



The Economics of Distributed Ledger Technology

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The views presented are those of the presenter and not necessarily those of the Bank for International Settlements

Main question:

- What is the economic potential of Distributed Ledger Technology (DLT) as a market design?
 - Answer needs to consider two very distinct variants
- I. **Permissionless**, ie based on proof-of-work & anonymous miners (in cryptocurrencies like Bitcoin)
- II. **Permissioned**, with multiple but predetermined & known validators (replacing a centralised infrastructure with a decentralised one)

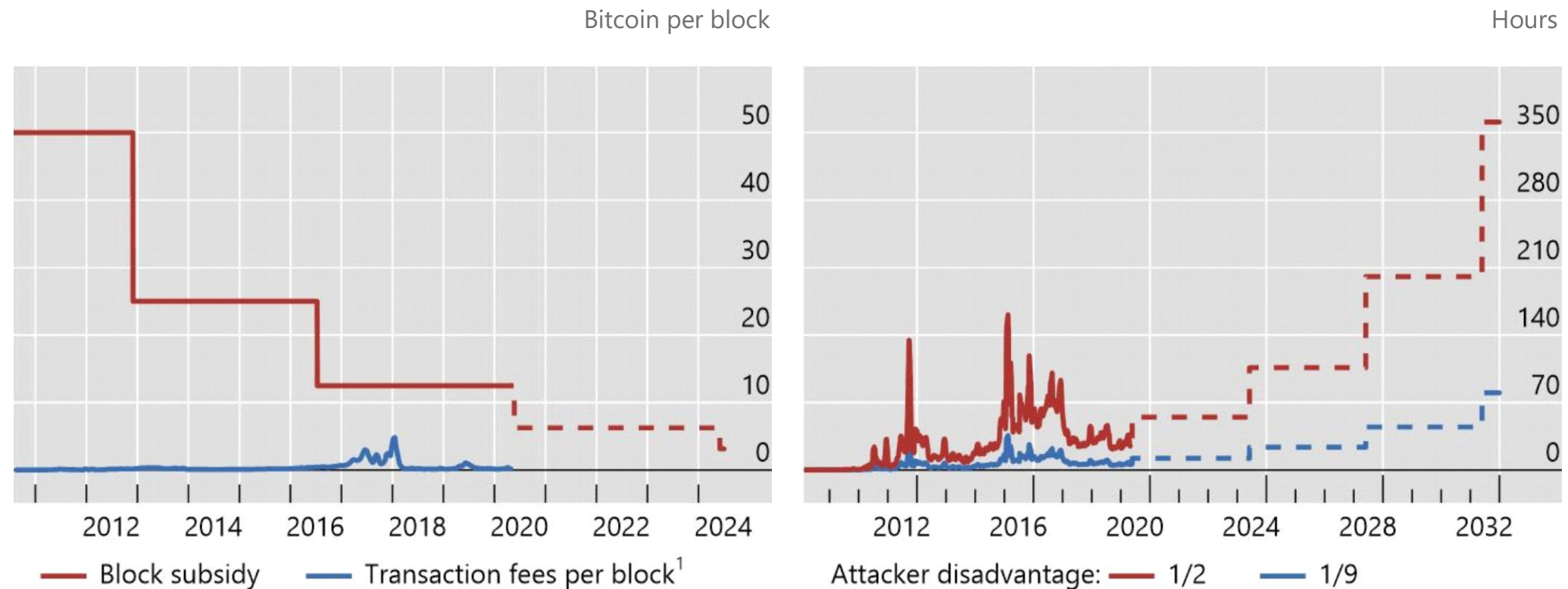
I. Permissionless DLT (focussing on Proof-of-work)

- In cryptocurrencies like Bitcoin, forgeries are deterred by a **costly signal**:
 - Solving a hard puzzle allows updating blockchain, and collect transactions fees & newly created bitcoins (block subsidy)
 - Higher mining income => puzzle becomes more difficult => payments safer
- Currently works, but:
 - A LOT of miner income is need to sustain exchange (Chiu & Koeppl (2017), Budish (2018), Leshno and Strack (2020), Garrat and van Oordt (2020), Gandal et al. (2020))
 - Outlook is unclear as block subsidy will decrease and transaction market cannot generate adequate income (Auer (2019)).

With decreasing miner income, liquidity deteriorates

Block subsidy has thus far made up the bulk of mining income ...

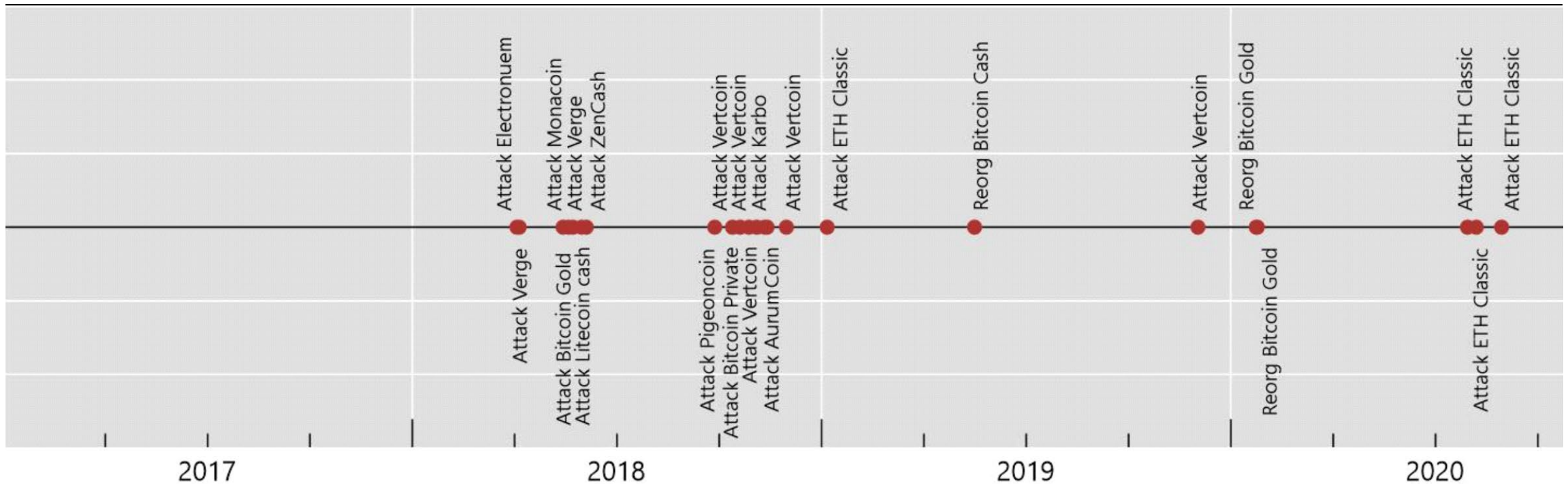
... so the liquidity will deteriorate over time.



Source: based on Auer, R (2019), "Beyond the doomsday economics of 'proof-of-work' in cryptocurrencies", *BIS Working Papers*, no 765.

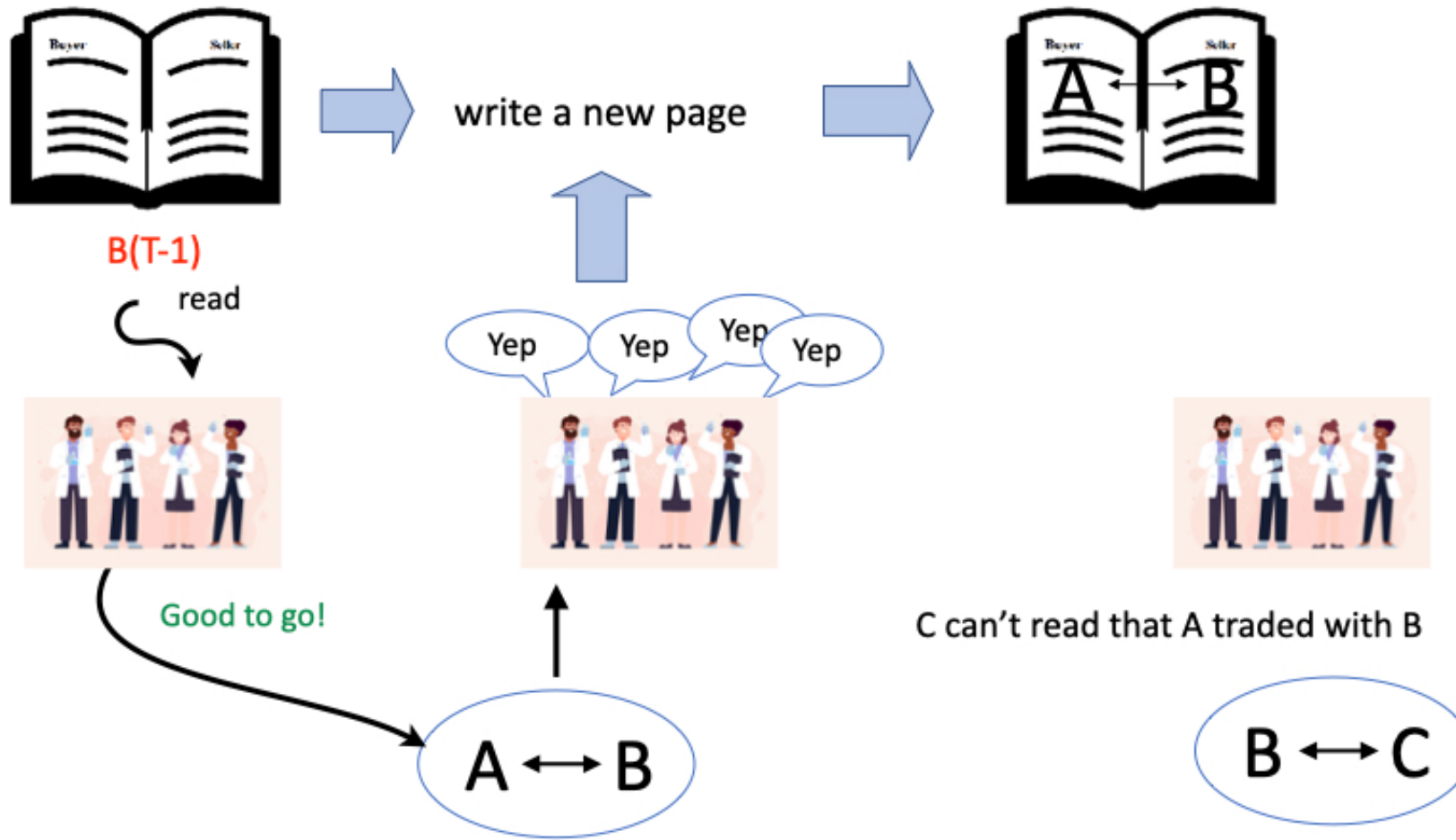
A number of cryptocurrencies have already fallen victim to attacks

A timeline of cryptocurrency 51% attacks/deep reorgs since 2017



Sources: S Shanaev (2020); blocksdecoded.com; bravenewcoin.com; btcmanager.com; coinbase.com; Coindesk.com; deribit.com; github.com; medium.com.

II. Permissioned DLT: a network of known validators

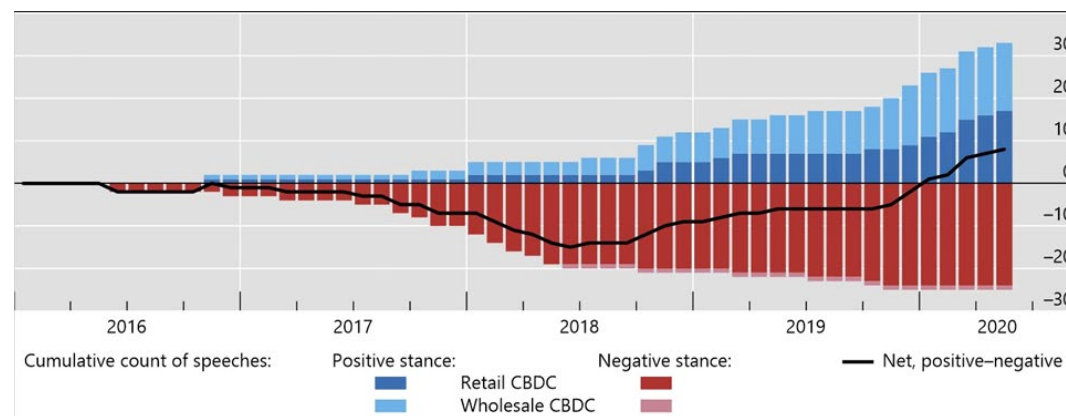


What is the potential of permissioned DLT?

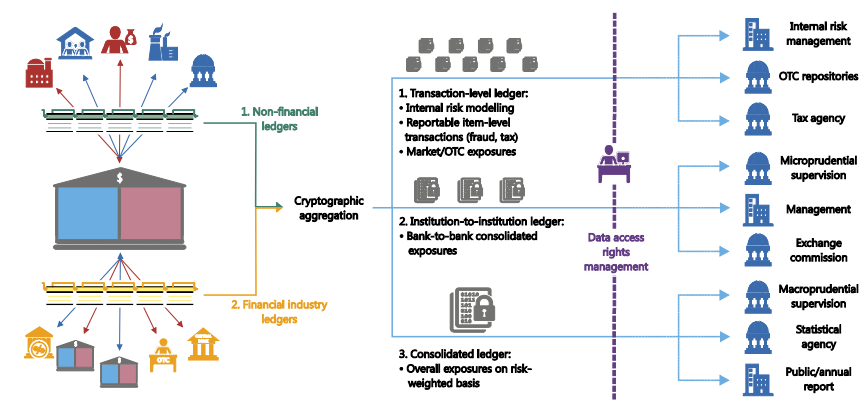
- Applications in CBDC, trade finance, compliance are being explored

Speeches on CBDCs have turned more positive since late 2018

Number of speeches



Can DLT facilitate compliance via "embedded supervision"?



Source: Author's elaboration.

- But what guarantees the governance of such systems?
 - Decentralisation itself is meaningless, outcomes matter!

The economics of permissioned DLT (Auer, Monnet, and Shin (2020))

- We formalise validators incentives to free ride and validate honestly in a public good contribution game
 - Validators coordinate on delivering a public good: **consensus**
- 1. Strong governance requires many validators with high stakes
 - Easier to incentivise validators if they also benefit from trading in the market
- 2. But, having multiple validators introduces difficulty of coordination efforts
 - **Optimal design of DLT balances these forces, which may make for a system that is more efficient than a centralised intermediary.**

Conclusion

- Economic analysis of DLT needs to distinguish different variants
 - I. **Permissionless** enables trade in under total anonymity at the expense of extreme inefficiency
 - II. **Permissioned** with a known set of multiple validators
 - Can be efficient under specific circumstances
 - But, technology and market design in infant stage, practical applicability still needs to be proven