Blockchain Technology and Stablecoins in Traditional Finance

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Introduction

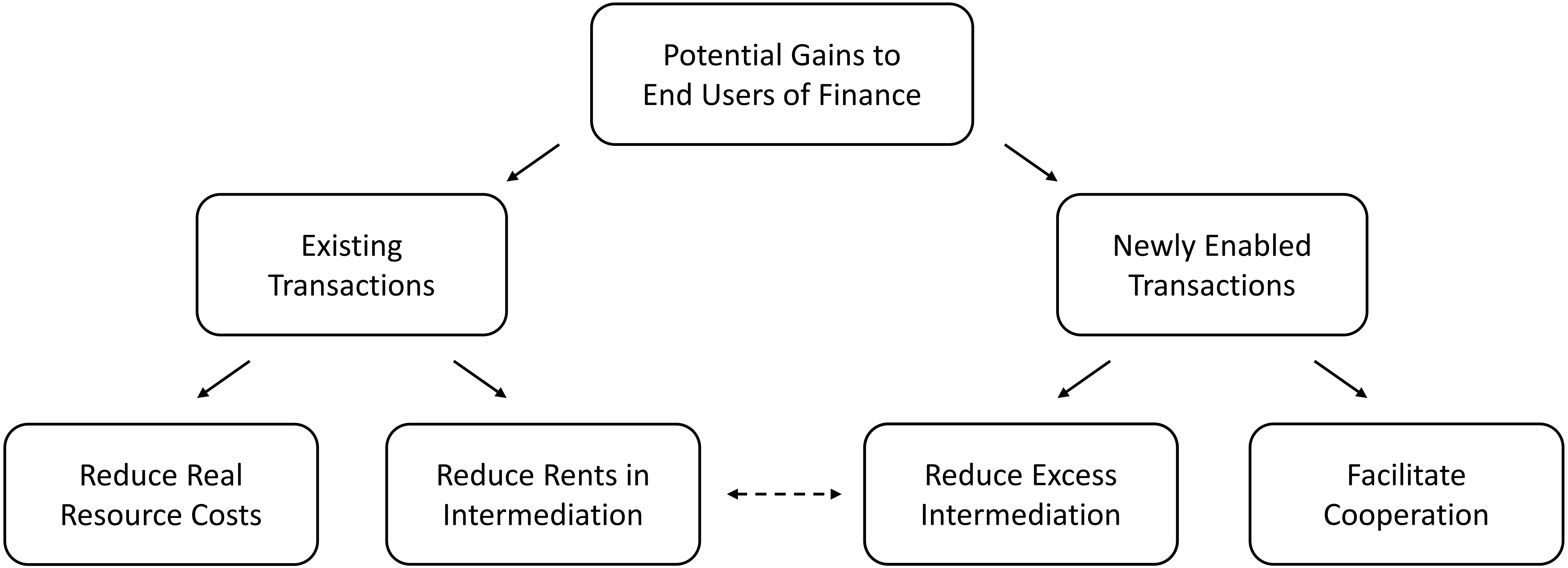
- **Much of traditional finance amounts to record keeping**
  - To invest and trade, must agree on who owns what at each point in time.

- **Historically use reputation, rule of law to sustain agreement about records**
  - Resulting system features concentration, high rents, and outdated technology

- **Blockchain technology opens new possibilities for record keeping**
  - Cryptocurrencies combine (i) novel data structure and (ii) novel trust mechanism
  - <u>Budish (2023):</u> decentralized, anonymous trust is very expensive
    - Flow cost of trust must be large relative one-off value of value of attacking the system

- **<u>Our question:</u> Can an idealized version Blockchain data structure generate value?**
  - Supplemented with traditional forms of trust like reputation and rule of law

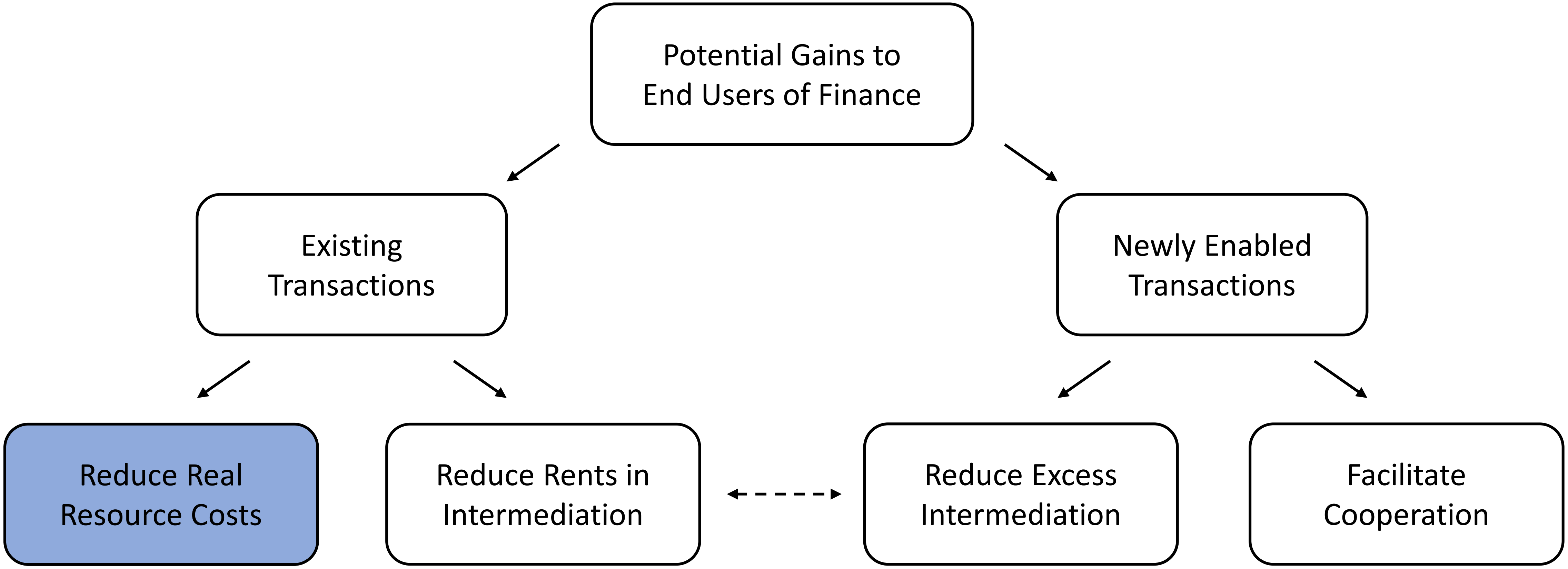
Framework for Analyzing Gains of Idealized Data Structure



Scope and Definitions

- **Blockchain tech = distributed database with trust grounded in existing mechanisms**
  - Example: distributed database that
    - uses cryptographic signatures as identifiers
    - requires distributed consensus to add transactions
    - enables smart contracts
    - is restricted to regulated financial institutions
- **Posit that this ideal data structure exists and explore economic gains it might provide to end users of financial system**
  - Will not take a stand on design, which sidesteps constraints highlighted by literature (Abadi and Brunnermeier 2022)
  - Makes our analysis an upper bound
- **Focus on financial intermediation that is primarily about the data structure**
  - Financial intermediaries that record and execute decisions, but do not make decisions
  - <u>Large:</u> US equity + fixed income transaction volume = $375 trillion per year

Reducing Real Resource Costs for Existing Transactions



Real Resource Costs: Back Office

- **Every large intermediary employees a significant number of people in back office and treasury functions**
  - For instance, DTCC employs 4,300 people

- **Blockchain technology could significantly streamline these functions**

- **What are the total potential gains?**
  - According to the BLS, the financial services industry employed 53,000 “bookkeeping, accounting, and auditing clerks” in 2021.
  - It employed another 10,000 people as “information clerks” and the there are many similar job categories.

- **<u>Rough approximation:</u> 100,000 jobs saved x $200,000 per job = $20 billion/year.**

Real Resource Costs: Balance Sheet Efficiency

- **Two types of balance sheet costs in a transaction: (i) gross and (ii) net.**

Real Resource Costs: Balance Sheet Efficiency

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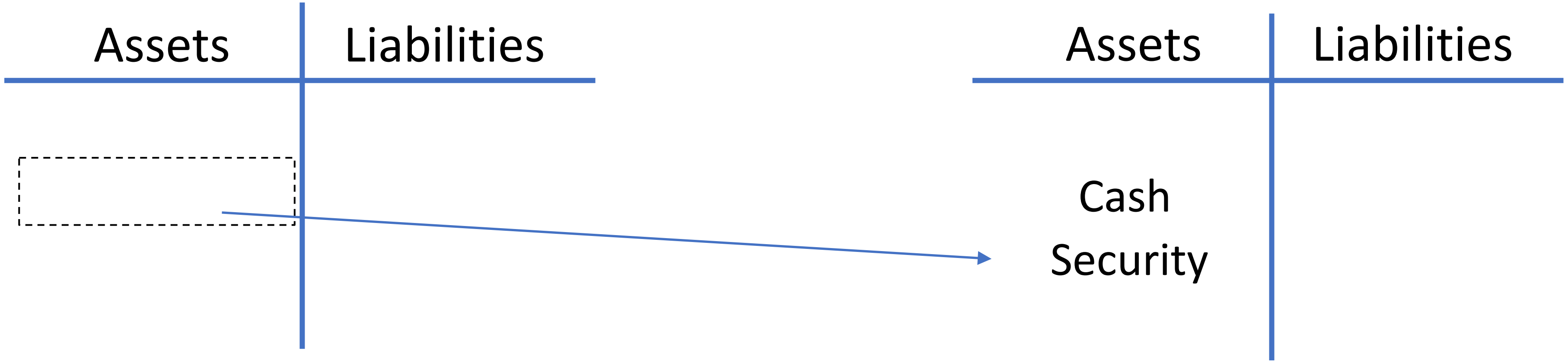
Assets	Liabilities
Security	

Assets	Liabilities
Cash	

Real Resource Costs: Balance Sheet Efficiency

1. **<u>Gross:</u> Forgone interest due to sending security before receiving cash.**



$$Forgone\ Interest \approx Riskfree\ rate \times \frac{Days\ to\ Clear}{365} \times Transaction\ Volume$$

Real Resource Costs: Balance Sheet Efficiency

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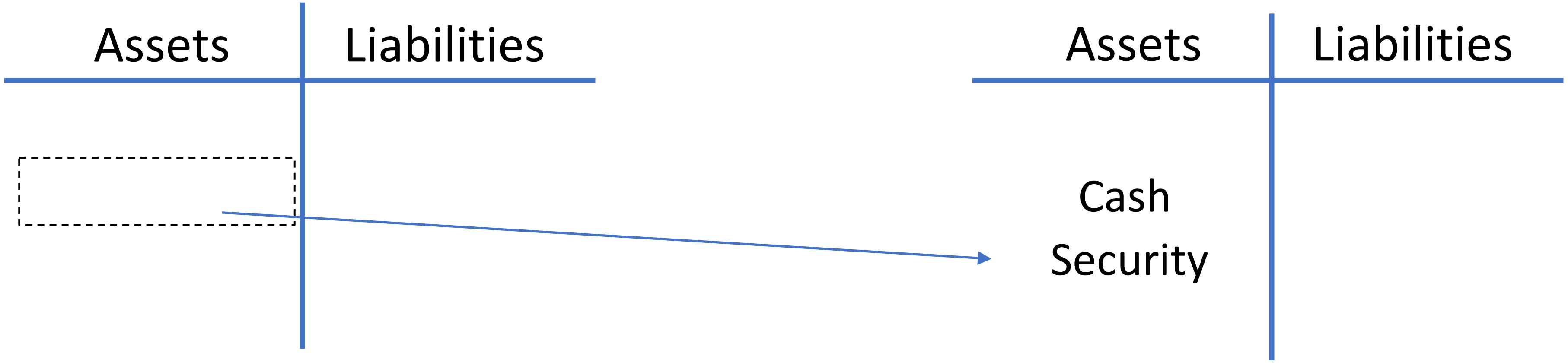
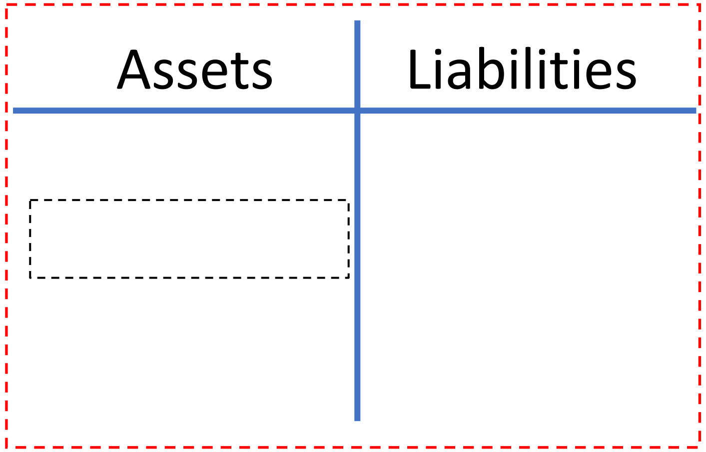


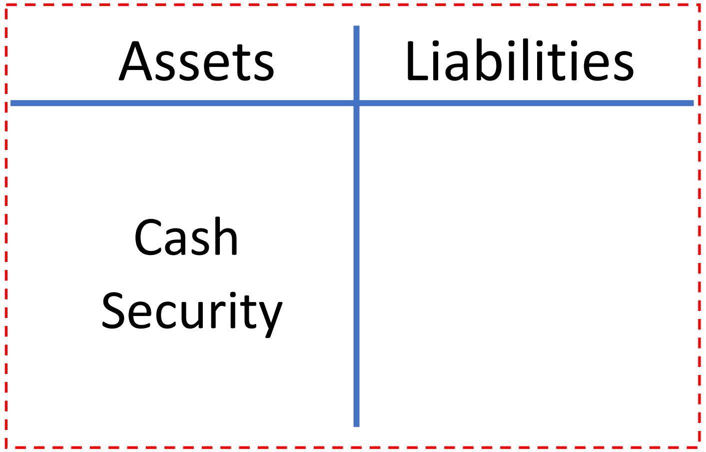
$$Forgone\ Interest \approx Riskfree\ rate \times \frac{Days\ to\ Clear}{365} \times Transaction\ Volume$$

- Applied to total transaction volumes: 5% x 2/365 x $375 trillion = $103 billion/year.
- **<u>But these costs offset:</u> One party's loss is the other's gain.**
  - Incentives to avoid losses may create net cost, e.g., war of attrition.

Real Resource Costs: Balance Sheet Efficiency

2. <u>Net:</u> Balance sheets are larger on average due to transactions clearing.

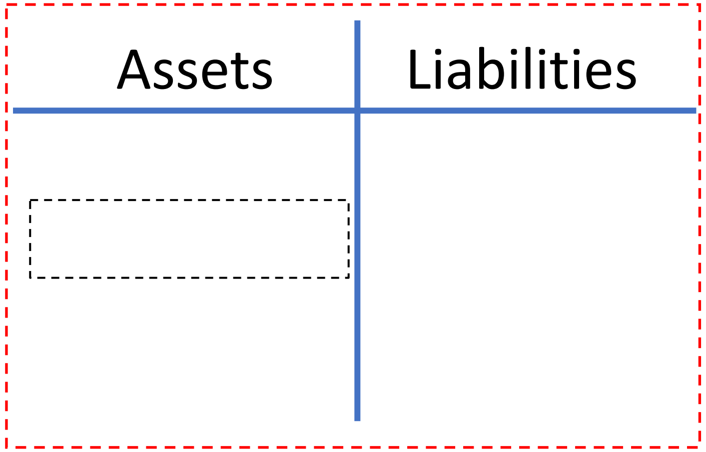


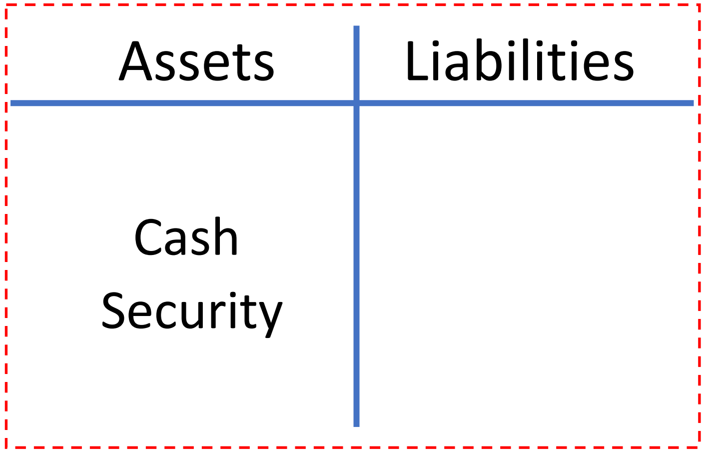


- Example: Fund with $100 balance sheet trades $1/2 days, transactions take 2 days to clear.
- $1 always tied up in transactions; i.e., balance sheet would be $99 with instant clearing

Real Resource Costs: Balance Sheet Efficiency

2. **<u>Net:</u> Balance sheets are larger on average due to transactions clearing.**





- Example: Fund with $100 balance sheet trades $1/2 days, transactions take 2 days to clear.
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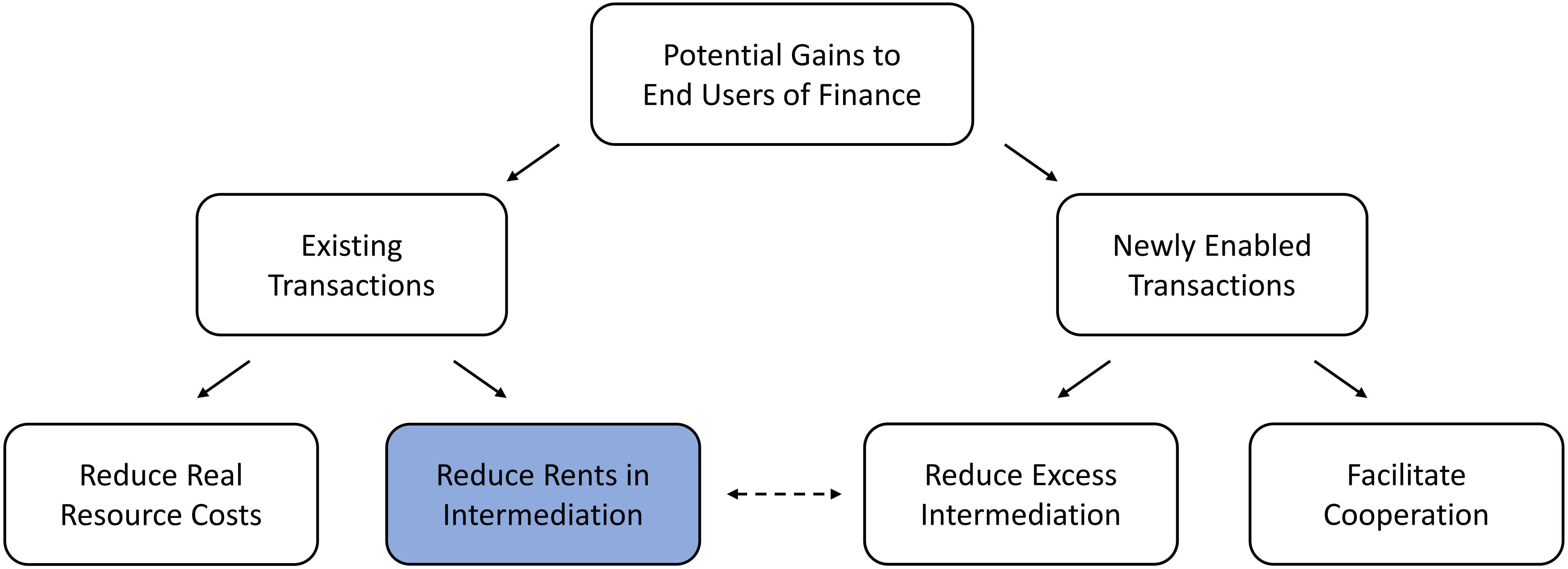
$$Cost \approx MMCost \times \frac{Days\ to\ Clear}{365} \times Transaction\ Volume$$

- Applied to total transaction volumes: 1% x 2/365 x $375 trillion = $21 billion/year.

Reducing Intermediation Rents for Existing Transactions



Intermediation Rents

- **Intermediation is highly concentrated.**
  - Market thickness externalities, high fixed costs, reputation, regulation, etc.
- **Concentration raises concerns that markups are high.**
- **Suggests that reducing real resource costs may not be enough to significantly lower overall price of transacting to end users of financial system.**
  - Indeed, often think that oligopoly accelerates technological innovation/adoption because individual firms capture more of the gain
- **High concentration and markups offer possibility of tantalizingly large gains from new technology.**
  - Philippon (2015): intermediation costs end users 2% of assets
  - Greenwood and Scharfstein (2013): 8% of GDP.

Intermediation Rents

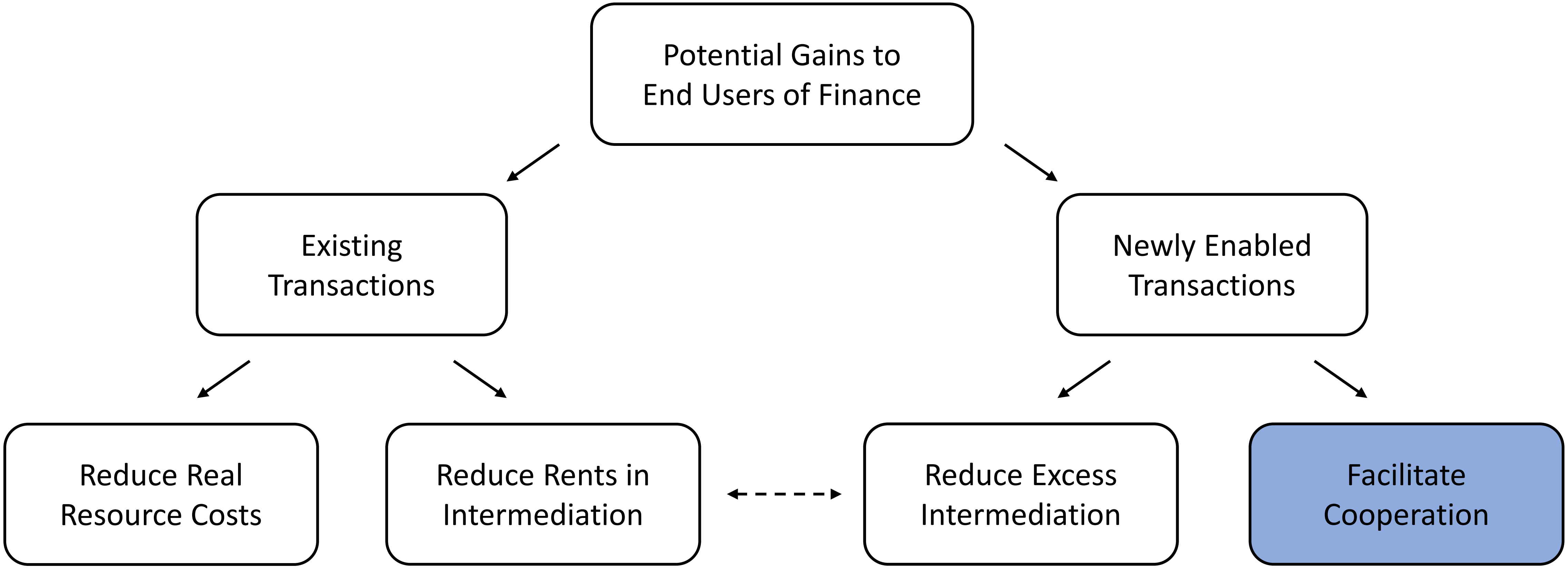
- **Hard to see gains of this magnitude at present.**
  - Macro reason: total cost of financial intermediation has been 2% for last 100 years (Philippon 2015).
  - Micro reason: markups often remain high because customers are inelastic and face high switching costs (e.g., Egan, Lewellen, Sunderam 2021 on bank deposits)

- **More broadly, can idealized data structure change microeconomic drivers of high concentration and high markups?**

- **If concentration driven by fixed costs, then potential for large reductions in price of transacting for end users of financial system.**

- **If concentration driven by trust or reputation, then smaller potential benefits.**
  - Market thickness externalities may reflect trust.
  - In which case gains limited by Budish (2023) argument.

Facilitating Cooperation to Enable New Transactions



Facilitating Cooperation to Enable New Transactions

	Player 2		
Player 1	Engage, Cooperate	Engage, Cheat	Do not Engage
Engage, Cooperate	$+f$, $+f$	$-V$, $+V$	0, 0
Engage, Cheat	$+V$, $-V$	$-\varepsilon$, $-\varepsilon$	0, 0
Do not Engage	0, 0	0, 0	0, 0

- **Think of a transaction as Prisoners' Dilemma, augmented with option to not engage.**
  - *f = surplus << V = size of transaction*

Facilitating Cooperation to Enable New Transactions

Player 1 \ Player 2	Engage, Cooperate	Engage, Cheat	Do not Engage
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Do not Engage	0, 0	0, 0	0, 0

- **Only static equilibrium is {Do not engage, Do not engage}**

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Do not Engage	0, 0	0, 0	0, 0

- **Folk theorem sustains cooperation if:** $\delta/(1-\delta)Nf > V$.
  - δ = discount factor, N = transactions/period.

Facilitating Cooperation to Enable New Transactions

Player 1 \ Player 2	Engage, Cooperate	Engage, Cheat	Do not Engage
Engage, Cooperate	$+f$, $+f$	$-V$, $+V$	0, 0
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- **Blockchain technology can help in three ways.**

Facilitating Cooperation to Enable New Transactions

Player 1	Player 2: Engage, Cooperate	Player 2: ~~Engage, Cheat~~	Player 2: Do not Engage
Engage, Cooperate	$+f$ $+f$	$+V$ $-V$	0 0
~~Engage, Cheat~~	$-V$ $+V$	$-\varepsilon$ $-\varepsilon$	0 0
Do not Engage	0 0	0 0	0 0

1. **Technologically eliminate ability to cheat.**

Facilitating Cooperation to Enable New Transactions

Player 1	Player 2: Engage, Cooperate	Player 2: Engage, Cheat	Player 2: Do not Engage
Engage, Cooperate	$+f$, $+f$	0, $-P$	0, 0
Engage, Cheat	$-P$, 0	$-\varepsilon$, $-\varepsilon$	0, 0
Do not Engage	0, 0	0, 0	0, 0

2. Reduce benefits to cheating in a static sense. Payoffs {-*V*, *V*} vs {0, -*P*}.

Facilitating Cooperation to Enable New Transactions

Player 1	Player 2: Engage, Cooperate	Player 2: Engage, Cheat	Player 2: Do not Engage
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Do not Engage	0, 0	0, 0	0, 0

3. Enhance <u>dynamic</u> cooperation: ***M*** x $\delta/(1-\delta)Nf > V$.

- *M* = number of other institutions that can observe transaction history between players 1 and 2.

Facilitating Cooperation to Enable New Transactions: Key Lessons

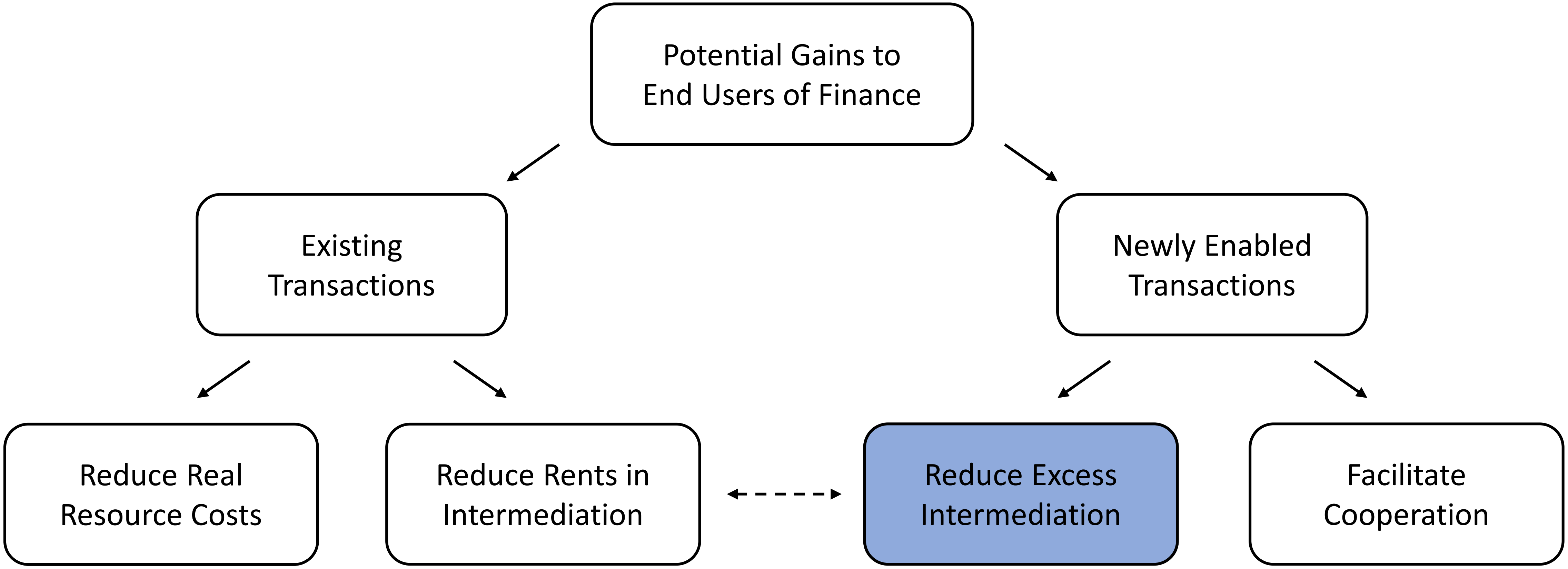
- **Transactions that are not taking place in the current system cannot be:**
  - High-surplus (high *f*) or
  - Between counterparties that frequently interact (high *N*).
  - If they were, they would already be taking place.

- **Missing transactions must be relatively infrequent and relatively low surplus.**

- **This does not mean that better technology cannot generate significant value.**

- **There could be many such transactions, so that in total the value lost from existing data structures is large.**

Enable New Transactions by Reducing Excess Intermediation



Excess Intermediation

- **Middle case between new and existing transaction: Two parties do not transact directly, but instead interact through trusted intermediary.**
  - For instance, a Polish bank and a Brazilian bank may not interact often enough to sustain cooperation directly.
  - They may then choose to transact through a trusted counterparty (e.g., JP Morgan).

- **Better technology may allow parties to transact directly, with two benefits:**
  - Rents to counterparties decline
  - Real resources spent to monitor counterparties/maintain their reputations decline

- **Close cousin of reducing intermediation rents for existing transactions**

Application: Stablecoins

- **Many stable value claims in traditional finance.**
  - Deposits, money market fund shares, intraday credit, etc.

- **Like these claims, stablecoins aim to serve two primary economic purposes:**
  1. Store of value
  2. Medium of exchange

- **Two key distinctions between stablecoins and other stable value claims:**
  - Use of Blockchain technology
  - Fungibility/transferability
    - Transactions in traditional finance involves updating more ledgers → transferability is itself a source of efficiency

Application: Stablecoins

- **Considering broader technological context changes the way we think about the potential benefits of stablecoins**

- **For stablecoins to significantly reduce markups in payment service, must resolve tension between thick markets externalities and competition.**
  - A standardized “backbone” protocol used by competing private firms is similar to the traditional system

- **If Blockchain technology is more broadly adopted, relative gains in payment services offered by stablecoins decline.**
  - Other ledgers in traditional finance become more efficient → smaller gains from stablecoins’ transferability

- **However, relative gains may expand in other areas, e.g., safe asset creation.**
  - Algorithmic stablecoins have not been successful to date
  - In part because the only assets currently on Blockchains are not suited to back them (e.g., other cryptocurrencies, the equity of the firm’s own business).

Static vs. Dynamic Considerations

- **Analysis here is essentially static: what are gains from Blockchain technology, given the way traditional finance works today?**

- **Leaves open the possibility that transparency and credibility of an idealized data structure might enable innovation that does create a lot of value.**

- **Example: The relational database (i.e., SQL databases)**
  - Proposed in 1970 and first commercialized in the late 1970s
  - In 1983, unlikely we have foreseen adoption and value creation
  - But today, financial firms find this technology essential
  - Adoption driven by private sector with coordination largely achieved through nongovernmental organizations (e.g., American National Standards Institute).

Conclusion

- **How big are the gains from an idealized data structure?**
  - Real resource costs could be reduced \$50 billion/year → capitalized value \$500 billion.
  - Meaningful compared to (i) peak market value of cryptocurrencies (\$3 trillion) and (ii) the market capitalization of global banks (\$8 trillion).
  - Bigger gains may be possible from changing competitive structure, but hard to see today.

- **Blockchain technology likely to valuable in a similar way as other computational technologies have turned out to be valuable in finance.**
  - Small efficiencies in the near term, but if there are large efficiencies they will develop slowly over time.

- **Hype and excitement about blockchains has shined a light on excess rents and outdated technologies in traditional finance.**
  - Likely to spur innovation and modernization.
- **Thanks!**

Scope and Definitions

- **Blockchain data structure**
  - Append-only distributed database with well-defined permissions
  - But trust grounded in existing legal infrastructure, reputations, relationships, etc.

- **<u>Example:</u> distributed database of transactions that**
  - Uses cryptographic signatures as identifiers
  - Requires distributed consensus to add transactions
  - Enables smart contracts
  - Is restricted to regulated financial institutions that fulfill know-your-customer and anti-money-laundering regulations

- **Posit that ideal data structure exists and explore economic gains it might provide**
  - Will not take a stand on design details
  - Sidesteps some constraints highlighted by literature (Abadi and Brunnermeier 2022)
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- **Focus on financial intermediation that is primarily about the data structure**
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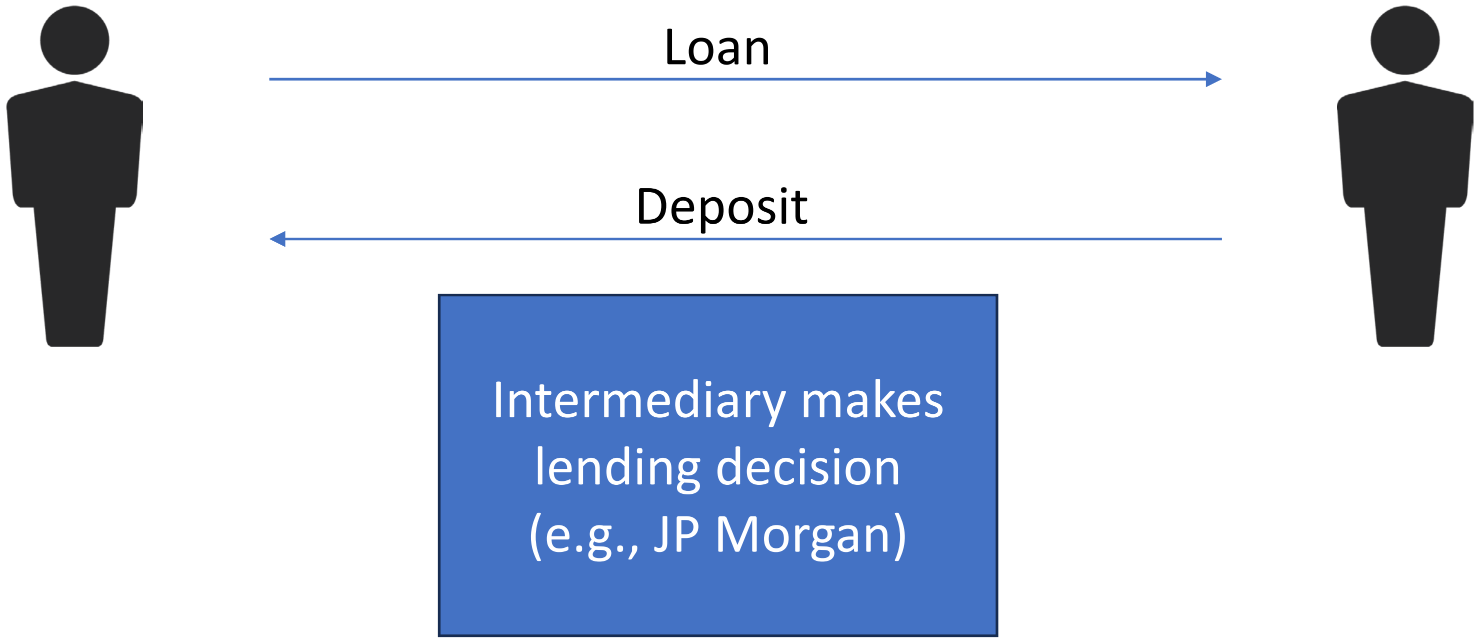

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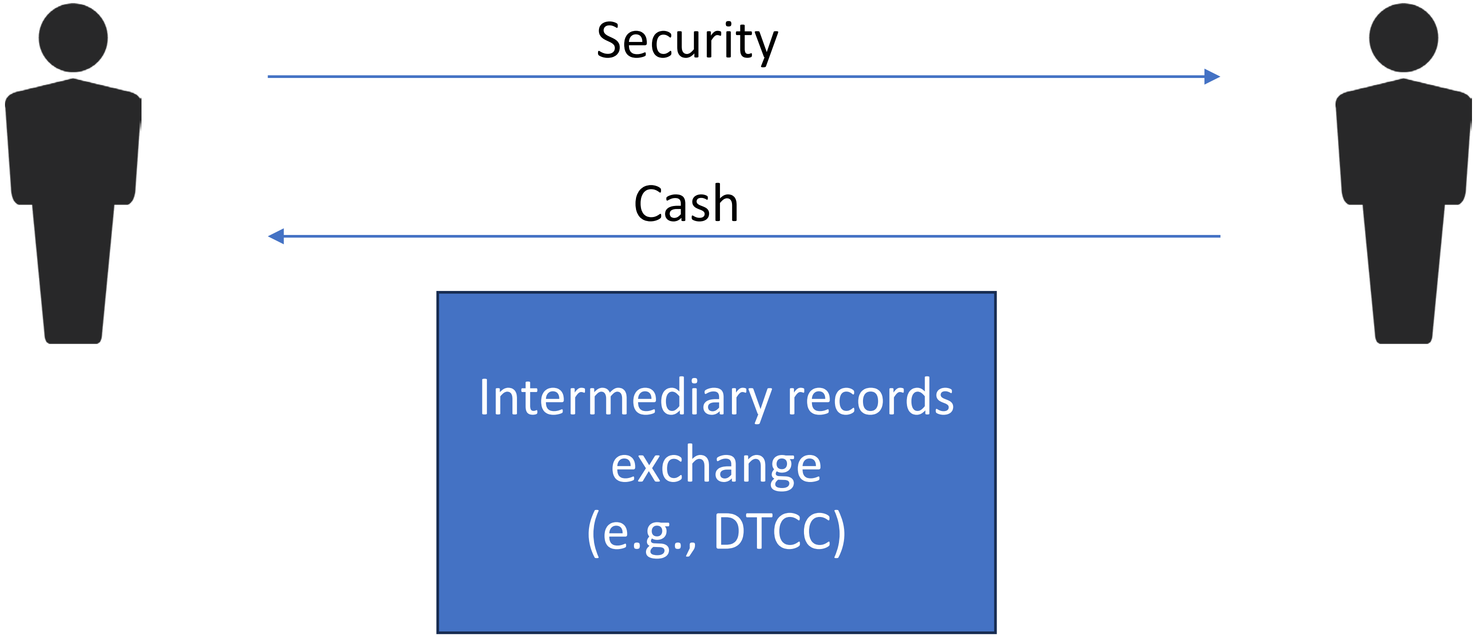
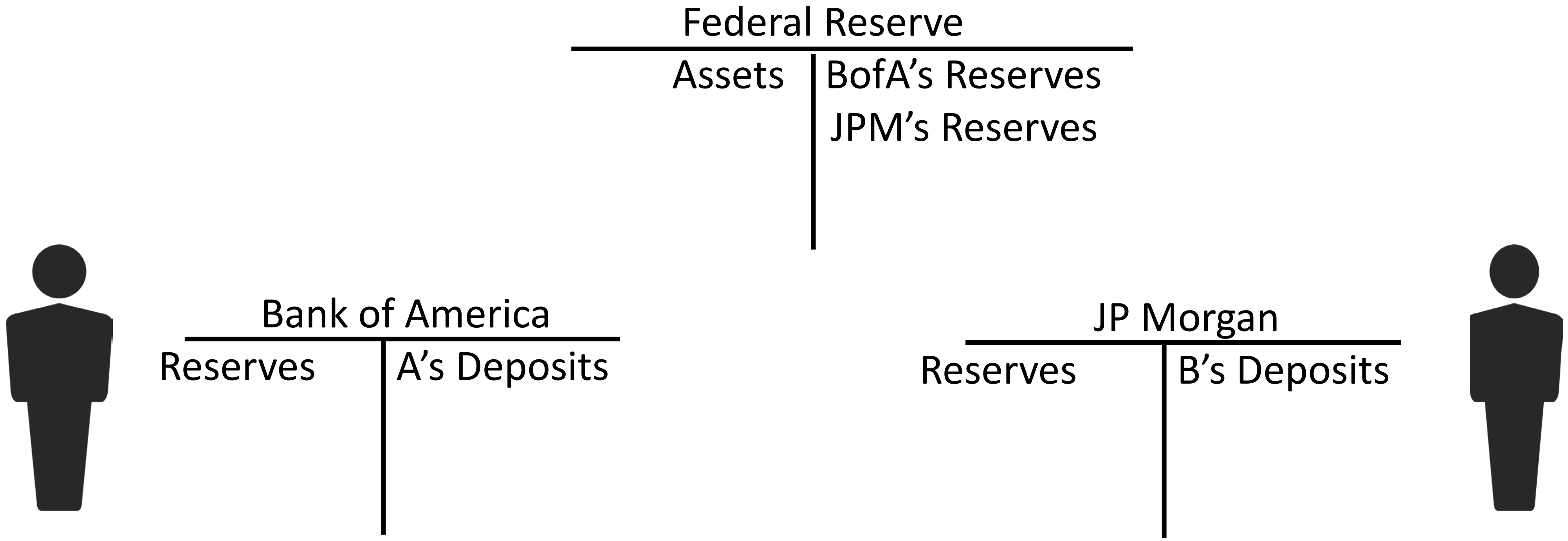


- **A large quantity of intermediation falls in this category**
  - US equity + fixed income transaction volume = $375 trillion per year

Application: Stablecoins

- **Fungibility/transferability reduce the number of ledgers involved in transaction**
  - Three ledgers involved in a traditional banking transaction



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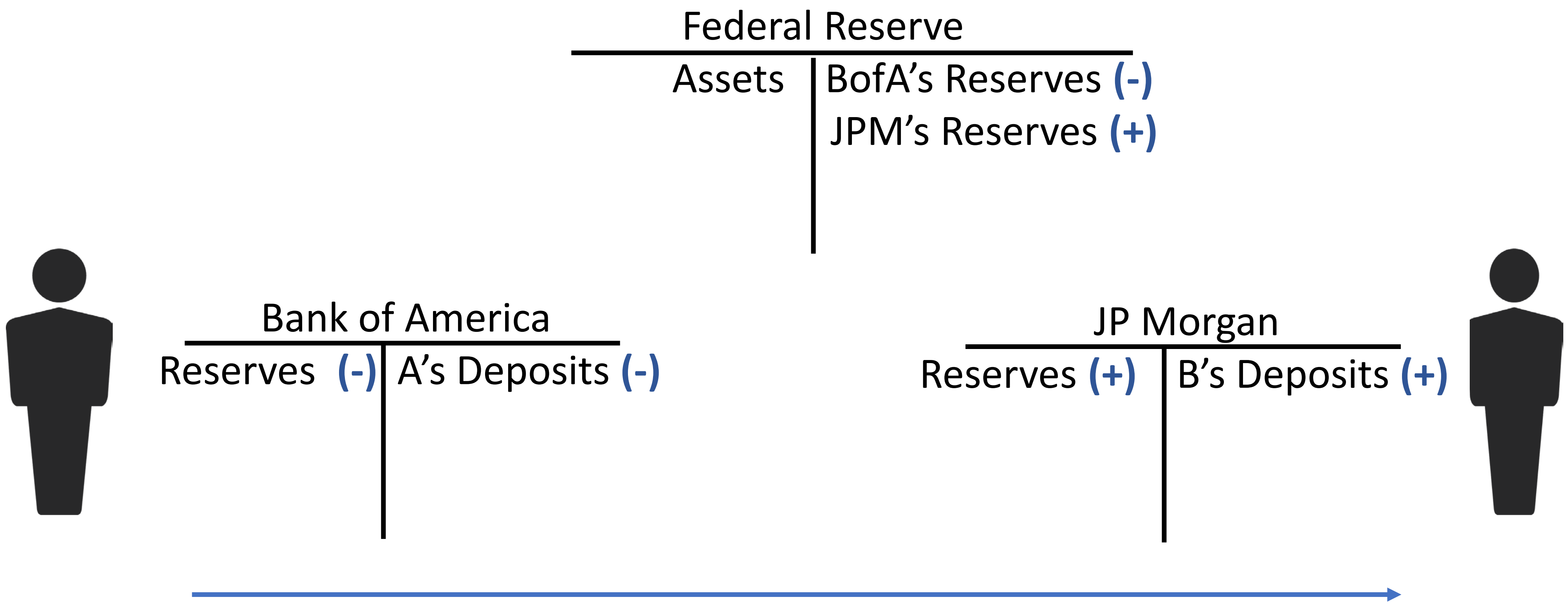
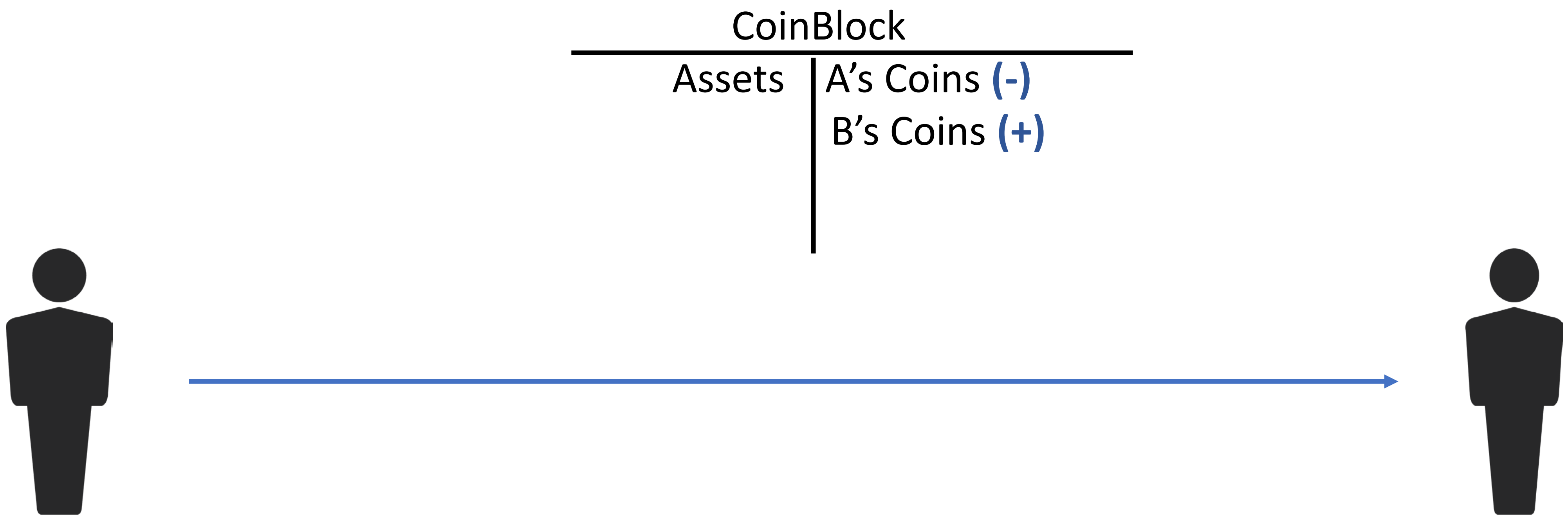


Application: Stablecoins

- **Fungibility/transferability reduce the number of ledgers involved in transaction**
  - Gains from stablecoin come from updating one ledger with better technology



Application: Stablecoins in Newly Enabled Transactions

- **Smart contracts could potentially expand the supply of safe assets**

- **Consider a bank that owns $100 of S&P 500 equity and puts on $100 of S&P 500 with a strike price of $90. Can potentially back $90 of deposits with these assets.**
  - Discouraged by regulations today.
  - In part due to asymmetric information: it is hard to verify the bank manager is properly following the strategy.
  - Convertibility of deposits back into cash has historically been thought of as important disciplinary mechanism (Calomiris and Kahn 1990; Diamond and Rajan 2000).

- **Thus far "algorithmic stablecoins" have not been successful.**
  - In part because the only assets currently on Blockchains are not suited to back bank deposits (e.g., other cryptocurrencies, the equity of the firm's own assets).

Application: Stablecoins in Existing Transactions

- **Three key observations**

1. For stablecoins to significantly reduce markups in payment service, must resolve tension between thick markets externalities and competition.
    - A standardized "backbone" protocol used by competitive private firms is similar to the traditional system
2. If Blockchain and other technologies improve efficiency of updating existing ledgers, gains from fungibility/transferability decline.
    - In other words, technology that makes stablecoins feasible may ultimately reduce the utility of stablecoins relative to other technologies.
3. In many parts of traditional finance, the securities clearing leg of the transaction is the constraint, not the cash transfer leg.