

Making Sense of Decentralized Finance

What is DeFi? And how does it differ from traditional finance?

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Decentralized finance (DeFi) is a system of financial platforms built on *public blockchains*—immutable, open-access ledgers that record the ownership of cryptocurrencies and other digital assets. Just as cryptocurrencies aim to provide an alternative to traditional currencies such as the dollar, DeFi platforms are an alternative to traditional finance (TradFi) platforms such as stock exchanges or credit card payment systems.¹

DeFi's proponents argue that TradFi is rife with inefficiencies and rent-seeking intermediaries. DeFi's value proposition, therefore, is to create a new financial system that will better serve users. To fulfill this mission, DeFi platforms differ from TradFi platforms in two key respects: their transaction technology and their ownership structure. DeFi platforms automate transactions, thereby eliminating the need for any centralized intermediary that executes transactions, such as an exchange. This also circumvents TradFi's legacy transaction-processing systems, which are often older and less technologically advanced. Unlike a shareholder-owned TradFi platform, a DeFi platform is collec-

tively owned and governed by its users as well as key insiders such as the founding team and software developers. Users thus have some authority to run a DeFi platform according to their own interests.

DeFi platforms have been deployed across a wide range of traditional financial applications as well as some new ones. Some platforms facilitate collateralized, peer-to-peer lending, providing a substitute for bank-intermediated credit. Other platforms (“decentralized exchanges”) allow users to trade cryptocurrencies with one another directly on the blockchain, just as investors would trade stocks on a traditional stock exchange. Still other platforms issue “stablecoins,” digital assets whose value is pegged to that of a fiat currency, such as the dollar or the euro.

summarized the optimists’ case for DeFi: “There [are] a lot of intermediaries that end up charging 20-30%, and if the concept of decentralization takes off, then those [fees] are also going to decline to near zero.”

Others, however, believe that DeFi’s potential to cut costs and give authority to users is greatly overstated. A recent report by the Bank for International Settlements (BIS) summarizes the pessimists’ stance: “There is a ‘decentralization illusion.’ First and foremost, centralized governance is needed to take strategic and operational decisions. In addition, some features in DeFi... favor a concentration of power.”² Indeed, despite its recent and rapid rise, DeFi still does not play a central role in the broader financial system, and it is unclear whether it will eventually provide a widely used alternative to TradFi.

FIGURE 1

DeFi Platforms Increased by a Factor of 10 Amid a Surge in Cryptocurrency Prices

Total dollar value of assets deposited on DeFi platforms, in millions, 2020–2023



Data Source: DeFi Llama (2023)

Although DeFi has existed since the popular Ethereum blockchain launched in 2015, DeFi activity took off in earnest in 2020, when transaction volumes on DeFi platforms increased by a factor of 25 amid a general surge in cryptocurrency prices (Figure 1). This drove interest in DeFi products among both retail and institutional investors, but the DeFi sector has faced some headwinds since then. The collapse of the Terra stablecoin in May 2022 and of the FTX cryptocurrency exchange in November of the same year shook investors’ confidence in the safety of cryptocurrency and DeFi products. Nevertheless, DeFi has defied predictions that it would quickly die in the wake of these crises, and transaction volumes remain well above their pre-2021 levels.

Economists and practitioners disagree about the future of DeFi. Optimists believe that in the long run, DeFi’s transaction technology and governance structure will prove vastly superior to TradFi’s. Vitalik Buterin, founder of the Ethereum blockchain,

Will DeFi’s automated transaction technology result in lower fees charged to users? Will its decentralized ownership structure succeed in redistributing decision-making power to users? To answer these questions, and to judge the merits of the pro and con arguments, we need to compare DeFi with TradFi in terms of costs and of ownership structure.

Lowering Costs by Automating Transactions

To manage transactions, TradFi uses intermediaries such as banks or centralized exchanges—but DeFi’s proponents argue that these intermediaries often use their market power to take advantage of users. (For example, they can *extract rents* by charging users high fees.) Instead of using intermediaries, DeFi users transact with one another via *smart contracts*—software protocols that automatically execute trades once a sequence of if-then conditions is met. Hence, the main benefit of automated

transactions is to cut out rent-seeking intermediaries. Furthermore, because trades are executed by code, there is no need for costly court proceedings or arbitration when a contract is breached. Rather, the smart contract automatically imposes a penalty for misbehavior (for example, by seizing collateral from the defaulting party).

However, DeFi transactions are not costless. Users must pay transaction fees to *validators*, a set of users who run computer programs that certify blockchain transactions. These fees are often substantial and in principle can exceed those paid to TradFi intermediaries. There is also an implicit cost of automatically executed DeFi contracts because there is no way to renegotiate a contract if unforeseen circumstances arise. Moreover, there is no recourse in cases of fraud or theft, as when a malicious counterparty exploits a vulnerability in a smart contract's code.

Governance by Users

DeFi's smart-contract-based settlement system is not the only feature that sets it apart from TradFi. Just as important is DeFi platforms' ownership structure: One of DeFi's ambitions is for platforms to be owned and governed by a "decentralized" community of users.

A TradFi platform is typically controlled by a manager who acts primarily in the shareholders' interests. The interests of other stakeholders, such as workers, suppliers, and creditors, are protected by contractual claims on specific payments. Workers have employment contracts with agreed-upon salaries, suppliers sell services at contractually specified prices, and creditors are owed payments of a fixed maturity.

Shareholders, on the other hand, are *residual cash flow claimants*: They receive whatever is left over after contracts with all other constituencies are paid out. Shareholders therefore need some degree of influence over the firm's management to ensure that they receive a return on their investment. Otherwise, shareholders might not receive anything from management. The protection of shareholders' interests has traditionally been viewed as the central problem in corporate governance and a primary focus of legislation. Although shareholders do not make day-to-day strategic decisions, managers legally have a fiduciary duty to act on shareholders' behalf.

A DeFi platform has no residual claimants whose interests need to be protected. The platform's code governs how all cash flows are distributed to stakeholders. For example, the platform's smart contracts specify the transaction fees charged by the platform, compensation for the platform's software developers, and the profits that will be distributed back to users. In contrast to TradFi, then, there is no problem of protecting shareholders. The main question in DeFi governance, rather, is who gets to write the platform's code. DeFi's governance model specifies that users themselves should decide how the code is written.

DeFi platforms delegate decision-making power to users and key insiders by issuing digital assets called *tokens*. On most DeFi platforms, each token is worth one vote, so users' voting power is directly proportional to their token holdings. To ensure that some tokens end up in users' hands, many platforms reward

users with tokens when they provide liquidity to the platform. A user can provide liquidity by making an asset available for others to purchase or borrow. The user deposits the asset in an escrow account owned by a smart contract, at which point other users can purchase or borrow it at a contractually specified price. Liquidity providers are rewarded with newly minted tokens. The smart contract specifies how many new tokens a liquidity provider will receive for depositing an asset for a fixed period.

This incentive scheme, known as "yield farming" (or sometimes "liquidity mining"), has been a significant institutional feature in the emergence of DeFi. The total quantity of assets deposited on a DeFi platform (called the total value locked, or TVL) is widely considered to be the most reliable metric of that platform's popularity. The "DeFi summer" of 2020, indeed, followed shortly after the introduction of yield farming on decentralized lending platforms and exchanges: From June to October 2020, the aggregate TVL on DeFi platforms jumped from \$1 billion to \$10 billion. Today, DeFi platforms continue to promote their yield farming policies to attract new users.

However, not all tokens are awarded to users. A DeFi platform will typically also issue new tokens as compensation for founders, software developers, and the venture capitalists that initially funded the platform. As such, users do not necessarily have full ownership of a platform; rather, they usually share ownership with these insiders.

Token holders vote on key policy decisions, such as liquidity providers' rewards, transaction fees, and the transaction protocol for the platform's smart contracts. A user community known as a *decentralized autonomous organization* (DAO) runs the voting process. Token holders can propose changes to the platform's policies in a DeFi platform's DAO, at which point the policy change is put to a vote. If the measure passes, then the DAO immediately updates the platform's smart contracts to reflect the new policy.

An Example of DeFi

To better understand how DeFi works, let's examine a DeFi lending platform that enables collateralized lending across several digital assets. Most DeFi lending platforms, such as Compound, Aave, or Cream Finance, share the same basic design. Unlike in traditional bank-intermediated credit markets, borrowing and lending rates on a DeFi lending platform are not set by financial intermediaries. Instead, a type of smart contract called a "lending pool" determines interest rates algorithmically.

Consider the following scenario with a hypothetical DeFi platform (henceforth "the platform"). Lenders have 200 units of popular stablecoin USD Coin (USDC) they would like to lend. Borrowers would like to borrow 100 units of USDC, and they have some Ether (the cryptocurrency issued by the Ethereum blockchain) they can post as collateral. Lenders deposit their \$200 of stablecoins in the USDC pool on the lending platform. Borrowers then borrow \$100 from the pool and deposit enough Ether to cover the required margin—say, \$150 (Figure 2). The interest rate paid by borrowers is algorithmically determined by the pool's *utilization rate*, which is the ratio of borrowed USDC

to deposited USDC (in this case, 0.5). The higher the utilization rate, the higher the interest rate paid by borrowers. Lenders receive the interest rate paid by borrowers minus a spread collected by the platform. The pool automates default penalties: If a borrower fails to repay a loan, or if the value of their collateral declines too much relative to the value of the loan, the smart contract will close out the borrower's position and deliver the collateral to lenders.

The platform issues new tokens as a reward to lenders. In our earlier example, USDC lenders receive newly minted tokens as additional yield on their loans. For instance, if lenders receive an interest rate of 2 percent from borrowers, and the platform provides a 50-basis-point subsidy in tokens, then the total return to lenders is 2.5 percent. Tokens also grant users the right to propose policy changes, receive a share of the platform's transaction fees, and vote on governance decisions in the platform's DAO.

the DAO determine the design of the platform's smart contracts. For instance, the platform's policies determine the interest rate schedule faced by borrowers, the spread charged by the platform, collateral requirements, and the token subsidy received by lenders. The platform's users therefore have some power to set interest rates themselves, whereas a bank's borrowers and depositors typically do not.

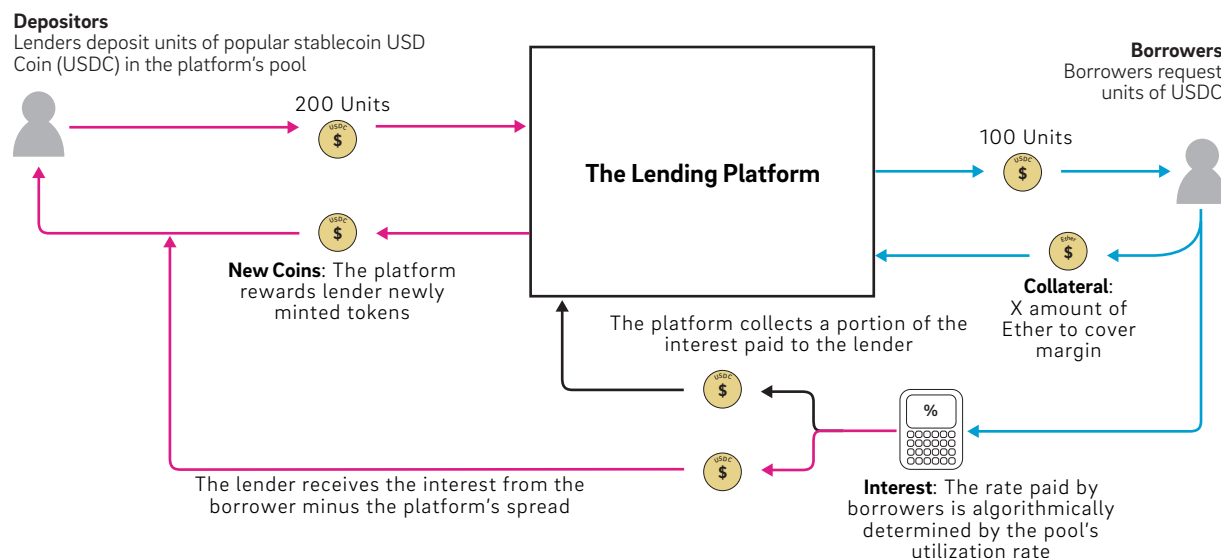
Living Up to Its Promise: Costs

DeFi's proponents argue that by cutting out the middleman, DeFi will be much cheaper for users than TradFi. However, the reality for now looks quite different. DeFi transactions usually incur a substantial fixed cost: Users must pay validators a fee to include their transactions in the blockchain. The cost of a small transaction is currently much higher in DeFi than in TradFi. For example, on the Ethereum blockchain, the average transaction

FIGURE 2

How a DeFi Platform Can Enable Collateralized Lending

Lenders receive the interest rate paid by borrowers minus a spread collected by the platform.



The lending platform sets interest rates on its loans and earns a spread, just like a traditional bank. But it's different from a bank in two important ways.

First, the platform sets interest rates algorithmically, whereas a bank has the discretion to set interest rates however it likes. A bank can therefore *price-discriminate*: It can charge higher interest rates to borrowers it perceives to have a greater need for credit. The platform, on the other hand, cannot price-discriminate. The interest rate charged to a borrower is defined by a set of observable loan-specific characteristics, such as the size of the loan or the quality of the collateral.

Second, the platform is governed in part by its users (who hold tokens), whereas a bank is not necessarily governed by its borrowers or depositors.³ The key governance decisions made in

fee is \$32.⁴ For comparison, a typical fee charged to a vendor in a \$100 credit card transaction would be about \$2. DeFi's high fees are especially detrimental to retail consumers who would like to use DeFi for everyday financial transactions.

DeFi transaction fees are high primarily because DeFi platforms, unlike TradFi platforms, have not scaled. The problem is neither a lack of demand for DeFi transactions nor a lack of validators who want to process them. Rather, popular DeFi platforms have run up against technological limits on their transaction-processing capacity. The Ethereum network, for instance, processes 15 to 20 transactions per second,⁵ whereas Visa's network can process 65,000.⁶ Due to these scale constraints, DeFi transaction fees have grown as these platforms have become more popular: As transaction demand increases, users must pay

higher transaction fees to ensure their transactions will be included in the blockchain. Several proposals have been put forth to enhance DeFi’s scalability, such as breaking up large blockchains into smaller pieces that only occasionally communicate with one another (a process called “sharding”). These proposals, however, are untested, so it is not clear whether DeFi will be able to scale and sustain broad-based use by retail consumers.

In other areas, though, DeFi shows promise. Tobias Adrian, an economist with the International Monetary Fund, argues that DeFi platforms incur much smaller *marginal* lending costs than banks.⁷ Unlike TradFi platforms, DeFi platforms do not have to cover significant labor, operational, or regulatory compliance costs. As a result, DeFi platforms can charge smaller lending spreads. DeFi borrowing may therefore be attractive to large borrowers, such as firms: On a large enough loan, the additional cost of a \$32 transaction fee is easily compensated for by a lower spread.

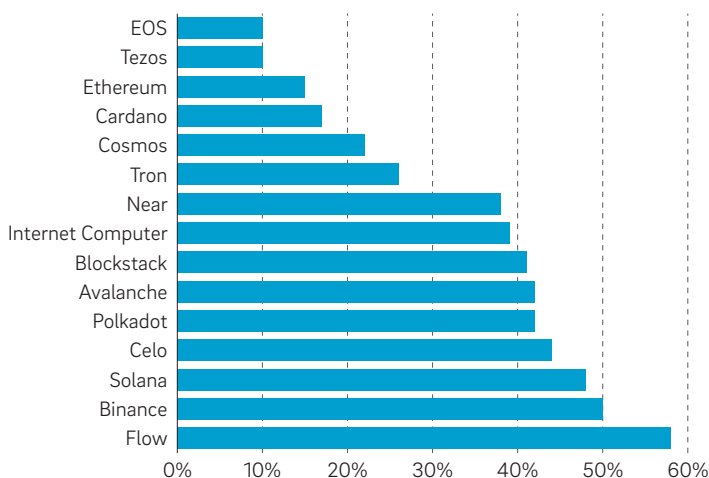
DeFi platforms have a long way to go before they are substantially more effective than TradFi, but there is no reason to believe that DeFi’s transaction technology can’t surpass TradFi’s. Moreover, even if DeFi never overtakes TradFi in popularity among retail customers, it may nevertheless prove superior in some specific applications, such as lending to large borrowers.

FIGURE 3

Most Tokens Go to Insiders

As a result, decision-making on DeFi platforms remains highly concentrated.

The share of tokens distributed to insiders in 15 large initial coin offerings (ICOs) as of 2022



Data Source: Watkins (2021)

Living Up to Its Promise: Governance

DeFi’s proponents argue that a platform is more likely to be run in users’ interests if it is governed by users themselves rather than by profit-seeking intermediaries. Of course, for this argument to have merit, DeFi must succeed in distributing decision-making power to users. So far, however, it has largely failed to do so.

Decision-making power in DeFi remains highly concentrated

for two reasons. First, token holdings tend to be concentrated in a few hands; insiders such as the founding team and venture capital funders often retain a substantial fraction of a platform’s tokens as compensation. In several large *initial coin offerings* (which are the equivalent of initial public offerings for traditional corporations), the share of tokens distributed to insiders exceeded 30 percent (Figure 3).

Even large liquidity-mining rewards do not necessarily resolve this issue. If liquidity mining activity is highly concentrated, then a handful of users will earn a large share of newly issued tokens. Also, most small-scale users are reluctant to vote on platform policies. The average user has little incentive to participate in a vote, since that vote is unlikely to influence the outcome. There may also be formal or informal barriers to small users’ participation: Some platforms require users to hold a minimum quantity of tokens before they can vote, and users sometimes lack the technical expertise necessary to understand policy proposals.

Due to concentrated token holdings and low user participation, a DAO’s decisions are often made by only a small set of individuals. For the average DAO proposal, the majority of voting power is controlled by three or fewer individuals.⁸ Decision-making power in a DAO may thus be even more concentrated than on the board of a traditional corporation.

Without broad user participation in DeFi governance, how can DeFi accomplish its goals? The entire point of DeFi is to avoid the concentration of decision-making power and “decentralize” authority. But there may still be hope for DeFi’s governance model. When a platform passes a DAO proposal that decreases barriers to voting, the platform’s token price tends to increase.⁹ Because insiders hold large quantities of these tokens, this incentivizes them to encourage broad-based user participation. Indeed, voting power in DAOs is becoming less concentrated: The Herfindahl-Hirschman index (HHI), a measure of the concentration of voting power in DAOs, declined from 0.45 in 2020 to 0.30 in 2022.¹⁰

Conclusion

DeFi platforms aim to improve upon the traditional financial system by combining two innovations: a “smart contract” transaction technology and a “token holder” governance model. Although DeFi’s transaction technology promises to reduce costs in some applications, it cannot, on its own, redistribute these economic gains to users. To achieve their goal, DeFi platforms must be governed in a way that is consistent with users’ interests. So far, however, DeFi has not decentralized decision-making power to users in the way its proponents had hoped. Future progress in DeFi will require not only technical advances in smart contract and distributed ledger design but also economic solutions to the governance problems faced by these platforms. □

Efficient Governance

Economists say that a platform's governance structure is *efficient* if it maximizes the total economic value the platform generates for its stakeholders. DeFi's proponents argue that user-owned platforms are likely to be governed more efficiently than traditional shareholder-owned platforms.

The main argument in favor of user ownership is that it protects users from rent extraction, making for a more efficient platform. Both TradFi and DeFi platforms exhibit *network effects*: The platform's service gains value as its user base grows. For instance, a credit card is useful to consumers only if enough merchants are willing to accept it. Similarly, a peer-to-peer lending app is useful to lenders only if borrowers use it. Thus, financial transaction platforms require a minimum number of users to function, which limits the extent of cross-platform competition. Credit card payment processing, for example, is a highly concentrated market, with credit card payments in the U.S. processed by just three companies: Visa, Mastercard, and American Express.

Financial transaction platforms can leverage their market power to boost profits at users' expense. In practice, platforms often do so by charging users various fees, such as the credit card payment processing fee charged to merchants (which is 2.2 percent on average).¹¹ Platforms may also extract rents by selling users' transaction data to third parties. For instance, stock trading apps sometimes sell user order flow data to high-frequency trading firms.¹² This type of rent extraction can be inefficient: High fees or other costs can dissuade users from transacting on a platform.

DeFi's token holder governance model views rent extraction as the main source of inefficiency in the governance of financial platforms. *Transaction cost* theories of organizational structure emphasize a similar argument: If a group of stakeholders stands to be exploited by a firm's market power, then it is sometimes efficient for those stakeholders to own the firm.¹³

However, other theories of corporate governance argue precisely the opposite: Platforms should be governed by an accountable group of knowledgeable insiders rather than a dispersed community of users. Governing a platform is difficult. It requires technical expertise and a capacity to coordinate, both of which users often lack. DeFi users may not be familiar enough with a platform's code to understand proposed policy changes. Moreover, deliberations among members of a DAO, which typically take place informally on message boards run by a platform, can lead to deadlocks. Since every proposed policy change must pass through a DAO, DeFi platforms may struggle to adapt to changing conditions if they rely on broad-based user participation in governance.

DAOs therefore tend to rely on founders and developers to guide upgrades to the platform. These insiders' technical expertise grants them informal authority that exceeds their voting power, as predicted by the theory of organizations.¹⁴ Users defer to insiders' judgment on questions of protocol design—but this concentrated decision-making power may not serve users' best interests. Unlike the managers of a corporation, these insiders do not have a fiduciary duty to anyone: They may pursue their own interests, even at users' expense. For example, a platform's developers may be reluctant to upgrade the platform's code to make transactions faster. Doing so would benefit users, but it could also be costly for developers.

It is thus unclear whether the token holder governance model can decentralize authority and advance users' interests. Token holder governance could mitigate rent extraction and benefit users, but a DAO's reliance on a decentralized community of users raises inefficiencies of its own. DeFi platforms must deal with the same governance problems as other types of organizations, and those problems cannot be eliminated by smart contracts.

Notes

1 For additional discussion of the competition between cryptocurrency and traditional currencies, see Sanches (2018).

2 Aramonte, Huang, and Schrimpf (2021).

3 Mutual savings banks are an important exception to this rule. Instead of distributing profits to shareholders, these banks distribute profits back to depositors.

4 Makarov and Schoar (2022).

5 Data on Ethereum's transaction throughput are taken from Blockchair's Ethereum Transactions per Second Chart, <https://blockchair.com/ethereum/charts/transactions-per-second>.

6 See Visa UK's Fact Sheet, <https://www.visa.co.uk/dam/VCOM/down->

[load/corporate/media/visanet-technology/aboutvisafactsheet.pdf](https://www.visa.co.uk/dam/VCOM/down-load/corporate/media/visanet-technology/aboutvisafactsheet.pdf).

7 The marginal cost of lending is defined as the additional cost incurred for each additional \$1 of lending. See Adrian (2022).

8 Appel and Grennan (2023b).

9 Appel and Grennan (2023a).

10 Appel and Grennan (2023b).

11 Daly (2023).

12 Williams (2021).

13 Hansmann (1988).

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