-2
Malaysia	8.1	15	6.7	2018 (17)	-2
Australia	2.3	1.9	-0.4	2018 ( 2)	-1
Euro Area	6.4	9.3	2.9	2016 (10)	-1
Singapore	6.7	5.5	-1.2	2014 ( 7)	-1
US	1.0	1.3	0.3	2011 ( 1)	-0
Mexico	10	27	19	2020 (29)	0

Notes: pp = percentage points; all data are rounded; data starts in 2009 for Singapore, 2006 for China.

# Aggregate use of cash in PPP US \$

**ATM cash** use (Blue Line) first rises, reaches a peak, and then falls. **CIC** (Orange Line) also rises, but never falls.

The 14 countries cover half of the world's population that produce 2/3rds of world GDP.



# Conclusions

- ❑ Consumer access to cash and acceptance of cash by merchants is a public policy issue in some countries. To monitor it properly, and to determine the trend in cash use, a better measure of cash use for payments than CIC or the ratio of CIC to GDP, is needed. We believe that better measure is ATM cash.
- ❑ ATM cash largely excludes cash held for hoarding, for illegal activities, or being held outside the country. As a flow measure of cash use, it properly includes the velocity of cash used for payments while CIC or Small CIC does not.
- ❑ The trend in ATM cash use per adult in our 14 countries indicate that cash use has reached a peak and is currently falling. Our results for the Euro Area using ATM cash are similar to those found in ECB (2022) for consumer cash use at the POS (which excludes P2P and P2B payments).

# Addendum

Note differences between **ATM cash** use or share per person (Blue Line) compared to **total currency in circulation** or share of GDP (Orange Line)

