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Corporate Governance Meets Data and Technology

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Contents

Corporate Governance Meets Data and Technology

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ABSTRACT

Corporate governance encompasses a set of processes, customs, policies, laws, and institutions that affect how a corporation is directed, administered, or controlled. Technology both enhances and disrupts the traditional board-centric corporate governance system, enhancing efficiency and transparency while introducing new challenges and risks. In this work we examine three key themes comprehensively: the redefinition of information and information asymmetry through the generation of and access to big data; blockchain technology's transformative potential for aggregating preferences and exercising shareholder voting rights while blurring the line between securities and tokens; and the impact of smart contracts and their underlying infrastructure on the expansion of contracts and the implementation of decentralized governance through decentralized autonomous organizations. These innovative technological solutions empower stakeholders to exercise governance rights effectively, but their complexity also gives rise to new barriers and inequalities. As technology evolves, collaboration among researchers,

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policymakers, and practitioners is imperative to ensure that corporate governance remains effective and responsive to the current dynamic business environment.

Keywords: Corporate governance; technology; blockchain; big data; AI; decentralized autonomous organization (DAO)

1

Introduction

While there is no official definition of corporate governance, it is generally accepted that it pertains to the system through which companies are directed and controlled. When discussing corporate governance, several issues immediately come to mind, including board elections, executive compensation, corporate disclosure, shareholder activism, leadership diversity, and more recently emerging topics such as environmental, social, and governance (ESG) policy and sustainability.[1] Beneath the surface of these specific concerns lies the essence of corporate governance, which fundamentally consists of the processes, policies, and institutions that influence how a corporation is guided and managed.

Why is corporate governance necessary in the first place? Two fundamental forces likely underpin its vital importance. The first force is the separation of ownership and control, a concept initially articulated by Fama and Jensen (1983). This separation becomes more pronounced as a firm's ownership extends beyond family and friends, particularly when it becomes publicly listed. From an economic perspective, we assume that individuals are primarily self-interested and that the disparity in

[1] We refer readers to a comprehensive survey of corporate governance by Hermalin and Weisbach (2017).

power or authority between those in control and the large and diverse group that owns a firm naturally gives rise to conflicts of interest. The second force is information asymmetry between insiders and outsiders, as described in the longstanding literature pioneered by Leland and Pyle (1977). There exists a gap between what insiders, especially senior management, know about a firm's current condition and prospects and what outsiders know. Uninformed outsiders are, nevertheless, eager to infer some of the unknown information based on the actions taken by insiders (e.g., capital structure adjustments or securities issuances) and often do so intelligently, motivating the firm to signal its quality (Myers and Majluf, 1984). Such a game of information inference often generates additional moral hazard and information frictions.

In the United States, these two factors have led to widespread adoption and establishment of a board-centric governance structure. While CEOs and senior managers serve as commanders-in-chief on the front line, making day-to-day decisions about how corporations are run and operated, the ultimate authority lies with the board of directors, which is elected by shareholders. This hierarchical system is further complemented by a layer of external monitors and gatekeepers, including auditors, the media, analysts, and, notably, regulators such as the U.S. Securities and Exchange Commission (SEC).

Where does technology fit into this structure and how is it transforming it? Technology introduces multiple factors to corporate governance and research in this domain. First, data and technology have the potential to reshape how corporations are governed. Real-time access to new information, improved infrastructure, and innovative toolkits can either enhance traditional systems or spawn entirely new ones. Second, data and technology governance presents pressing issues. Questions arise about data ownership, privacy rights, data monopolies, biases associated with algorithms, and the ethics of artificial intelligence (AI). Third, the incorporation of big data and machine-learning techniques into corporate governance research has swiftly transitioned from a new trend to mainstream methodology. Machine learning-based measures, analyses, and newer tools that use generative AI have revolutionized how researchers conduct corporate governance research.

Each of the three abovementioned factors related to corporate governance deserves its own in-depth examination. In this context, we have chosen to focus on the first factor to examine how data and technology are reshaping our familiar corporate governance system. Under this overarching theme, we provide a comprehensive review of three key topics: first, the evolving nature of information and its impact on the redefinition of information asymmetry; second, the transformative impact of new technologies, particularly distributed ledger technology such as blockchains, on ownership and governance; third, the role of smart contracts and their underlying infrastructure in expanding the contractual landscape by altering verification and enforcement mechanisms.

Technology has led to an explosion of data in the corporate world. Real-time information, big data analytics, and AI have revolutionized the way corporations access, process, and use information. Shareholders and other stakeholders now have access to a wealth of data, enabling them to monitor company performance more closely and make informed decisions. While some stakeholders may have access to sophisticated data analysis tools, others may be at a disadvantage, potentially leading to new forms of information inequality. Because the flow of information does not necessarily originate from inside a firm, such information asymmetry is fundamentally different from that under the classic definition based on the insider/outsider dichotomy. Exploring how technology shapes this changing information structure and assessing its impact on corporate governance is crucial to understanding corporate governance in data-intensive businesses. For additional details on the profusion of data in contemporary corporate operations, see Section 2.

Distributed ledger technology (DLT), of which blockchain technology is currently the most prominent, offers a decentralized and tamper-resistant way to record ownership and transactions. This technology has the potential to transform traditional ownership structures and governance models, a premise for shareholder governance. The transparency and immutability of a blockchain can enhance trust among stakeholders by providing a single source of truth for ownership, transaction records, and corporate actions (Yermack, 2017). This can streamline processes such as shareholder voting and proxy management. Additionally, blockchain makes it possible to create digital assets and tokens,

such as tokenized securities and governance rights, that can represent ownership in new ways. These innovations have expanded the scope of ownership and corporate governance, which have been based primarily on securities and their trading in marketplaces, including exchanges and over-the-counter markets. The new system raises fresh questions about the allocation and distribution of both cash-flow and decision-making rights (e.g., Sockin and Xiong, 2023; Chod and Lyandres, 2021). Currently, DLT mitigates some, but creates new, governance issues associated with the separation of ownership and control as well as information or preference aggregation. We discuss these questions more extensively in Section 3.

Blockchain-based technology opens an opportunity to devise a fresh system for governance. Smart contracts are self-executing contracts with the terms of an agreement written directly in code. These contracts execute automatically and enforce themselves when predefined conditions are met, eliminating the need for intermediaries (Cong and He, 2019). Smart contracts have the potential to streamline various corporate processes, such as supply chain management, payment settlements, and shareholder agreements. By eliminating intermediaries and enhancing transparency and accuracy, smart contracts can reduce transaction costs and prevent fraudulent and unethical behavior. By enforcing pre-agreed-to rules and conditions, smart contracts also discourage strategic ex-post renegotiation, a classic contracting issue. However, many financial contracts, such as loan agreements, are inherently incomplete. In these situations, where ex-post risk sharing is desirable, standard smart contracts would be suboptimal. The technical features of smart contracts also generate additional limitations, such as the need for and challenge involved in online–offline interactions. Smart contracts may also facilitate collusive behavior. Therefore, we must explore how smart contracts change verification and enforcement mechanisms and understand their implications for corporate governance in a digital business landscape. See Section 4 for a fuller discussion of these issues.

The issues we have mentioned here represent critical facets of the evolving relationship between technology and corporate governance, each presenting its own unique challenges and opportunities. Investigating

them in detail can provide valuable insights into the future of corporate governance in a technology-driven world.

References

Abis, S. and L. Veldkamp (2024). "The changing economics of knowledge production". *The Review of Financial Studies*. 37(1): 89–118.

Adhami, S., G. Giudici, and S. Martinazzi (2018). "Why do businesses go crypto? An empirical analysis of initial coin offerings". *Journal of Economics and Business*. 100: 64–75.

Aghion, P. and P. Bolton (1992). "An incomplete contracts approach to financial contracting". *The Review of Economic Studies*. 59(3): 473–494.

Aloosh, A. and J. Li (2022). "Direct evidence of bitcoin wash trading". *Management Science*: forthcoming.

Amiram, D., E. Lyandres, and D. Rabetti (2020). "Cooking the order books: Information manipulation and competition among crypto exchanges". *SSRN 3745617*.

Amoussou-Guenou, Y., B. Biais, M. Potop-Butucaru, and S. Tucci-Piergiovanni (2024). "Committee-based blockchains as games between opportunistic players and adversaries". *The Review of Financial Studies*. 37(2): 409–443.

Apfel, R. C., J. E. Parsons, G. W. Schwert, and G. S. Stewart (2001). "Short sales, damages and class certification in 10b-5 actions". *National Bureau of Economic Research*. (w8618).

Appel, I. and J. Grennan (2023). "Control of decentralized autonomous organizations". *AEA Papers and Proceedings*. 113: 182–185.

Aramonte, S., W. Huang, and A. Schrimpf (2021). "DeFi risks and the decentralisation illusion". *BIS Quarterly Review*.

Arruñada, B. and L. Garicano (2018). "Blockchain: The birth of decentralized governance". *Pompeu Fabra University, Economics and Business Working Paper Series*. 1608.

Auer, R., C. Monnet, and H. Shin (2021). "Distributed ledgers and the governance of money". *SSRN 3975959*.

Austen-Smith, D. and J. S. Banks (1996). "Information aggregation, rationality, and the Condorcet jury theorem". *American Political Science Review*. 90(1): 34–45.

Avdjiev, S., B. Bogdanova, P. Bolton, W. Jiang, and A. Kartasheva (2020). "CoCo issuance and bank fragility". *Journal of Financial Economics*. 138(3): 593–613.

Bach, L. and D. Metzger (2019). "How close are close shareholder votes?" *The Review of Financial Studies*. 32(8): 3183–3214.

Beaver Finance (2022). "DeFi Security Lecture 7 – Price Oracle Manipulation". *Medium*.

Bena, J. and S. Zhang (2023). "Token-based decentralized governance, data economy and platform business model". *SSRN 4248492*.

Benhaim, A., B. H. Falk, and G. Tsoukalas (2023a). "Scaling blockchains: Can committee-based consensus help?" *Management Science*. 69(11): 6525–6539.

Benhaim, A., B. Hemenway Falk, and G. Tsoukalas (2023b). "Balancing power in decentralized governance: Quadratic voting and information aggregation". *SSRN 4416748*.

Björkegren, D., J. E. Blumenstock, and S. Knight (2020). "Manipulation-proof machine learning". *arXiv preprint arXiv:2004.03865*.

Bolton, P. and E.-L. Von Thadden (1998). "Blocks, liquidity, and corporate control". *The Journal of Finance*. 53(1): 1–25.

Bolton, P. and F. Samama (2013). "Loyalty-shares: Rewarding long-term investors". *Journal of Applied Corporate Finance*. 25(3): 86–97.

Bond, P., A. Edmans, and I. Goldstein (2012). "The real effects of financial markets". *Annual Review of Financial Economics*. 4(1): 339–360.

Bourveau, T., E. T. De George, A. Ellahie, and D. Macciocchi (2022). "The role of disclosure and information intermediaries in an unregulated capital market: Evidence from initial coin offerings". *Journal of Accounting Research*. 60(1): 129–167.

Bourveau, T., J. Brendel, and J. Schoenfeld (2023). "Decentralized finance (DeFi) assurance: Early evidence". *Review of Accounting Studies, forthcoming*.

Braun, A., N. Häusle, and S. Karpischek (2022). "Collusion-proof decentralized autonomous organizations". *SSRN 3760531*.

Brav, A. and P. A. Gompers (2003). "The role of lockups in initial public offerings". *The Review of Financial Studies*. 16(1): 1–29.

Brav, A., W. Jiang, T. Li, and J. Pinnington (2020). "Picking friends before picking (proxy) fights: How mutual fund voting shapes proxy contests". *Columbia Business School Research Paper*. (18-16).

Brav, A., M. Cain, and J. Zytnick (2022). "Retail shareholder participation in the proxy process: Monitoring, engagement, and voting". *Journal of Financial Economics*. 144(2): 492–522.

Brav, A., W. Jiang, T. Li, and J. Pinnington (2024). "Shareholder monitoring through voting: New evidence from proxy contests". *The Review of Financial Studies*. 37(2): 591–638.

Brown, A. (2018). "Could distributed ledger shares lead to an increase in stockholder-approved mergers and subsequently an increase in exercise of appraisal rights". *William & Mary Business Law Review*. 10: 781.

Brynjolfsson, E. and K. McElheran (2019). "Data in action: Data-driven decision making and predictive analytics in US manufacturing". *Rotman School of Management Working Paper*. (3422397).

Buterin, V. (2014). "DAOs, DACs, DAs and more: An incomplete terminology guide". *Ethereum Blog*. 6: 2014.

Buterin, V. (2021). "Moving beyond coin voting governance". In: *Vitalik Buterin's website*.

Calvano, E., G. Calzolari, V. Denicolo, and S. Pastorello (2020). "Artificial intelligence, algorithmic pricing, and collusion". *American Economic Review*. 110(10): 3267–3297.

Canidio, A. (2018). "Financial incentives for the development of blockchain-based platforms". *Working paper*.

Cao, S., W. Jiang, B. Yang, and A. L. Zhang (2023). "How to talk when a machine is listening: Corporate disclosure in the age of AI". *The Review of Financial Studies*. 36(9): 3603–3642.

Capponi, A. and R. Jia (2023). "Liquidity provision on blockchain-based decentralized exchanges". *SSRN 3805095*.

Capponi, A., G. Iyengar, and J. Sethuraman (2023). "Decentralized finance: Protocols, risks, and governance". *Foundations and Trends® in Privacy and Security*. 5(3): 144–188.

Catalini, C. and J. S. Gans (2018). "Initial coin offerings and the value of crypto tokens". National Bureau of Economic Research (w24418).

Chainalysis (2022). "Crime and NFTs: Chainalysis detects significant wash trading and some NFT money laundering in this emerging asset class". In: *Chainalysis Blog*.

Chainalysis (2023). "Oracle manipulation attacks are rising, creating a unique concern for DeFi". In: *Chainalysis Blog*.

Chen, Q., I. Goldstein, and W. Jiang (2007). "Price informativeness and investment sensitivity to stock price". *The Review of Financial Studies*. 20(3): 619–650.

Chen, H., P. De, Y. Hu, and B.-H. Hwang (2014). "Wisdom of crowds: The value of stock opinions transmitted through social media". *The Review of Financial Studies*. 27(5): 1367–1403.

Chen, Y., J. I. Richter, and P. C. Patel (2021). "Decentralized governance of digital platforms". *Journal of Management*. 47(5): 1305–1337.

Chen, M. A., S. S. Hu, J. Wang, and Q. Wu (2023). "Can blockchain technology help overcome contractual incompleteness? Evidence from state laws". *Management Science*. 69(11): 6540–6567.

Chi, F., B.-H. Hwang, and Y. Zheng (2023). "The use and usefulness of big data in finance: Evidence from financial analysts". *Management Science*: forthcoming.

Chod, J. and E. Lyandres (2021). "A theory of ICOs: Diversification, agency, and information asymmetry". *Management Science*. 67(10): 5969–5989.

Chod, J., N. Trichakis, and S. A. Yang (2022). "Platform tokenization: Financing, governance, and moral hazard". *Management Science*. 68(9): 6411–6433.

Coase, R. H. (1937). "The nature of the firm". *Economica*. 4(16): 386–405.

Cohen, L., C. Malloy, and Q. Nguyen (2020). "Lazy prices". *The Journal of Finance*. 75(3): 1371–1415.

Cong, L. W. and Z. He (2019). "Blockchain disruption and smart contracts". *The Review of Financial Studies*. 32(5): 1754–1797.

Cong, L. W., Z. He, and J. Li (2021). "Decentralized mining in centralized pools". *The Review of Financial Studies*. 34(3): 1191–1235.

Cong, L. W., Y. Li, and N. Wang (2022). "Token-based platform finance". *Journal of Financial Economics*. 144(3): 972–991.

Cong, L. W., X. Li, K. Tang, and Y. Yang (2023a). "Crypto wash trading". *Management Science*. 69(11): 6427–6454.

Cong, L. W., E. S. Prasad, and D. Rabetti (2023b). "Financial and informational integration through oracle networks". *SSRN 4495514*.

Coughlan, J. and A. G. Orlov (2023). "High-frequency trading and market quality: Evidence from account-level futures data". *Journal of Futures Markets*. 43(8): 1126–1160.

Cremers, M., B. Lauterbach, and A. Pajuste (2024). "The life-cycle of dual class firm valuation". *Review of Corporate Finance Studies*. 13(2): 459–493.

CryptoFisher (2018). "Fraud detection and cryptocurrency". *Medium*.

Daian, P., T. Kell, I. Miers, and A. Juels (2018). "On-chain vote buying and the rise of dark DAOs". *Hacking, Distributed*.

Davydiuk, T., D. Gupta, and S. Rosen (2023). "De-crypto-ing signals in initial coin offerings: Evidence of rational token retention". *Management Science*. 69(11): 6584–6624.

DeMarinis, R. (2017). "Is Blockchain the answer to e-voting? Nasdaq believes so". *Nasdaq*.

Deng, X., Y. T. Lee, and Z. Zhong (2018). "Decrypting coin winners: Disclosure quality, governance mechanism and team networks". *SSRN 3247741*.

Dessaint, O., T. Foucault, L. Frésard, and A. Matray (2019). "Noisy stock prices and corporate investment". *The Review of Financial Studies*. 32(7): 2625–2672.

Dilger, W. (1997). "Decentralized autonomous organization of the intelligent home according to the principle of the immune system". *1997 IEEE International Conference on Systems, Man, and Cybernetics. Computational Cybernetics and Simulation*. vol. 1. IEEE. 351–356.

Dobos, L. (2022). "Build Finance DAO hostile takeover, treasury drained". In: *CryptoSlate*.

Dou, W. W., I. Goldstein, and Y. Ji (2023). "AI-Powered Trading, Algorithmic Collusion, and Price Efficiency". *SSRN 4452704*.

Dugast, J. and T. Foucault (2018). "Data abundance and asset price informativeness". *Journal of Financial Economics*. 130(2): 367–391.

Edelman, P. H., W. Jiang, and R. S. Thomas (2018). "Will tenure voting give corporate managers lifetime tenure". *Texas Law Review*. 97: 991.

Edmans, A., I. Goldstein, and W. Jiang (2015). "Feedback effects, asymmetric trading, and the limits to arbitrage". *American Economic Review*. 105(12): 3766–3797.

Eng, L. L. and Y. T. Mak (2003). "Corporate governance and voluntary disclosure". *Journal of Accounting and Public Policy*. 22(4): 325–345.

Everything Blockchain (2022). "Beanstalk exploit – A simplified post-Mortem analysis". *Medium*.

Ewens, M. and N. Malenko (2020). "Board dynamics over the startup life cycle". *National Bureau of Economic Research (w27769)*.

Fama, E. F. and M. C. Jensen (1983). "Separation of ownership and control". *The Journal of Law and Economics*. 26(2): 301–325.

Feddersen, T. J. and W. Pesendorfer (1996). "The swing voter's curse". *American Economic Review*: 408–424.

Ferreira, D., J. Li, and R. Nikolowa (2023). "Corporate capture of blockchain governance". *The Review of Financial Studies*. 36(4): 1364–1407.

Fos, V. and W. Jiang (2015). "Out-of-the-money CEOs: Private control premium and option exercises". *The Review of Financial Studies*. 29(6): 1549–1585.

Fritsch, R., M. Müller, and R. Wattenhofer (2022). "Analyzing voting power in decentralized governance: Who controls daos?" *arXiv preprint arXiv:2204.01176*.

Froot, K., N. Kang, G. Ozik, and R. Sadka (2017). "What do measures of real-time corporate sales say about earnings surprises and post-announcement returns?" *Journal of Financial Economics*. 125(1): 143–162.

Fudenberg, D. and J. Tirole (1991). *Game Theory*. MIT press.

Fusaro, T. and M. Hougan (2019). "Presentation to the us securities and exchange commission". *Bitwise Asset Management*.

Gan, J., G. Tsoukalas, and S. Netessine (2021). "Initial coin offerings, speculation, and asset tokenization". *Management Science*. 67(2): 914–931.

Gan, J., G. Tsoukalas, and S. Netessine (2023). "Decentralized platforms: Governance, tokenomics, and ICO design". *Management Science*. 69(11): 6667–6683.

Gandal, N., J. Hamrick, T. Moore, and T. Oberman (2018). "Price manipulation in the Bitcoin ecosystem". *Journal of Monetary Economics*. 95: 86–96.

Ganong, P. and P. Noel (2023). "Why do borrowers default on mortgages?" *The Quarterly Journal of Economics*. 138(2): 1001–1065.

Garratt, R. J. and M. R. Van Oordt (2022). "Entrepreneurial incentives and the role of initial coin offerings". *Journal of Economic Dynamics and Control*. 142: 104171.

Goldberg, M. and F. Schär (2023). "Metaverse governance: An empirical analysis of voting within decentralized autonomous organizations". *Journal of Business Research*. 160: 113764.

Goldstein, I., D. Gupta, and R. Sverchkov (2019). "Utility tokens as a commitment to competition". *The Journal of Finance, forthcoming*.

Goldstein, I. (2023). "Information in financial markets and its real effects". *Review of Finance*. 27(1): 1–32.

Griffin, J. M. and A. Shams (2020). "Is Bitcoin really untethered?" *The Journal of Finance*. 75(4): 1913–1964.

Grossman, S. J. and O. D. Hart (1980). "Takeover bids, the free-rider problem, and the theory of the corporation". *The Bell Journal of Economics*. 42–64.

Grossman, S. J. and O. D. Hart (1986). "The costs and benefits of ownership: A theory of vertical and lateral integration". *Journal of Political Economy*. 94(4): 691–719.

Gryglewicz, S., S. Mayer, and E. Morellec (2021). "Optimal financing with tokens". *Journal of Financial Economics*. 142(3): 1038–1067.

Halaburda, H., Z. He, and J. Li (2021). "An economic model of consensus on distributed ledgers". National Bureau of Economic Research (w29515).

Hamrick, J., F. Rouhi, A. Mukherjee, A. Feder, N. Gandal, T. Moore, and M. Vasek (2021). "An examination of the cryptocurrency pump-and-dump ecosystem". *Information Processing & Management*. 58(4): 102506.

Han, J., J. Lee, and T. Li (2023). "DAO governance". *SSRN 4346581*.

Hart, O. and J. Moore (1988). "Incomplete contracts and renegotiation". *Econometrica*. 56(4): 755–785.

Hart, O. (1995). *Firms, Contracts, and Financial Structure*. Clarendon Press.

Hart, O. and J. Moore (1999). "Foundations of incomplete contracts". *The Review of Economic Studies*. 66(1): 115–138.

Hart, O. (2009). "Hold-up, asset ownership, and reference points". *The Quarterly Journal of Economics*. 124(1): 267–300.

Harvey, C. R. (2016). "Cryptofinance". *SSRN 2438299*.

Harvey, C. R., A. Ramachandran, and J. Santoro (2021). *DeFi and the Future of Finance*. John Wiley & Sons.

Harvey, C. R. and D. Rabetti (2024). "International business and decentralized finance". *Journal of International Business Studies*. 1–24.

Healy, P. M. and K. G. Palepu (2001). "Information asymmetry, corporate disclosure, and the capital markets: A review of the empirical disclosure literature". *Journal of Accounting and Economics*. 31(1-3): 405–440.

Hennessy, C. A., D. Livdan, and B. Miranda (2010). "Repeated signaling and firm dynamics". *The Review of Financial Studies*. 23(5): 1981–2023.

Hennessy, C. A. and C. A. Goodhart (2023). "Goodhart's law and machine learning: A structural perspective". *International Economic Review*. 64(3): 1075–1086.

Hermalin, B. and M. Weisbach (2017). *The Handbook of the Economics of Corporate Governance*. Vol. 1. Elsevier.

Howell, S. T., M. Niessner, and D. Yermack (2020). "Initial coin offerings: Financing growth with cryptocurrency token sales". *The Review of Financial Studies*. 33(9): 3925–3974.

ICObench (2019). "ICO market quarterly analysis – Q1 2019".

Immunefi (2023). "Hack analysis: Beanstalk governance attack". *Medium*.

Jensen, M. and W. H. Meckling (1976). "Theory of the firm: Managerial behavior, agency costs and ownership structure". *Journal of Financial Economics*. 3(4): 305–360.

Jiang, W., T. Li, D. Mei, and R. Thomas (2016). "Appraisal: Shareholder remedy or litigation arbitrage?" *The Journal of Law and Economics*. 59(3): 697–729.

Jiang, W., T. Li, and R. Thomas (2020). "The long rise and quick fall of appraisal arbitrage". *Boston University Law Review*. 100: 2133.

John, K., L. Kogan, and F. Saleh (2023). "Smart contracts and decentralized finance". *Annual Review of Financial Economics*. 15: 523–542.

John, K., B. Monnot, P. Mueller, F. Saleh, and C. Schwarz-Schilling (2024). "Economics of Ethereum". *Working paper*.

Johnson, W. C. and S. Yi (2019). "Governance in the absence of regulation: A study of initial coin offerings". *SSRN 3337096*.

Kahan, M. and E. Rock (2008). "The hanging chads of corporate voting". *Georgetown Law Journal*. 96: 1227.

Kim, H. and R. Michaely (2019). "Sticking around too long? Dynamics of the benefits of dual-class voting". *ECGI-Finance Working Paper*. (590): 19–09.

Lalley, S. P. and E. G. Weyl (2018). "Quadratic voting: How mechanism design can radicalize democracy". *AEA Papers and Proceedings*. 108: 33–37.

Laturnus, V. (2023). "The economics of decentralized autonomous organizations". *SSRN 4320196*.

Lee, J. and C. A. Parlour (2022). "Consumers as financiers: Consumer surplus, crowdfunding, and initial coin offerings". *The Review of Financial Studies*. 35(3): 1105–1140.

Lee, J., T. Li, and D. Shin (2022). "The wisdom of crowds in fintech: Evidence from initial coin offerings". *The Review of Corporate Finance Studies*. 11(1): 1–46.

Lehar, A. and C. A. Parlour (2022). "Systemic fragility in decentralized markets". *SSRN 4164833*.

Lehar, A. and C. A. Parlour (2023). "Battle of the bots: Flash loans, miner extractable value and efficient settlement". *SSRN 4382292*.

Leland, H. E. and D. H. Pyle (1977). "Informational asymmetries, financial structure, and financial intermediation". *The Journal of Finance*. 32(2): 371–387.

Levi, S. D. and A. B. Lipton (2018). "An introduction to smart contracts and their potential and inherent limitations". *Harvard Law School Forum on Corporate Governance*.

Levit, D., N. Malenko, and E. Maug (2024). "Trading and shareholder democracy". *The Journal of Finance*. 79(1): 257–304.

Lewis, M. (2014). *Flash Boys: A Wall Street Revolt*. WW Norton & Company.

Li, T., D. Shin, and B. Wang (2018). "Cryptocurrency pump-and-dump schemes". *SSRN 3267041*.

Li, J. and W. Mann (2021). "Initial coin offerings: Current research and future directions". *The Palgrave Handbook of Technological Finance*. 369–393.

Li, T., D. Shin, C. Sun, and B. Wang (2022). "The dark side of decentralized finance: Evidence from meme tokens". *SSRN 4228920*.

Listokin, Y. (2008). "Management always wins the close ones". *American Law and Economics Review*. 10(2): 159–184.

Liu, J., I. Makarov, and A. Schoar (2023). "Anatomy of a run: The Terra Luna Crash". National Bureau of Economic Research (w31160).

Loughran, T. and B. McDonald (2011). "When is a liability not a liability? Textual analysis, dictionaries, and 10-Ks". *The Journal of Finance*. 66(1): 35–65.

Luo, Y. (2005). "Do insiders learn from outsiders? Evidence from mergers and acquisitions". *The Journal of Finance*. 60(4): 1951–1982.

Lyandres, E., B. Palazzo, and D. Rabetti (2022). "Initial coin offering (ICO) success and post-ICO performance". *Management Science*. 68(12): 8658–8679.

Makarov, I. and A. Schoar (2022). "Cryptocurrencies and decentralized finance (DeFi)". National Bureau of Economic Research (w30006).

Makridis, C. A., M. Fröwis, K. Sridhar, and R. Böhme (2023). "The rise of decentralized cryptocurrency exchanges: Evaluating the role of airdrops and governance tokens". *Journal of Corporate Finance*. 79: 102358.

Malinova, K. and A. Park (2023). "Tokenomics: When tokens beat equity". *Management Science*. 69(11): 6568–6583.

Matvos, G. and M. Ostrovsky (2010). "Heterogeneity and peer effects in mutual fund proxy voting". *Journal of Financial Economics*. 98(1): 90–112.

Maug, E. (1998). "Large shareholders as monitors: Is there a trade-off between liquidity and control?" *The Journal of Finance*. 53(1): 65–98.

Maug, E. and K. Rydqvist (2009). "Do shareholders vote strategically? Voting behavior, proposal screening, and majority rules". *Review of Finance*. 13(1): 47–79.

Mayer, S. (2021). "Token-based platforms and speculators". *SSRN 3471977*.

Mitchelhill, T. (2023). "SBF was 'very resistant' to investors on FTX board: Paradigm co-founder". *Cointelegraph*.

Myers, S. C. and N. S. Majluf (1984). "Corporate financing and investment decisions when firms have information that investors do not have". *Journal of Financial Economics*. 13(2): 187–221.

Neuder, M., D. J. Moroz, R. Rao, and D. C. Parkes (2021). "Low-cost attacks on Ethereum 2.0 by sub-1/3 stakeholders". *arXiv preprint arXiv:2102.02247*.

Nicolle, E. (2023). "Crypto's most influential companies often FollowTheir own rules – Even after FTX's collapse". *Bloomberg*.

Ofir, M. and I. Sadeh (2020). "ICO vs. IPO: Empirical findings, information asymmetry, and the appropriate regulatory framework". *Vanderbilt Journal of Transnational Law*. 53: 525.

Oh, S. (2023). "Market manipulation in NFT markets". *SSRN 4397409*.

Quarmby, B. (2021). "DAO treasuries surged 40x in 2021: DeepDAO". In: *Cointelegraph*.

Saleh, F. (2021). "Blockchain without waste: Proof-of-stake". *The Review of Financial Studies*. 34(3): 1156–1190.

Shifflett, S. and P. Vigna (2018). "Some traders are talking up cryptocurrencies, then dumping them, costing others millions". *Wall Street Journal*.

Shleifer, A. and R. W. Vishny (1986). "Large shareholders and corporate control". *Journal of Political Economy*. 94(3, Part 1): 461–488.

Smith, E. E. (2013). "Over-voting". *SSRN 2564730*.

Sockin, M. and W. Xiong (2023). "Decentralization through tokenization". *The Journal of Finance*. 78(1): 247–299.

Sundaresan, S. and Z. Wang (2015). "On the design of contingent capital with a market trigger". *The Journal of Finance*. 70(2): 881–920.

Tally (2021). "Gas costs and voter participation". *Medium*.

Tsoukalas, G. and B. H. Falk (2020). "Token-weighted crowdsourcing". *Management Science*. 66(9): 3843–3859.

Verrecchia, R. E. (1983). "Discretionary disclosure". *Journal of Accounting and Economics*. 5: 179–194.

Victor, F. and A. M. Weintraud (2021). "Detecting and quantifying wash trading on decentralized cryptocurrency exchanges". *Proceedings of the Web Conference 2021. 23–32*.

Viswanath, P. V. (1993). "Strategic considerations, the pecking order hypothesis, and market reactions to equity financing". *Journal of Financial and Quantitative Analysis*. 28(2): 213–234.

von Wachter, V., J. R. Jensen, F. Regner, and O. Ross (2022). "NFT wash trading: Quantifying suspicious behaviour in NFT markets". *arXiv preprint arXiv:2202.03866*.

Weinstein, G., S. Lofchie, and J. Schwartz (2022). "A primer on DAOs". In: *Harvard Law School Forum on Corporate Governance*.

Williamson, O. E. (1979). "Transaction-cost economics: The governance of contractual relations". *The Journal of Law and Economics*. 22(2): 233–261.

Xu, J. and B. Livshits (2019). "The anatomy of a cryptocurrency {Pump-and-Dump} scheme". *28th USENIX Security Symposium (USENIX Security 19)*. 1609–1625.

Yermack, D. (2017). "Corporate governance and blockchains". *Review of Finance*. 21(1): 7–31.

Zetzsche, D. A., R. P. Buckley, D. W. Arner, and L. Fohr (2019). "The ICO gold rush: It's a scam, it's a bubble, it's a super challenge for regulators". *Harvard International Law Journal*. 60: 267.

Zhu, C. (2019). "Big data as a governance mechanism". *The Review of Financial Studies*. 32(5): 2021–2061.