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Benchmark Competition

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ABSTRACT

Over-the-counter ("OTC") markets—those for currencies, derivatives, swaps, bonds, and commodities, for instance—make up an immense and critical component of global financial markets. Certain benchmarks, such as the London Interbank Offered Rate ("LIBOR"), are hardwired throughout these markets and play crucial roles in pricing and valuation. For example, interest payments on instruments ranging from student loans and mortgages to synthetic derivatives are tied to the value of LIBOR. In 2016, estimates of notional exposure to U.S. dollar LIBOR totaled about $200 trillion—ten times U.S. gross domestic product ("GDP") that year. Correspondingly, minuscule variations in a benchmark's value will impact vast numbers of assets and transactions for hundreds of millions of people.

These benchmarks have become so ubiquitous for an important reason: they have introduced substantial harmonization effects in otherwise decentralized, opaque dealer markets. These benefits fit within the prevailing view of financial regulation: because sophisticated market participants, through wealth-maximizing behavior, tend to select towards structures that maximize efficiency, in aggregate social welfare is maximized, meaning that observed equilibria are likely the most efficient equilibria. And thus, OTC markets have remained largely unregulated for decades.

This Article argues that this understanding is incomplete and identifies a fundamental misalignment between what is privately optimal and what is socially optimal in OTC markets. By undertaking a structural analysis, this Article documents overreliance by market participants on benchmarks even when they are substantially suboptimal. Thus, in contrast to existing reform proposals, which overwhelmingly assume that a single benchmark will

* Assistant Professor of Law, Santa Clara University School of Law. I am grateful to Ian Ayres, Tom Brower, Bill Eskridge, Larry Glosten, Vikramaditya Khanna, Yair Listokin, Jonathan Macey, Eric Pan, Menesh Patel, Gabriel Rauterberg, and especially Merritt Fox and William Moon, as well as participants in the National Business Law Scholars Conference at UC Berkeley Law School for helpful comments and conversations. This work was selected for presentation at the 2020 Michigan Law School Junior Scholars Conference, and benefited from faculty workshops at Brooklyn Law School, University of Kentucky College of Law, University of Maine School of Law, Northeastern University School of Law, Ohio State University Moritz College of Law, University of Richmond School of Law, Santa Clara University School of Law, SMU Dedman School of Law, Southwestern Law School, Wayne State University Law School, and Willamette University College of Law.

continue to dominate, this Article proposes an alternative competitive equilibrium—one where multiple benchmarks compete.

INTRODUCTION

Financial trading markets are generally organized in one of two ways: exchange-based or over-the-counter ("OTC"). Exchange-based markets, such as the New York Stock Exchange ("NYSE"), function similarly to auction markets, where buyers and sellers submit prices at which they are willing to transact, and transactions take place at the highest bid to buy and lowest offer to sell.[1] These exchange-based markets are highly regulated and

1. For a broader explication of exchange-based equities markets, *see generally* MERRITT B. FOX, LAWRENCE R. GLOSTEN & GABRIEL V. RAUTERBERG, THE NEW STOCK MARKET: LAW, ECONOMICS, AND POLICY (2019). Most stock purchases and sale transactions take place on exchanges. Such markets are largely transparent, anyone can participate, and little is left to

feature a centralized limit order book that coordinates participants' price quotes and executions.[2] OTC markets are the opposite. They are decentralized dealer markets, characterized by bilateral transactions between an end user and a dealer such as Goldman Sachs or another large market-making entity.[3]

OTC markets developed as marketplaces for assets that may not be as standardized or as liquid as those more commonly traded on exchanges. Interest rate products, bonds, foreign exchange products, complex derivatives, and many commodities are traded on OTC markets.[4] Although OTC markets receive less academic and regulatory attention than exchange-based ones, a vast amount of trading takes place on them, with estimates of notional value often in the hundreds of trillions of dollars.[5] For example, in 2018, estimates of OTC derivatives markets measured over $550 trillion in notional amount outstanding.[6] Over $5 trillion *a day* turns over in the markets for foreign currency alone.[7]

This Article is concerned with OTC markets that rely on benchmarks, such as the London Interbank Offered Rate ("LIBOR") or the WM/Reuters

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negotiate. The best executable price quotes are consolidated and made available to market participants, often on a central limit order book, and exchanges have little ability to exclude anyone from access. Almost every aspect of such exchanges is heavily regulated: the providers of the exchanges (now for-profit companies), those who can transact on an exchange (broker-dealers), their duties to counterparties, what right (if any) exchanges have to exclude would-be participants, what trades and quotes must be reported, and to whom, rules of competition between exchanges, and so forth.

2. *See id.*

3. For purposes of this Article, I will use "OTC markets" to refer to markets in which non-equities OTC assets are traded.

4. *See, e.g.*, Gabriel V. Rauterberg & Andrew Verstein, *Assessing Transnational Private Regulation of the OTC Derivatives Market: ISDA, the BBA, and the Future of Financial Reform*, 54 VA. J. INT'L L. 9, 11–13 (2013) [hereinafter Rauterberg & Verstein, *Transnational Regulation*]; Vincent Glode & Christian C. Opp, Over-the-Counter vs. Limit-Order Markets: The Role of Traders' Expertise 1 (Nov. 8, 2018) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2697281. In addition, some derivatives, such as exchange-traded options and futures, are traded on exchanges.

5. *See, e.g.*, BANK FOR INT'L SETTLEMENTS, MONETARY & ECON. DEP'T, STATISTICAL RELEASE: OTC DERIVATIVES STATISTICS AT END-DECEMBER 2015 2 (2016), https://www.bis.org/publ/otc_hy1605.pdf; Dan Awrey, *The Mechanisms of Derivatives Market Efficiency*, 91 N.Y.U. L. REV. 1104, 1107 (2016) [hereinafter Awrey, *Derivatives Market Efficiency*] (identifying $493 trillion in global derivatives markets); Colleen M. Baker, *Regulating the Invisible: The Case of Over-the-Counter Derivatives*, 85 NOTRE DAME L. REV. 1287, 1299–1300 (2010) (noting that OTC derivative markets vastly exceed exchange-traded markets in size).

6. BANK FOR INT'L SETTLEMENTS, GLOBAL OTC DERIVATIVES MARKET tbl.D5, https://www.bis.org/statistics/d5_1.pdf (last visited Aug. 23, 2020).

7. BANK FOR INT'L SETTLEMENTS, TURNOVER OF OTC FOREIGN EXCHANGE INSTRUMENTS, tbl.D11.1, https://www.bis.org/statistics/d11_1.pdf (last visited Aug. 23, 2020); *see also* Dagfinn Rime & Andreas Schrimpf, *The Anatomy of the Global FX Market Through the Lens of the 2013 Triennial Survey*, BANK FOR INT'L SETTLEMENTS Q. REV., at 27 (Dec. 2013), https://www.bis.org/publ/qtrpdf/r_qt1312e.pdf.

foreign exchange ("FX") benchmark, to value or price the vast majority of transactions in those markets. Staggering sums of money end up tied to benchmarks. In 2016, estimates of total notional exposure to a single benchmark in a single region, the U.S. Dollar LIBOR, totaled about $200 trillion—ten times U.S. GDP that year.[8] Correspondingly, minuscule variations in a single benchmark will impact vast numbers of assets and transactions for hundreds of millions of people, sophisticated and unsophisticated. Instruments ranging from student loans and home or auto mortgages, to complex hedges and synthetic derivatives, reference LIBOR,[9] which has often been called "the world's most important number."[10] The impact of foreign currency benchmarks—the WM/Reuters FX rates—extends into retirement funds and stock markets, where pension funds and stock indices (such as the S&P 500 and Dow Jones Industrial Average) all reference WM/Reuters FX rates in valuing investments and stocks denominated in foreign currency.[11]

8. *Second Report of the Alternative Reference Rates Committee* (Mar. 5, 2018), https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Second-report.com.

9. LIBOR is the most commonly used index for U.S. mortgages. *For an Adjustable-Rate Mortgage (ARM), What Are the Index and Margin, and How do They Work?*, CONSUMER FIN. PROT. BUREAU, https://www.consumerfinance.gov/ask-cfpb/for-an-adjustable-rate-mortgage-arm-what-are-the-index-and-margin-and-how-do-they-work-en-1949/ (last updated Nov. 15, 2019); *see also* Gina-Gail S. Fletcher, *Benchmark Regulation*, 102 IOWA L. REV. 1929, 1931 (2017) (noting that everything from consumer loans to commodity contracts and complex synthetic derivatives is tied to LIBOR); Gabriel Rauterberg & Andrew Verstein, *Index Theory: The Law, Promise and Failure of Financial Indices*, 30 YALE J. ON REG. 1, 30 (2013) [hereinafter Rauterberg & Verstein, *Index Theory*] (tracing LIBOR's dominance throughout short-term lending, from home and student loans to corporate borrowing and speculation); Darrell Duffie & Piotr Dworczak, *Robust Benchmark Design* 2 (Nat'l Bureau of Econ. Rsch., Working Paper No. 20540, 2018), https://ssrn.com/abstract=2505846 [hereinafter Duffie & Dworczak, *Benchmark Design*] (noting "[l]iterally millions of different financial contracts, including interest rate swaps, futures, options, variable rate bank loans, and mortgages, have payments that are contractually linked to LIBOR").

10. *See, e.g.*, David Enrich, *Libor: A Eulogy for the World's Most Important Number*, WALL ST. J. (July 27, 2017), https://www.wsj.com/articles/libor-a-eulogy-for-the-worlds-most-important-number-1501170720; Matt Levine, *Banks Will Miss Libor When It's Gone*, BLOOMBERG (Apr. 11, 2018), https://www.bloomberg.com/opinion/articles/2018-04-11/banks-will-miss-libor-when-it-s-gone [hereinafter Levine, *Banks Will Miss LIBOR*]; Matt Phillips, *The Most Important Number in Finance Is Going Away. Wall St. Isn't Prepared*, N.Y. TIMES (July 19, 2018), https://www.nytimes.com/2018/07/19/business/libor-future-2021-phase-out.html; Barry Ritholtz, *The World's Most Important Number*, BLOOMBERG (Apr. 13, 2018), https://www.bloomberg.com/opinion/articles/2018-04-03/the-world-s-most-important-number.

11. *See Dow Jones Averages: Methodology*, S&P DOW JONES INDICES 12 (Apr. 2020), https://us.spindices.com/documents/methodologies/methodology-dj-averages.pdf). Economists have written broadly on the microstructure of OTC markets and the role benchmarks play. *See* Darrell Duffie, Piotr Dworczak & Haoxiang Zhu, *Benchmarks in Search Markets*, 72 J. FIN. 1983, 1984–86 (2017); Darrell Duffie & Jeremy C. Stein, *Reforming LIBOR and Other Financial Market Benchmarks*, 29 J. ECON. PERSPS. 191, 195 (2015); Duffie & Dworczak, *Benchmark Design*, *supra* note 9; Darrell Duffie, Nicolae Garleanu & Lasse Heje Pedersen, *Over-the-Counter Markets* (Nat'l Bureau of Econ. Rsch., Working Paper No. 10816, 2004), https://ssrn.com/abstract=601118.

These benchmarks are in trouble.[12] Beginning around 2008, evidence began emerging of manipulation and misconduct concerning one benchmark after another: LIBOR, the WM/Reuters FX rates, and ISDAFIX (a reference rate for interest rate swap rates), to name just a few.[13] The harms have been vast. Because so many transactions depend on benchmarks for payment or valuation, evidence has emerged that benchmark manipulation may have even exacerbated effects of the 2008 financial crisis.[14] In the United States alone, implicated banks have paid billions of dollars—including through criminal penalties levied by the Justice Department, fines imposed by the Commodity Futures Trading Commission ("CFTC") and Federal Reserve Bank, and civil settlements in the Southern District of New York.[15] Their employees have been terminated and sent to prison.[16] Domestic and foreign regulators have entered into onerous transition and reform schemes.[17]

A single benchmark, referenced throughout enormous markets, presents a particularly tempting target for manipulation. With respect to LIBOR, the

12. Other scholars have identified susceptibilities to manipulation of benchmarks. *See, e.g.*, Fletcher, *supra* note 9, at 1931–33 (assessing the merits of ex ante and ex post regulation of benchmark-related wrongdoing); Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 36–37 (developing a taxonomy of indices and noting their susceptibility to under- and nonproduction because their promulgators are not able to internalize associated rewards); Andrew Verstein, *Benchmark Manipulation*, 56 B.C.L. REV. 215, 230–33 (2015) [hereinafter Verstein, *Benchmark Manipulation*] (examining reasons benchmarks are particularly profitable and tempting targets for manipulation and arguing that financial market manipulation is growing increasingly synonymous with benchmark manipulation).

13. *See, e.g.*, Carrick Mollenkamp & Mark Whitehouse, *Study Casts Doubt on Key Rate*, WALL ST. J. (May 29, 2008), https://www.wsj.com/articles/SB121200703762027135.

14. *See* Stephen M. Bainbridge, *Reforming LIBOR: Wheatley Versus the Alternatives*, 9 N.Y.U. J. L. & BUS. 788, 798–99 (2013) (explaining that sustained underreporting of LIBOR may have worsened the financial crisis because lower rates would result in borrowers paying less on their loans, resulting in under-compensation for banks bearing the risks of such loans).

15. *See, e.g.*, Portia Crowe, *Wall Street Gets Slammed with $5.8 Billion in Fines for Rate Rigging*, BUS. INSIDER (May 20, 2015), https://www.businessinsider.com/libor-rigging-criminal-charges-and-fines-2015-5; Matt Levine, *Bank FX Fine Scorecard (Follow Along at Home!)*, BLOOMBERG (May 20, 2015), https://www.bloomberg.com/opinion/articles/2015-05-20/bank-fine-scorecard-follow-along-at-home-; Jill Treanor, *Libor-Rigging Fines: A Timeline*, GUARDIAN (Apr. 23, 2015), https://www.theguardian.com/business/2015/apr/23/libor-rigging-fines-a-timeline.

16. *See, e.g.*, David Enrich, *Former Trader Tom Hayes Sentenced to 14 Years for Libor Rigging*, WALL ST. J. (Aug. 3, 2015), https://www.wsj.com/articles/tom-hayes-convicted-of-libor-rigging-1438610483; Alexandra Stevenson, *HSBC Bank Executives Face Charges in $3.5 Billion Currency Case*, N.Y. TIMES (July 20, 2016), https://www.nytimes.com/2016/07/21/business/dealbook/hsbc-foreign-exchange-investigation-currency.html.

17. *See, e.g.*, *Transition from LIBOR*, N.Y. FED., ALT. REFERENCE RATES COMM., https://www.newyorkfed.org/arrc/sofr-transition (last visited Aug. 23, 2020); *Staff Statement on LIBOR Transition*, U.S. SEC. & EXCH. COMM'N (July 12, 2019), https://www.sec.gov/news/public-statement/libor-transition; *Financial Benchmarks,* FIN. STABILITY BD., https://www.fsb.org/work-of-the-fsb/policy-development/additional-policy-areas/financial-benchmarks/ (last visited Aug. 23, 2020).

setting of which depended on thirteen or so large dealers' self-reported costs of borrowing, banks' derivatives traders needed only to convince the banks' LIBOR submitters to over- or underestimate the rate on any given day to benefit those traders' positions.[18] This was successful because small distortions in LIBOR could generate very large profits on hefty outstanding positions for which payments depended on LIBOR. For example, in a single quarter, a 25 basis point (0.25%) change in LIBOR could net $337 million in interest revenue for JPMorgan, and $936 million for Citigroup.[19] And if a rate such as LIBOR were systematically overreported, interest rates on everything from mortgages to derivatives would be systematically too high.[20]

Similarly, because the WM/Reuters FX benchmark reflected only a sliver of interdealer transactions during a one-minute window of time around 4 p.m. each day, a would-be manipulator need not have controlled the global supply of a currency; they needed only to tweak the benchmark rate to which the global exchange rates are indexed. For example, if Citibank received an order from a client who wished to purchase the New Zealand dollar ("NZD") at the WM/Reuters 4 p.m. benchmark rate, Citibank would purchase the NZD and then sell it to the counterparty at the 4 p.m. fixing price. If Citibank could ensure that other dealers did not interfere with its buying, then Citibank might be able to buy the NZD in ways so as to push the 4 p.m. WM/Reuters rate up, which could lead to Citibank then selling that NZD to its customer at an inflated rate.

A few observations about these examples are worth noting. First, the disparity between the size of the market snippet surveyed to create a benchmark and the size of the market indexed to that benchmark—and thus affected by manipulation—is enormous. Second, a few dealers seem to possess outsize influence, both due to their involvement in the benchmark-setting process and as counterparties to the same transactions indexed to those benchmarks. Finally, reform has proved tricky, not only because of how deeply these benchmarks have permeated the markets, but due to the lack of viable alternatives. As the President of the Federal Reserve Bank of New York stated in a recent speech, "[c]ontracts that reference U.S. dollar

18. *See, e.g.*, Press Release No. 15-499, U.S. Dep't of Justice, Deutsche Bank's London Subsidiary Agrees to Plead Guilty in Connection with Long-Running Manipulation of LIBOR (Apr. 23, 2015), https://www.justice.gov/opa/pr/deutsche-banks-london-subsidiary-agrees-plead-guilty-connection-long-running-manipulation; Press Release No. 13-161, U.S. Dep't of Justice, RBS Securities Japan Limited Agrees to Plead Guilty in Connection with Long-Running Manipulation of Libor Benchmark Interest Rates (Feb. 6, 2013), https://www.justice.gov/opa/pr/rbs-securities-japan-limited-agrees-plead-guilty-connection-long-running-manipulation-libor.

19. *See* Connan Snider & Thomas Youle, Does the LIBOR Reflect Banks' Borrowing Costs? 10, 12 (Apr. 2, 2010) (unpublished manuscript), http://ssrn.com/abstract=1569603.

20. *See, e.g.*, Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 4.

LIBOR continue to be written, which only serves to increase the level of systemic risk."[21]

Understanding how these structures arose and drawing insights to guide future reform is this Article's central analytical aim. Benchmarks such as LIBOR or the WM/Reuters FX rate have become ubiquitous for an important reason: they have substantially helped harmonize otherwise decentralized, opaque OTC markets. These benefits fit the prevailing view in much of financial regulation: because sophisticated market participants, through wealth-maximizing behavior, tend to select towards structures that maximize efficiency, aggregate social welfare is maximized, meaning that observed equilibria are likely to be the most efficient equilibria.[22]

This Article makes the claim that this understanding is incomplete and identifies a fundamental misalignment between what is privately optimal (i.e., for individual parties to a given transaction), and what is socially optimal (i.e., for the economy more broadly) in OTC markets. By undertaking a structural analysis, this Article identifies significant distortions that have resulted from treating benchmark rates as "one size fits all": (a) entrenched oligopolistic structures, (b) the temptation of manipulation and weakened incentives to monitor wrongdoing, and (c) stagnation around a suboptimal benchmark. It argues that the "natural" oligopoly observed among powerful dealers in decentralized, opaque OTC markets, along with network effects and accompanying path dependencies, have encouraged inefficient lock-in and facilitated wrongdoing. Suboptimal yet "systemically" important benchmarks have resulted, with skyrocketing switching costs for market participants and vanishing incentives to develop better benchmarks.

Thus, this Article proposes an alternative competitive equilibrium—one where multiple benchmarks compete. So long as a benchmark remains so entrenched in an ecosystem dominated by powerful institutions, there is little likelihood of innovation or competition from socially beneficial alternative benchmarks, and market-based discipline will remain ineffective. Nor should the persistence of certain dominant benchmarks be taken to indicate their desirability. Simply because OTC markets have historically been dominated by private ordering does not necessarily mean that the results of such private orders are indicative of optimal or efficient outcomes.

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21. John C. Williams, President and Chief Exec. Officer, FED. RESERVE BANK N.Y., Remarks at the 2019 U.S. Treasury Market Conference (Sept. 23, 2019), https://www.newyorkfed.org/newsevents/speeches/2019/wil190923.

22. *See generally, e.g.*, FRANK H. EASTERBROOK & DANIEL R. FISCHEL, THE ECONOMIC STRUCTURE OF CORPORATE LAW 1–39 (1991); Armen A. Alchian & Harold Demsetz, *Production, Information Costs, and Economic Organization*, 62 AM. ECON. REV. 777 (1972); R. H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937); Oliver Williamson, *Corporate Governance*, 93 YALE L.J. 1197 (1984).

Existing reform proposals emphasize calculation methodology reform, enforcement, or turning over responsibility to the government. All overwhelmingly assume that a single benchmark will continue to dominate. In doing so, these proposals ignore the deeper pathologies identified in this Article and invite a repeat of the same problems that plague one-size-fits-all benchmarks.

Calculation reform, while useful, comes at a cost. For example, widening the sampling window for the WM/Reuters FX benchmark calculation has introduced tracking error and potentially lowered the utility of such a rate to end users. Moreover, total immunity to manipulation is impossible, and attempting to achieve it would be exceedingly costly. Enforcement and compliance will no doubt remain important. However, the patchwork of fraud, manipulation, and antitrust regimes, and the difficulty of measuring harm or disgorging profits pose significant obstacles to both ex ante deterrence and ex post discipline. Nor do such proposals address the problem of regulatory capture due to the systemic importance of a benchmark. Relying on the government as a benchmark provider is also problematic, and likely to be slow, cumbersome, and costly. Nor is there any guarantee that the government would get it right.[23]

Competition among multiple benchmarks, by contrast, can benefit participants market-wide by encouraging innovation, transparency, the development of better information, and entry by more efficient providers. Benchmarks would be nimbler, less systemically important, and less tempting and more difficult to manipulate.

Additional benchmarks would, critically, significantly lower the cost for end users of switching from one benchmark to another. Stagnation around a single benchmark could be more easily avoided, and wealth-promoting innovation and updating around existing and new benchmarks could occur (with the proper incentives). Reduced hardwiring of a single benchmark

23. *See infra* Part IV.A. For example, in the U.S., regulators have settled on the secured overnight financing rate ("SOFR"), a measurement of banks' overnight borrowing rate (secured by Treasury securities), as the sole designated LIBOR replacement. LIBOR had flaws, to be sure. But so does SOFR: the markets for SOFR can be finicky and overly dependent on volatility spurts related to funding market idiosyncrasies. SOFR, an average of past transactions, should also not necessarily be viewed as a satisfactory substitute for LIBOR, a credit-sensitive term rate. Importantly, SOFR is backward-looking, while LIBOR is forward-looking. For many borrowers, interest rates pegged to future economic movements will be much more useful than those that will always lag the market. These differences mean that, to fully transition to SOFR, market participants will need to understand and calculate mathematical relationships between LIBOR and SOFR for many contracts with payment obligations extending far into the future, an exceedingly costly endeavor. Any issues will be exacerbated because banks, the main players in OTC markets, are better off when they can match their lending revenue with their borrowing costs. LIBOR, which measures banks' cost of borrowing from each other, was actually an excellent rate at which to lend: banks' revenue from loans made at LIBOR would match their cost of borrowing from each other, allowing a match between assets and liabilities.

would also make market discipline more effective by reducing not only the temptation to manipulate (by lowering the upside), but also a benchmark's systemic impact.

This Article proceeds as follows. Part I explicates the social functions of financial trading markets, introduces OTC markets, and describes their basic dealer-mediated structure. Dealers' expertise, superior information, and lower cost of providing liquidity in bespoke, decentralized markets have resulted in their natural dominance. As a byproduct of their market-making business, dealers amass information and acquire expertise, creating a kind of "natural" oligopoly. Part II explores the "private" disciplining structures in OTC markets and how benchmarks can exert radical standardizing effects and generate efficiencies and social value for a wide swath of OTC market participants. Part III considers the limits of such structures, seeking to understand how dealer-promulgated benchmarks then benefit from network effects and path dependencies that promote inefficient pooling around the "default" benchmark. Negative consequences can snowball: oligopolies can entrench; "systemically" important benchmarks may result in the same way a bank can become systemically important; incentives to monitor wrongdoing can weaken; and manipulation may seem particularly tempting, especially when dealers both set a benchmark and are the counterparties to transactions that reference that benchmark. Part IV discusses implications and avenues for reform. So long as a benchmark remains so entrenched in an ecosystem dominated by powerful institutions, innovation or competition from socially beneficial alternative benchmarks will be unlikely, and market-based discipline will lack credibility. Thus, in contrast to existing reform proposals, which overwhelmingly assume that a single benchmark will continue to dominate, this Article advocates for a more fundamental approach. An alternative competitive equilibrium is proposed—one where multiple benchmarks compete. Benefits of introducing additional benchmarks and encouraging competition are considered, as are mechanisms for transition. A brief conclusion follows.

I. OVER-THE-COUNTER MARKETS

While the focus of this Article is on benchmark-based OTC markets, I will first discuss OTC markets more broadly, their structures, and their capacity for generating social value. Understanding these structures provides important background for understanding the emergence of financial benchmarks.

OTC markets are dealer markets, which means that a dealer (such as Goldman Sachs) will be the counterparty to every transaction. Dealers play critical roles in matching parties, facilitating transactions, and lowering search costs that might prevent participation in the markets at all. Particular

attention will be paid to the consequences of dealer domination: as a byproduct of this role, dealers amass information and acquire expertise, creating a kind of "natural" oligopoly.

A. Social Value of OTC Markets

At their broadest, financial trading markets—regardless of structure—serve important social purposes. Beyond simply generating wealth for powerful players within them, properly functioning markets funnel participants' profit-seeking activities toward actions that generate social value and help allocate real economic resources to projects that benefit the economy.[24] The mechanisms through which this occurs differ from market to market, but in general, the more accurate prices are and the more liquid markets are, the more smoothly this process works.[25]

If properly functioning, OTC markets can enhance the efficiency with which resources are allocated.[26] Most importantly, they provide economical and flexible means through which firms and funds can efficiently hedge risk. Of course, improperly functioning OTC markets—like any market—will do the opposite. At their worst, OTC markets can facilitate speculation, leverage, and socially harmful activities, which can have disastrous consequences for the economy and arguably played a role in previous market

24. Consider the market for equities—stocks. Secondary trading markets for equities, such as the NYSE, incentivize information discovery about the value of corporations through relatively well-understood mechanisms. As traders seek to profit off of information, buying if they believe the stock is undervalued, and selling if they believe it is overvalued, stock prices move toward levels that better reflect available information. As more information is impounded into prices through trades, prices act as a signal for investors to further direct their capital accordingly. For further detail, see generally, FOX, GLOSTEN & RAUTERBERG, *supra* note 1.

25. *See, e.g.*, Merritt B. Fox, Lawrence R. Glosten & Gabriel V. Rauterberg, *Informed Trading and Its Regulation*, 43 J. CORP. L. 817, 832–35 (2018). Price accuracy refers to the degree in which a price reflects the value of the asset. Liquidity is a multidimensional concept that captures the cost of trading. It touches on availability of the trade, possible prices, ease of transacting, and time required. Additional considerations also bear on an evaluation of the desirability of any practice in financial markets: the real resources consumed (e.g., personnel and infrastructure), and the practice's effect on favorable innovation, for example. The more accurate prices are, and the more liquid markets are, the more easily resources can be directed to projects that generate the most social value, and the better the markets are able to promote core aspects of social welfare. Tying into the Efficient Capital Markets Hypothesis, or the idea that prices in the equities market reflect all available information, this underlies many regulatory goals, a disclosure-based legal regime, and prevailing views on corporate governance and enforcement (e.g., the use of fraud-on-the-market presumption). *Id.*; *see also* Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 VA. L. REV. 549 (1984).

26. *See, e.g.*, Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1122 (explaining that derivatives markets, functioning well and embedding price expectations, enhance market efficiency); Joel Hasbrouck & Richard M. Levich, *FX Market Metrics: New Findings Based on CLS Bank Settlement Data* 3, 35 (Nat'l Bureau of Econ. Rsch., Working Paper No. 23206, 2017), https://www.nber.org/papers/w23206.pdf (noting the importance of liquidity to international currency markets and international trade).

crashes.[27] Below, I provide an example of a socially useful OTC transaction. Because it is customizable, a swap (a kind of OTC derivative) can provide a precise hedge for the idiosyncratic business risk that a particular firm faces.

One of the largest risks to the profitability of an airline's business is rising jet fuel prices. For example, if jet fuel prices rise, Delta Air Lines's profits will decline. In order to manage this risk, or hedge its exposure, Delta might enter into a jet fuel swap. Such a swap will ensure that rising or falling fuel prices will not cripple Delta's profitability. Structured as a fixed-for-floating swap (one party pays a fixed price in return for a floating, or market, price over some period of time), if fuel prices rise, Delta receives payment that directly offsets the higher prices it may have to pay in the market for fuel. As a result, Delta becomes indifferent to otherwise volatile changes in fuel costs. In this way, swaps can be tailored to hedge a multitude of other commodity risks, interest rate risks (the risk that a company's borrowing costs rise), foreign exchange rate risks, and so forth. Indeed, Delta's 2019 second quarter financial report makes note of derivative contracts (both exchange-traded and OTC) used to hedge fuel price risk, interest rate risk, and foreign exchange risk.[28]

This example illustrates the usefulness of OTC products in allocating risks onto parties better able to bear them.[29] The above swap was particularly useful because it could be precisely customized. Delta could arrange for payment and delivery on the same dates on which it would need to obtain fuel. To cite an example from a different industry, an executive at MillerCoors has stated: "[We] use over-the-counter swaps to precisely match the timing and prices of our complex manufacturing and distribution process . . . . [W]e match our OTC swaps for aluminum with the actual use of cans over the same exact timeframe."[30] End users of such OTC products

27. This is a common criticism leveled at OTC markets. *See, e.g.*, Lynn A. Stout, *Derivatives and the Legal Origin of the 2008 Credit Crisis*, 1 HARV. BUS. L. REV. 1, 3–4, 22–29 (2011) (arguing that the 2008 credit crisis directly resulted from removing the Commodities Futures Modernization Act's ban on speculative trading in OTC derivatives).

28. Delta Air Lines, Quarterly Report (Form 10-Q) 12 (June 30, 2019), http://d18rn0p25nwr6d.cloudfront.net/CIK-0000027904/43093a3a-581e-4dc0-8f23-499bb7031e64.pdf.

29. Kathryn Judge, *Investor-Driven Financial Innovation*, 8 HARV. BUS. L. REV. 291, 322 (2018) (contrasting reallocation of risk through financial market activity with hedging exogenous risks with derivatives).

30. *Assessing the Regulatory, Economic, and Market Implications of the Dodd-Frank Derivatives Title, Hearing Before the Comm. on Fin. Servs.*, 112th Cong. 52 (2011) (statement of Craig Reiners, Director of Risk Management, MillerCoors), https://play.google.com/books/reader?id=kFZGAQAAMAAJ&hl=en&pg=GBS.PA52; *see also* Bruce Tuckman, *Derivatives: Understanding Their Usefulness and Their Role in the Financial Crisis*, 28 J. APPLIED CORP. FIN. 62, 63–64 (2016), https://onlinelibrary.wiley.com/doi/epdf/10.1111/jacf.12159.

range from Delta Air Lines to institutional portfolio managers[31] to sovereign states,[32] and such transactions are prevalent throughout a wide range of industries.[33] This kind of customization[34] can help a company alleviate large components of business risk[35] that might otherwise jeopardize its operations or make its day-to-day continuation significantly more uncertain,[36] or lower certain kinds of risk in an investment portfolio.[37]

31. *See, e.g.*, Momtchil Pojarliev & Richard M. Levich, *Should Investors Avoid or Seek Out Currency Risk? How to Resolve a Long-Standing Puzzle*, 2 J. FIN. PERSPS. (2014).

32. *See* Henry T.C. Hu, *Misunderstood Derivatives: The Causes of Informational Failure and the Promise of Regulatory Incrementalism*, 102 YALE L.J. 1457, 1466 n.39 (1993) (noting that as early as 1991, governments have been party to hundreds of billions of dollars' worth of interest rate and currency swaps); John Kiff, Uri Ron, & Shafiq Ebrahim, *The Federal Government's Use of Interest Rate Swaps and Currency Swaps*, BANK OF CAN. R. 23–24 (2000–01) (noting Canada's billions of dollars' worth of interest rate swaps and currency swaps used to manage foreign currency risk); Benn Steil, *Central Bank Currency Swaps Tracker*, COUNCIL ON FOREIGN RELATIONS 1, 4 (Nov. 5, 2019), https://www.cfr.org/international-finance/central-bank-currency-swaps-since-financial-crisis/p36419#!/ (noting the importance of U.S. Federal Reserve swaps in responding to the 2007 crisis).

33. *See, e.g.*, Apple Inc., Annual Report (Form 10-K) 26–27 (Sept. 28, 2019), http://d18rn0p25nwr6d.cloudfront.net/CIK-0000320193/1a919118-a594-44f3-92f0-4ecca47b1a7d.pdf; General Electric Company, Annual Report (Form 10-K) 147–48 (Dec. 31, 2018), https://www.sec.gov/Archives/edgar/data/40545/000004054519000014/ge10-k2018.htm (reporting $1.5 billion in derivatives hedges); UnitedHealth Group Inc., Annual Report (Form 10-K) 46 (Dec. 31, 2018), https://www.unitedhealthgroup.com/content/dam/UHG/PDF/investors/2018/UNH-Q4-2018-Form-10-K.pdf) (reporting $14 billion of assets and $9 billion of liabilities with variable interest rates, directly or via interest rate swaps); *The Value of Derivatives*, INT'L SWAPS AND DERIVATIVES ASS'N (2014), https://www.isda.org/a/qJEDE/isda-final-2014.pdf (discussing how firms across a multitude of industries rely on OTC derivatives to manage business and financial risks, enabling them to better serve their clients).

34. In a three-month study of interest rate derivatives, over 10,500 traded combinations of product, currency, and tenor were observed (roughly 4,300 combinations just once). Michael Fleming, John Jackson, Ada Li, Asani Sarkar & Patricia Zobel, *An Analysis of OTC Interest Rate Derivatives Transactions: Implications for Public Reporting* 3 (Mar. 2012), FED. RES. BANK N.Y. Staff Report No. 557, https://ssrn.com/abstract=2030461.

35. This is especially true for the component of firm-specific risk that cannot be diversified away. *See, e.g.*, Edward G. Fox, Merritt B. Fox & Ronald J. Gilson, *Economic Crisis and the Integration of Law and Finance: The Impact of Volatility Spikes*, 116 COLUM. L. REV. 325, 330 (2016) (noting differences between firm-specific—or idiosyncratic—risk and market-wide—or systemic—risk).

36. This is not to say that there are not costs or tradeoffs to OTC market usage. Greater flexibility in customization usually entails greater risk, in counterparty risk, default risk, and simple valuation risk. *See* Hu, *supra* note 32, at 1465–67 (describing benefits to derivatives, such as lowered transaction costs and cheaper and more flexible risk management); Kiff, Ron & Ebrahim, *supra* note 32, at 24 (explaining that swaps are useful because they are private and customizable, but also have counterparty risk and lock in costs).

37. For example, economists have modeled the beneficial effects of both passive and active hedging of currency risk in portfolios, demonstrating that they reduce volatility and generate better returns. *See, e.g.*, Pojarliev & Levich, *supra* note 31, at 2, (arguing for institutional investments in currency because they are resilient, liquid, and tend to be imperfectly correlated with other aspects

B. OTC Market Structures

This Part lays out the attendant structures in OTC trading markets and highlights an important aspect of transactions such as the example described for Delta: the importance of intermediaries. Usually large banks such as Goldman Sachs or other large market-making entities, dealers serve particularly crucial functions in OTC markets due to (a) such markets' lack of a centralized coordination mechanism for transactions, such as a limit order book; and (b) parties' needs for complex, bespoke instruments and transactions.

This Part will explain that as OTC markets have expanded, these dealers have grown even more important, attaining a "natural" oligopoly of sorts through the superior information and expertise acquired as a byproduct of their market-making business. First, I discuss dealers' roles in providing liquidity. Then, I focus on the information asymmetries that persist in these markets. Finally, this Part explores the oligopolistic nature of dealers' roles in OTC markets.

1. Dealer-Mediated Liquidity

Dealers provide liquidity in OTC markets. OTC markets lack coordinated or centralized sources, such as a limit order book, through which a would-be participant could undertake its own search for a counterparty or compare the quotes offered by counterparties.[38]

A limit order book, such as those featured on equities exchanges, consolidates the best executable price quotes (prices at which buyers and sellers are willing to enter into transactions) and makes them available to market participants.[39] Executions take place when a buyer is willing to pay a price that is equal to or higher than the lowest sale offer, or when a seller is willing to accept a price that is equal to or lower than the highest bid.[40]

In a limit order book market, any entity can be the counterparty to a transaction. The counterparty is largely random and will be whoever posts a price at which another is willing to transact. In equities markets today, more often than not this is a high-frequency trader.[41] By contrast, in a dealer

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of the market, including downturns and other cyclical events, as their values depend on relative economic strength).

38. *See, e.g.*, Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1107–08, 1133.

39. *See* FOX, GLOSTEN AND RAUTERBERG, *supra* note 1. For many years, there existed "specialists" on the stock exchanges, who were designated "market makers" and stood ready to provide quotes on a continuous basis. These no longer exist. (Anyone can provide liquidity on a stock exchange today.) *See* LARRY HARRIS, TRADING AND EXCHANGES: MARKET MICROSTRUCTURE FOR PRACTITIONERS 494 (2003).

40. *See* FOX, GLOSTEN AND RAUTERBERG, *supra* note 1, at 11–32.

41. *See id.* at 95–130.

market, which OTC markets are, a dealer will always be the counterparty to each transaction. But the limit order book model, as we will see, in which anyone can provide liquidity or act as a counterparty to a trade, has limited viability for markets where transactions are highly complex or in which risks are bespoke and idiosyncratic.

In the Delta example, because Delta has a business risk exposure to rising jet fuel prices, Delta is an end user of a jet fuel swap, or OTC derivative. Rather than try and find a counterparty with the exact opposite exposure to fuel costs on matching future dates and in identical future amounts, Delta would most likely enter into a swap with a dealer such as Goldman Sachs. Goldman could then enter into additional swaps with other end users, overall maintaining minimal exposure itself.[42] In this way, both Delta and the would-be counterparty gain perfect hedges, while Goldman bears only minimal risk (and no business risk) that it is able to eliminate because it is counterparty to a huge volume of such transactions, earning fees on these transactions.[43]

Goldman provides valuable flexibility, and likely at significantly lower cost than, for example, an oil refinery might. Searching for a refinery with the same precise opposite exposure would also be expensive and time-consuming, meaning firms might settle for imperfect hedges, leaving varying amounts of risk unmanaged. Further, another end user (as counterparty) would most likely exhibit idiosyncratic settlement risk or default risk—risks that are exacerbated by the future-oriented nature of swaps and hedging instruments that contemplate continuing payment obligations of both parties over some length of time.[44] Goldman is a far less risky counterparty. Dealers, who have superior resources and who are in the business of managing risk, are naturally better positioned to take on a counterparty role.

In this way, dealers can contribute to market efficiencies by allowing risk to be allocated more efficiently.[45] Dealers act as market makers. By

42. *See also* Hu, *supra* note 32, at 1466–68; Sivaprakasam Sivakumar & Anita Mathew, *Currency Swaps: An Instrument of International Finance*, 21 VIKALPA 3, 4–5 (1996), https://journals.sagepub.com/doi/pdf/10.1177/0256090919960201 (noting the transition from intermediaries bringing counterparties together to intermediaries acting as counterparties to the transactions themselves, reducing counterparty risk for end users).

43. *See, e.g.*, Tuckman, *supra* note 30 at 63–64 (noting that the variability and idiosyncrasies of many end users' needs (mismatched buyers and sellers) means that liquidity providers play important roles, providing immediacy and earning fees for the risks of doing so).

44. *See* Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1126–28.

45. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 12; *see also* Lukas Menkhoff, Lucio Sarno, Maik Schmeling & Andreas Schrimpf, *Information Flows in Foreign Exchange Markets: Dissecting Customer Currency Trades*, 71 J. FIN. 601, 602 (2016) (noting that large dealers allow differing parties to share risk); Semyon Malamud & Andreas Schrimpf, *An Intermediation-Based Model of Exchange Rates* 4–5 (Bank for Int'l Settlements, Working Paper

packaging transactions for clients and being willing to take either side of a trade, dealers usually eliminate the resulting risk through offsetting transactions with other clients or other dealers.[46] Access to a liquid interdealer market can also help hedge such exposure.[47] Without ready intermediaries, search in an OTC market might be extremely costly.[48]

2. Informational Advantages

OTC market structures also tend to concentrate superior information in the hands of these same dealers. There is little price transparency, price discrimination persists, and larger dealers are better informed as a result of their market-making activities.[49]

Prices for transactions executed in an OTC market are known to the participants in any given transaction, but are rarely disseminated any further.[50] End users must approach counterparties sequentially and engage in bilateral negotiating.[51] Information is obtained only by requesting quotes from different dealers, which takes time and still does not necessarily tell end users anything about recent prices or the desirability of any given quote.[52] And, once a quote is agreed upon, it is difficult to monitor execution.[53]

743, 2018), https://www.bis.org/publ/work743.pdf (observing that markups may decrease due to the overall lower risk exposure resulting from successful intermediation).

46. *See* Dan Awrey, *Complexity, Innovation, and the Regulation of Modern Financial Markets*, 2 HARV. BUS. L. REV. 235, 268 (2012) [hereinafter Awrey, *Complexity*].

47. For example, in the foreign exchange markets, because dealers prefer to keep "flat" books, after taking one side of a transaction with a customer, that dealer will hedge the resulting exposure on the opposite side through the interdealer market. *See* Michael R. King, Carol Osler & Dagfinn Rime, *Foreign Exchange Market Structure, Players and Evolution* 14 (Norges Bank Working Paper No. 2011/10, 2011), https://ssrn.com/abstract=1935858 [hereinafter King, Osler & Rime, *FX Market Structure*].

48. If the costs are great enough, entities may abstain from participating at all. Thus, these costs act as a sort of wedge that potentially reduces gains from trade or results in risk remaining unhedged.

49. This is another crucial aspect in which OTC markets differ from exchange markets: in order for the price discovery mechanism to work smoothly in exchange markets, a multitude of regulations ensure relatively "fair" access to markets, prices, and information. In exchange markets, no single entity—or concentrated group of powerful entities—controls the price discovery mechanism. Anyone can be a market maker, and anyone can be trading on information. Overall, the more information seeking there is, the more accurate prices tend to be. *See generally* FOX, GLOSTEN AND RAUTERBERG, *supra* note 1, at 33–58; HARRIS, *supra* note 39.

50. There are some exceptions, for example, post-trade reporting through TRACE in the U.S. bond markets. *See Trade Reporting and Compliance Engine ("TRACE")*, FIN. INDUS. REGULATORY AUTH., https://www.finra.org/filing-reporting/trace (last visited Feb. 2, 2020).

51. *See* Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1133; Duffie, Garleanu & Pedersen, *supra* note 11, at 1; Glode & Opp, *supra* note 4, at 3.

52. *See* Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1133. Indeed, certain banks have been fined for adding "silent" markups on quotes without informing their clients. *See, e.g.*, Plea Agreement at 3–9, United States v. JPMorgan Chase, 2015 WL 2441398 (D. Conn. May 20, 2015) No. 3:15CR79(SRU).

53. *See* Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1128.

On the flip side, dealers amass information, almost passively.[54] Customer orders provide dealers with a constant stream of information.[55] In foreign exchange markets, for example, empirical evidence confirms the informational advantages enjoyed by the largest dealers.[56] Moreover, the general opacity of transactions enables dealers to engage in price discrimination and profit from their superior information.[57] It is well documented that OTC markets see a variety of prices paid by differing clients for the same asset, making OTC markets more profitable for dealers.[58] Price accuracy can suffer, especially as compared to an exchange on which assets are continuously traded, and where price transparency, liquidity, and immediacy limit the markups that a dealer can charge.[59] Indeed, work has demonstrated that centralized, continuous trading multi-dealer platforms can help eliminate discriminatory pricing and equalize spreads paid by clients regardless of sophistication level.[60]

These informational advantages grow as transactions and products attain increasing heterogeneity and complexity. Returning to the previous example, Delta has a specific set of exposures it needs to hedge and a specific business risk profile. MillerCoors has a completely different one. Other

54. *See id.* at 1143–44.

55. *See, e.g.*, Menkhoff, Sarno, Schmeling & Schrimpf, *supra* note 45, at 602 (finding that FX orders incorporate information about future rates).

56. *See, e.g.*, Michael R. King, Carol L. Osler & Dagfinn Rime, *The Market Microstructure Approach to Foreign Exchange: Looking Back and Looking Forward*, 38 J. INT'L MONEY & FIN. 95, 109–11 (2013) (discussing how those with large customers are better informed); Martin D.D. Evans & Dagfinn Rime, *Microstructure of Foreign Exchange Markets* 3 (Norges Bank Working Paper No. 6/2019, 2019), https://www.norges-bank.no/en/news-events/news-publications/Papers/Working-Papers/2019/62019/ (noting in FX markets, these informational advantages most significantly come from customer orders, concentrated in large dealers); King, Osler & Rime, *FX Market Structure*, *supra* note 47, at 16 (discussing a study of FX dealers' order flow concluding that larger dealers are better informed than smaller dealers).

57. *See, e.g.*, Harald Hau, Peter Hoffmann, Sam Langfield & Yannick Timmer, *Discriminatory Pricing of Over-the-Counter Derivatives* 1–2 (Swiss Fin. Inst. Research Paper No. 17-70, 2017), https://ssrn.com/abstract=3099089 (finding that less sophisticated clients pay the most in FX derivatives markets, while client sophistication does not affect spreads on multi-dealer request-for-quote platforms).

58. *See* DARRELL DUFFIE, DARK MARKETS: ASSET PRICING AND INFORMATION TRANSMISSION IN OVER-THE-COUNTER MARKETS (PRINCETON LECTURES IN FINANCE) 12 (2012). Dealers charge wider spreads when they have more information vis-à-vis their counterparties. *See, e.g.*, Hau, Hoffmann, Langfield & Timmer, *supra* note 57, at 1–2. Similarly, spreads quoted between dealers in the interdealer market are usually narrower than those quoted to customers. *See* King, Osler & Rime, *FX Market Structure*, *supra* note 47, at 15–16.

59. *See* Awrey, *Complexity*, *supra* note 46, at 268 (arguing that the dealer-centric structure in OTC markets has significantly impeded transparent pricing); Kathryn Judge, *Intermediary Influence* 82 U. CHI. L. REV. 573, 615–16, 625 (2015) [hereinafter Judge, *Intermediary Influence*] (noting that prices in OTC markets may be less accurate than exchange-traded ones).

60. *See* Hau, Hoffmann, Langfield & Timmer, *supra* note 57, at 2 (finding in the FX market, the rents extracted by dealers with superior information are not observed in multi-dealer request for quote platforms).

companies, portfolio managers, and end users will have other idiosyncratic needs and risks. Dealers, with expertise in multiple kinds of exposures and assets, will invest in the resources and models to understand and value complex transactions and instruments, acquiring even greater expertise as the market evolves.[61] This reinforces an earlier observation: the limit order book model, in which anyone can provide liquidity or act as a counterparty to a trade, has limited viability for markets where transactions are highly complex or in which risks are bespoke and idiosyncratic. This also helps clarify the value added by dealers: they are much better positioned to provide hedging instruments to end users such as Delta. Thus, we arrive at a basic, unavoidable trade-off: intermediaries add significant value by structuring such transactions, but doing so also amplifies those same intermediaries' substantial informational advantages vis-à-vis end users or clients.[62]

3. "Natural" Oligopoly

A natural monopoly occurs when a single supplier of services or products naturally dominates because it can more efficiently supply the market than its competitors can.[63] While the antitrust literature contains a rich debate as to such structures, for our purposes it is sufficient to note its contours.[64] Naturally arising monopolies or oligopolies result from supply-side economies of scale, rather than demand characteristics.[65] Understanding the structural profile of OTC markets—their dealer-mediated liquidity and persistent information asymmetries—as a "natural" oligopoly of dealers can provide valuable insights.

Intuitively, it should not be too surprising that the markets described above tend to exhibit some characteristics of an oligopoly. Certain efficiencies can be achieved by concentrating activity within large, expert dealers who can provide near perfect hedges while posing very little counterparty risk to an end user. End users in OTC markets usually have one-off, idiosyncratic needs, with a somewhat fixed cost of doing business in OTC markets.[66] Delta's cost of negotiating additional jet fuel swaps may

61. For example, in the foreign exchange markets, customer demand for electronic platforms has driven investment in technology, which is expensive and can prove unprofitable for dealers with smaller market share. This phenomenon may be exacerbated if dealers are incentivized to invest in transactions that enable high-fee, more complex products. *See* Judge, *Intermediary Influence*, *supra* note 59, at 627.

62. *See id.* at 625.

63. *See* Richard A. Posner, *Natural Monopoly and Its Regulation*, 21 STAN. L. REV. 548, 548 (1969). Telecommunications or public utility industries are examples of natural monopolies. *Id.*

64. *See generally id*.

65. *See id.* at 548.

66. *See, e.g.*, Matt Levine, *The Libor Change Is Coming*, BLOOMBERG (Aug. 27, 2019), https://www.bloomberg.com/opinion/articles/2019-08-27/the-libor-change-is-coming [hereinafter

diminish after the negotiation of an initial one, but that diminishment cannot compare to the economies of scale that a dealer such as Goldman benefits from across its entire swaps business. For Goldman, packaging additional swaps carries very low marginal additional cost and effort, and maintaining hedges across its book ensures that Goldman is largely indifferent to the additional minor risk taken on in any given single transaction.[67] This also enables Goldman to charge lower prices than a competitor with fewer resources might be able to.

Thus, it should not be a surprise that dealer activity in OTC markets has grown more and more concentrated. Over time, a small group of very powerful dealers has grown to represent a disproportionate proportion of counterparties to transactions.[68] For instance, a study at the end of 2010 found that over 96% of the outstanding $217 trillion in derivatives contracts had one of the largest five banks as counterparty (Goldman Sachs, Bank of America, Citi, JPMorgan Chase, and Wells Fargo).[69] Contrast this to exchange-driven equities markets, where trading activity is dispersed throughout the public, and liquidity could be provided by anyone.[70]

End users' ability to seek out a counterparty that is not one of the leading dealers is severely limited, and dealers acquire key "positional advantages," including powerful relationships among themselves.[71] A feedback loop results, through which increased concentration fuels dealers' knowledge and expertise relative to clients, the markets, and even regulators.[72] Dealers have

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Levine, *The Libor Change Is Coming*] (noting that there are "all sorts of reasons" that a bank's client may have for entering into or exiting derivatives positions).

67. *See, e.g.*, *id.* ("You, meanwhile, are a bank; your derivatives trades are all hedged, and you don't care unduly about staying in or getting out of any particular trade.").

68. Market power is not an uncontroversial concept, and scholars do disagree as to its measurement, in particular, whether market concentration suffices as a proxy. *See generally* Awrey, *Complexity*, *supra* note 46; Louis Kaplow, *Why (Ever) Define Markets?*, 124 HARV. L. REV. 437 (2010); Gregory J. Werden, *Why (Ever) Define Markets? An Answer to Professor Kaplow*, 78 ANTITRUST L.J. 729 (2013).

69. *See* Judge, *Intermediary Influence*, *supra* note 59, at 619. These are common statistics. *See* Awrey, *Complexity*, *supra* note 46, at 268 (noting that in 2010, the fourteen largest dealers were counterparties to 82% of global outstanding notional in swaps) (citing David Mengle, *Concentration of OTC Derivatives Among Major Dealers* 1 (ISDA Research Notes, no. 4, 2010), http://www.isda.org/researchnotes/pdf/ConcentrationRN_4-10.pdf).

70. *See generally* FOX, GLOSTEN AND RAUTERBERG, *supra* note 1; HARRIS, *supra* note 39. In fact, a key motivation for instituting the trade-through rule in equities markets was to foster competition: by mandating that orders must execute at the best available price regardless of which exchange that price is found at (i.e., if NYSE receives an order but the best available price is on NASDAQ, NYSE must route that order to NASDAQ), a small exchange, so long as it has the best price, is guaranteed order flow.

71. *See* Judge, *Intermediary Influence*, *supra* note 59, at 577–78, 617–18 (explaining that these can be characterized by formal or informal relationships, in-house expertise over bespoke transactions, control over a trading vehicle, etc.).

72. *See id.* at 577–78.

the benefit of volume, they often have the financial resources to invest in complex models that can more accurately value the relevant assets and their markets,[73] and by simple consequence of acting as counterparty to the vast majority of transactions, information acquisition about the asset and the market in question is almost a passive consequence of their business.[74] Moreover, the opacity of prices and executions ensures that this information is not disseminated to their customers.

OTC markets—through the basic dealer-mediated nature of transactions and the lack of a centralized coordination or pricing mechanism—have thus proven particularly susceptible to oligopolistic domination by a few large players. The next Part seeks to understand the role of benchmarks within such markets.

II. BENCHMARK HARMONIZATION

As illustrated by the above discussion, the claim that OTC markets are completely unstructured and a financial free-for-all would be inaccurate. They have, instead, in ad hoc form loosely organized themselves around dealers' activities. This Part explores the degree to which standardization has been achieved by financial benchmarks such as LIBOR, ISDAFIX and FX, and how, as a result, they have grown to dominate default transaction choices in OTC markets.

Generally speaking, left to their own devices, private markets can evolve in efficient ways. This is because actors are naturally incentivized to acquire expertise and invest in structures that minimize transaction costs and maximize any resulting gain.[75] This reflects a dominant view in much of corporate and financial legal thinking,[76] and I will turn to it more fully in Part III.D. For now, it is sufficient to note that this understanding has some explanatory power for the dealer-mediated structures in OTC markets. Without dealers, many of the costs to transacting in OTC markets identified above might otherwise deter would-be investors from participating in such markets at all, resulting in risk that remains unhedged. But as we will see, dependence on the alignment between the market and its most powerful participants—dealers—for socially beneficial innovation can be a risky and problematic endeavor.

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73. *See* King, Osler & Rime, *FX Market Structure*, *supra* note 47, at 29 (explaining that because FX trading is unprofitable for small dealers due to the cost of investing in trading technology, the share of trading concentrated in the few largest banks had grown to 40% by 2010).

74. *See* Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1143–44.

75. *See* Dan Awrey, *The Limits of Private Ordering Within Modern Financial Markets*, 34 REV. BANKING & FIN. L. 183, 191–93 (2014) [hereinafter Awrey, *Private Ordering*].

76. *See supra* note 22.

A. Benchmark Introduction

Financial benchmarks' standardizing effects in OTC markets have been profound, especially with respect to price accuracy and liquidity, allowing end users and dealers alike to capture the resulting gains from lowered information asymmetries. All OTC transactions—indeed, all financial transactions—hinge on price or payment terms, whether the immediate price of an asset, the schedule of payments for some time into the future, or some yet-to-be-determined payoffs conditioned on future circumstances. Without benchmarks, negotiating each such price term can be costly, time-consuming, and inefficient. End users might spend valuable resources doing so, pay higher or worse prices that reduce or even eliminate the benefit to entering into the transaction at all, or simply leave the market, potentially leaving risk unmanaged. This Part focuses on how benchmarks can significantly reduce these costs.

Some market segments rely more on benchmarks for coordination and informational transparency benefits than others. These include foreign exchange markets, commodities, and those for certain interest rate products. Three examples of such benchmarks—LIBOR, FX, and ISDAFIX—are described below.

LIBOR originated out of frustration with the rampant nonuniformity in the early days of obtaining loans (parties frequently disagreed as to interest rates, where to obtain reference numbers, and whom to obtain them from).[77] U.K. banks eventually requested that the British Bankers Association ("BBA") standardize a means to calculate "the interest rates on syndicated loans."[78] This became LIBOR, which proved hugely useful in calculating banks' funding costs easily and cheaply.[79] By lending at LIBOR, which estimated their own costs of borrowing, banks were able to better match their lending revenue to their borrowing costs.[80] By 2012, LIBOR was reported for ten currencies and at fifteen maturities for each.[81] LIBOR has become the benchmark used globally to set interest rates—and through its incorporation, the benchmark used to "price" borrowing costs of entities all over the world.[82] Frequently referred to as the "world's most important

77. *See* Rauterberg & Verstein, *Transnational Regulation*, *supra* note 4, at 25 (citing Jeffrey B. Golden, *Setting Standards in the Evolution of Swap Documentation*, 13 INT'L FIN. L. REV. 18 (1994)) (noting the contentiousness among market participants in deciding reference rates).

78. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 30.

79. *Id.*

80. *Id.*

81. *Id.* at 16.

82. *Id.* at 3, 11; Verstein, *Benchmark Manipulation, supra* note 12, at 261 (noting ambiguities in the term "price").

number,"[83] referencing or relying on LIBOR is ubiquitous throughout the swap markets and debt markets—where it impacts everything from student loans and mortgages to complex hedges and synthetic derivatives (statistics pegged over $360 trillion to be indexed to LIBOR in 2008).[84]

In 1994, WM/Reuters introduced Closing Spot Rates as a benchmark for currency prices.[85] Calculated for over 150 currency pairs,[86] the most important rates are those calculated at 4 p.m. London time, daily.[87] WM/Reuters FX rates have grown hugely influential in markets worldwide. The value of standardizing currency exchange rates so that portfolio valuations could be more easily and accurately measured has been enormous. WM/Reuters FX rates are referenced throughout currency derivatives and commonly used to calculate the value of foreign-denominated assets.[88] This is especially important, as most major equity and bond indices (the S&P 500 and Dow Jones, for example) as well as pension funds and mutual funds rely on the WM/Reuters FX rates to determine the value of foreign-denominated assets.[89] The daily turnover of these instruments has been estimated at $5 trillion.[90]

In 1998, the International Swaps and Derivatives Association ("ISDA") established the ISDAFIX, now known as the ICE Swap Rate, to act as a reference rate for interest rate swap rates. ISDAFIX is less widely known but has had powerful standardizing effects in the market for swap derivatives. Published daily, ISDAFIX indicated the mid-market rate for the fixed leg of

83. *See supra* note 10.

84. *See* Duffie & Dworczak, *Benchmark Design*, *supra* note 9, at 2; Fletcher, *supra* note 9, at 1931; Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 3, 30.

85. *WM/Reuters FX Benchmarks: Spot, Forward and NDF Rates Methodology Guide*, REFINITIV BENCHMARK SERVS. 5 (Sept. 2020), https://www.refinitiv.com/content/dam/marketing/en_us/documents/methodology/wm-reuters-methodology.pdf.

86. *Thomson Reuters WM/Reuters FX Benchmark*, REFINITIV 1, https://www.refinitiv.com/content/dam/marketing/en_us/documents/fact-sheets/wm-reuters-fx-benchmarks-fact-sheet.pdf.

87. *See, e.g.*, Martin D.D. Evans, Peter O'Neill, Dagfinn Rime & Jo Saakvitne, Fixing the Fix? Assessing the Effectiveness of the 4pm Fix Benchmark 1 (Oct. 22, 2018) (unpublished manuscript), https://ssrn.com/abstract=3270844. For most of the relevant period, these rates were calculated by taking the median of the spot currency trades in the interbank market during the one-minute window beginning thirty seconds prior to 4 p.m. and ending thirty seconds after 4 p.m. *Id.* at 4.

88. *See supra* note 11 and accompanying text.

89. *See* Evans, O'Neill, Rime & Saakvitne, *supra* note 87, at 2 (identifying $6 trillion in funds that reference indices with the WM/Reuters FX rates as inputs); Verstein, *Benchmark Manipulation*, *supra* note 12, at 235–36 (describing the vast reach of the WM/Reuters FX rates, including by being referenced by equities indices and investment funds).

90. *See* Rime & Schrimpf, *supra* note 7, at 27; *Triennial Central Bank Survey: Foreign Exchange Turnover in April 2013: Preliminary Global Results*, BANK FOR INT'L SETTLEMENTS 9 (Sept. 2013), http://www.bis.org/publ/rpfx13fx.pdf.

a vanilla (fixed-for-floating) interest rate swap.[91] In 2014, ISDA estimated that the swaptions (options to enter into swaps) market itself comprised $30 trillion in outstanding contracts.[92] Almost all swaptions reference ISDAFIX in determining an exercise price (for a cash settled swaption).[93]

B. Benchmark Discipline

Benchmarks have facilitated tectonic informational shifts in OTC markets. By very inexpensively coordinating the price discovery-like functions of dealers, benchmarks have had enormous benefits for the market, including enhancing price transparency, lowering the cost of contracting, expanding the range of hedging opportunities, and generating huge amounts of liquidity through network effects. This Part considers each in turn.

1. Price and Execution Transparency

Benchmarks have essentially allowed ordinary market participants to leverage information capabilities of large dealers. This has led to radically reduced information asymmetries and greater price accuracy.

Consider two parties. Party A holds an asset that pays a fixed rate of 2.5% a month. Party B has an investment that pays a variable interest rate each month. If the two parties are dissatisfied with their payment streams, for example if Party B prefers the certainty of a fixed payment or Party A believes the market will outperform the rate it is entitled to, they can enter into an interest rate swap, whereby Party A pays its 2.5% to Party B and receives the variable rate from Party B. The value of the variable rate will determine gains and losses to both parties (usually netted out).

The value of the variable rate can vary enormously. Overwhelmingly, it is tied to LIBOR.[94] But consider a world without LIBOR, or without some market benchmark for interest rates. It does not seem an exaggeration to say that an end user would have negligible ability to determine such rates. Contracts would likely vary wildly in borrowing rates. But LIBOR introduces significant uniformity and predictability, not only for any given end user or borrower, but also across end users and borrowers.

As another example, consider the world before foreign exchange benchmarks were introduced. A company seeking to purchase foreign

91. *ICE Swap Rate*, INTERCONTINENTAL EXCH., https://www.theice.com/iba/ice-swap-rate (last visited Aug. 6, 2020).

92. *The Value of Derivatives*, *supra* note 33.

93. *ICE Swap Rate*, *supra* note 91.

94. *See* Levine, *Banks Will Miss LIBOR*, *supra* note 10; Karen Fernandez, *The LIBOR Is a Global Interest Rate That Affects the Rates of Many Loans and Investments. Here's How It's Set, and Why It's Slated to End*, BUS. INSIDER (Sept. 29, 2020), https://www.businessinsider.com/what-is-libor.

currency would need to engage in a bilateral, iterative search for price quotes from dealers, and have little ability to monitor the actual execution of the transaction ex post. With the introduction of WM/Reuters FX rates, that same firm need only request that its purchase be executed using the public 4 p.m. WM/Reuters FX rates.[95]

The reduced ambiguity and increased uniformity in transacting resulting from the introduction of benchmarks lowers the cost of entering into OTC transactions in the first place. Rather than engage in a one-off transaction with a dealer who possesses superior information about the value of an asset—whether the correct pricing of a loan, the settlement value of a bespoke interest rate contract, or the exchange rate of any given currency—market participants can simply look to the aggregated agreed-upon price set by multiple dealers and capitalize on their knowledge.[96]

Benchmarks also mitigate search frictions. For end users and other traders, this can encourage efficient entry, enabling them to more easily identify "low-cost" dealers and decide whether to participate at all in the market.[97] As pointed out in the examples above, a pension fund that needs to value foreign-denominated assets could simply request that its assets be benchmarked against the WM/Reuters fix, so that the fund does not need to engage in costly search. Similarly, LIBOR enables end users to ascertain the suitability of a loan rate with less difficulty.[98] This most benefits the least sophisticated customers, who might otherwise find the cost of participating in OTC markets too high. Indeed, in FX markets, evidence demonstrates that the least sophisticated clients most frequently request trade execution at benchmark prices.[99] These benefits are compounded because end users have much lower costs of ex-post monitoring of execution when they can employ benchmarks. Reference prices will be public, reducing the risk of being fleeced by those with superior information.[100] In this way, benchmarks may also incentivize better behavior by agents.

95. *See supra* text accompanying note 87.

96. Thus Duffie, Dworczak, and Zhu identify three main benefits of benchmarks in markets with persistent information asymmetries: contracts with formulas that settle by reference to a benchmark, enabling ex-post monitoring of execution quality, and the ability to compare quotes received to a benchmark. Duffie, Dworczak & Zhu, *supra* note 11, at 5 (observing that in certain markets "[b]enchmarks would be almost redundant, from the viewpoint of pre-trade price transparency, if the best executable price quotes are published and accessible to all market participants, for example on an open central limit order book").

97. *Id.* at 2 (noting that increased transparency can result in lowered quotes due to competition, which can, in turn, reduce wasteful search and promote business for low-cost or more efficient dealers since cost is more observable).

98. *See* Duffie & Stein, *supra* note 11, at 194.

99. *Id.* at 194–95.

100. *Id.* (noting that agent behavior will be easier to observe when benchmarks exist as a basis for comparison).

2. Contracting

Price terms are often the most difficult to negotiate aspects of a long-term contract, because of risks of opportunism and breach.[101] But by incorporating a benchmark into a legally binding contract, parties can retain future flexibility without ceding certainty or clarity.[102] For example, derivative contracts almost universally tie their payment conditions to benchmark values at multiple points into the future.[103] By incorporating benchmarks as price terms either directly or by reference, for example agreeing to a loan that uses LIBOR as a term, or entering into a long term set of swaptions with settlement terms that periodically are determined by ISDAFIX, parties reduce the need to negotiate a complete price schedule ex ante. The tricky (and sometimes impossible) endeavor of attempting to predict price fluctuations into the future becomes largely unnecessary thanks to financial benchmarks.

Through benchmarks incorporated as price referents, then, parties are able to benefit from the expertise of dealers, or those who set the benchmarks, which can overall increase contracting efficiency.[104]

3. Hedging

All of these benefits accumulate to allow parties participating in OTC markets to better hedge and allocate risk. A greater number of parties have access to an expanded range of instruments, more accurate prices, and increased liquidity.[105] This Article began with the Delta example. Consider a cross-currency swap, a transaction that can enable parties to achieve cheaper funds to support growth abroad. If a U.S. company, Apple, wishes to expand operations in Japan and seeks Japanese yen, and a Japanese company, Sony, needs U.S. dollars to do the same in the U.S., the two companies can (through dealers) enter into a cross-currency swap. This would be beneficial since, presumably, it is cheaper for Apple to borrow in U.S. dollars than in Japanese yen, and vice versa for Sony. A cross-currency swap can provide a useful means to accomplish this: both Apple and Sony

101. *See, e.g.*, Andrew Verstein, *Ex Tempore Contracting*, 55 WM. & MARY L. REV. 1869, 1877–78 (2014) [hereinafter Verstein, *Ex Tempore Contracting*].

102. *See* Verstein, *Benchmark Manipulation*, *supra* note 12, at 226. There is a rich literature on the benefits of "flexible and unambiguous" contracts. *See, e.g.*, *id.*; George G. Triantis, *The Efficiency of Vague Contract Terms: A Response to the Schwartz-Scott Theory of U.C.C. Article 2*, 62 LA. L. REV. 1065, 1068 (2002); Verstein, *Ex Tempore Contracting*, *supra* note 101.

103. Hardwired into contracts in this way, benchmarks effectively act as the price. *See* Verstein, *Benchmark Manipulation*, *supra* note 12, at 226–28 (also noting the commonplace nature of tying payment conditions to benchmarks rather than the price of, say, a commodity).

104. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 11 (referencing *Eastern Air Lines v. Gulf Oil* for referring to the Platts oil price index as the arbiter of oil prices, rather than courts).

105. *Id.* at 11 (these benefits accrue to retail investors as well as institutional ones).

borrow in their respective domestic debt markets and swap the amounts. Interest rates paid by Apple and Sony on the loans are usually tied to LIBOR. Because LIBOR is designed to measure banks' borrowing costs, lending to Apple or Sony at a rate tied to LIBOR means that banks can match their borrowing cost with their lending revenue. If a bank's cost of borrowing rises, then so does its lending revenue, and vice versa.[106] In this way, LIBOR, if properly functioning, can make it easier for banks to hedge, which in turn should lower the cost of providing such a loan to Apple or Sony, which in turn can promote socially beneficial global growth.

These hedging benefits are compounded due to the increasing linkages that characterize financial markets. Using a single benchmark rate as a price term across many disparate transactions increases market actors' ability not only to map risk and price across various transactions and even across various rates, but to better understand risk across multiple LIBOR exposures.[107] If done properly, this reduces risk while facilitating greater or differentiated exposures.

4. Network Effects

In addition to first order information benefits, benchmarks have also generated enormous network effects, which greatly increase liquidity market-wide.

Widespread use generates additional liquidity, and increased liquidity attracts additional use.[108] This sort of network effect, in contrast with the supply-side oligopolistic characteristics described above, is a demand-side phenomenon: the demand for a service or product is shaped by existing demand.[109] In particular, network effects exist when the value to a user of an additional unit increases by simple virtue of additional users or units.[110] One obvious example is a telephone, which would be useless if used only by one person, but which becomes more and more useful the larger the network of

106. This can be beneficial to banks in another way. *See* Duffie & Stein, *supra* note 11, at 195 (describing how adverse selection may impede a bank's ability to hedge volatility in its own borrowing costs, because the bank has private information about its own credit risk, and counterparties might be justly wary of taking an opposite position).

107. *See* Rauterberg & Verstein, *Transnational Regulation*, *supra* note 4, at 25.

108. *See* THIERRY FOUCAULT, MARCO PAGANO, AND AILSA RÖELL, MARKET LIQUIDITY: THEORY, EVIDENCE, AND POLICY 310 (2013); Awrey, *Derivatives Market Efficiency*, *supra* note 5, at 1135–36 (explicating the mechanism by which liquidity generates liquidity: depth and volume promote price discovery, narrowing spreads and attracting more traders, which creates more depth, and so on); Awrey, *Private Ordering*, *supra* note 75, at 194–95 (examining the pull of network effects on markets).

109. *See* STAN J. LIEBOWITZ & STEPHEN E. MARGOLIS, WINNERS, LOSERS & MICROSOFT: COMPETITION AND ANTITRUST IN HIGH TECHNOLOGY 67 (2001).

110. *See* Nicholas Economides, *Competition Policy in Network Industries: An Introduction* 5 (NYU Ctr. for Law and Bus. Research Paper No. 03-10, 2004), https://ssrn.com/abstract=386626.

people using it.[111] Financial exchanges (such as the NYSE and NASDAQ) are another example. Increased activity on the exchange increases the utility of any trader's participation in the exchange.[112] Benchmarks provide a similar benefit, as the more entities that measure interest rate risk using LIBOR, the more valuable LIBOR is in standardizing transactions and providing price information across otherwise disparate contracts. In the same way that commonly used contract terms yield greater value by receiving increased clarity via judicial precedents, shared business practices, and utility of associated documentation, widespread adoption of a benchmark can bring significant benefits in the form of interoperability and transparency across otherwise disparate contracts and documents.[113] Public bodies also cite to benchmarks (including directly in statutes and regulations), affording a presumption of validity to benchmark-linked prices and contractual terms.[114] These benefits are compounded for instruments of longer duration, for example, an interest rate swap that extends for several years into the future.[115]

Financial benchmarks have vastly increased the notional value in OTC markets and reduced information asymmetries and search frictions, enabling more participants than ever to access the risk-shifting benefits bestowed by such markets. That benchmarks would have such transformative effects makes sense,[116] because network effects tend to be most powerful under circumstances with the greatest uncertainties.[117]

But network effects also exert a pull in the other direction. A widely relied upon benchmark with powerful network effects might cause more standardization across transactions than is socially beneficial or which might exist in an alternate equilibrium. Marcel Kahan and Michael Klausner have identified this tendency in the corporate contracting context, arguing that network effects will cause contracts to be more standardized than in their

111. *Id.* at 9.

112. *See, e.g.*, Carmine Di Noia, *The Stock-Exchange Industry: Network Effects, Implicit Mergers, and Corporate Governance* 9-10 (MARZO Working Paper No. 33, 1999), https://ssrn.com/abstract=200991 (noting that the more liquid an exchange is, the more intermediaries and participants wish to trade on it, as the greater number of users raises the utility for all); Economides, *supra* note 110, at 5.

113. *See* Michael Klausner, *Corporations, Corporate Law, and Networks of Contracts*, 81 VA. L. REV. 757, 761 (1995); Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 14.

114. *See* Verstein, *Benchmark Manipulation*, *supra* note 12, at 227 (noting the presumption of validity often afforded to benchmarks cited by statutes, investment funds, retirement plans, etc.).

115. *See* Klausner, *supra* note 113, at 828 (describing this phenomenon in contractual choices).

116. *See generally* Frank Partnoy, *Second-Order Benefits from Standards*, 48 B.C.L. REV. 169 (2007) (observing that some of the most important benefits from such coordination achievements are those having to do with standard setting and network effects).

117. *See* Klausner, *supra* note 113, at 784 (describing that network effects tend to be largest for the most ambiguous or complex terms, as well as the most commonplace practices).

absence.[118] Bob Scott has also pointed out that in multilateral markets, economies of scale that promote standardization may also paradoxically amplify the stickiness of inefficient contract terms.[119] These effects are considered more closely in Part III.C.

There are a few additional consequences that flow out of network effects. As observed by Nicholas Economides and others, markets with network effects will tend to experience rapid expansion, a "natural" monopoly among suppliers may occur (which we have already seen), path dependence will be strong, and traditional forms of competition may not cause change to the naturally occurring market structure.[120] "[L]ock-in" can occur, as each iterative decision may "look[] optimal given past decisions, but is sub-optimal if earlier investment decisions had been delayed and all the decisions were taken at once."[121] These will be considered next.

III. BENCHMARK DISTORTIONS

The efficiencies achieved through dealer-mediated private ordering in OTC benchmark markets should not be overlooked. But they are additionally notable because they have resulted from the serendipitous alignment of dealers' incentives with end users' incentives. Financial benchmarks largely originated with dealers "without regulatory pressure"; even though benchmarks may reduce dealers' informational advantages, increased liquidity and volume resulting from a benchmark can more than offset lost profits.[122]

So long as dealers' incentives are aligned with other market participants' incentives more broadly, socially beneficial innovation—such as the promulgation of financial benchmarks—will tend to occur.[123] But

118. *See* Marcel Kahan & Michael Klausner, *Standardization and Innovation in Corporate Contracting (or "the Economics of Boilerplate")*, 83 VA. L. REV. 713, 729 (1997).

119. *See* Robert Scott, *The Paradox of Contracting in Markets* L. & CONTEMP. PROBS. (forthcoming), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3561705.

120. *See* Economides, *supra* note 110, at 10–17.

121. *Id.* at 23 (observing that rapid technological change can exacerbate this problem with an oligopoly, where firms race to adopt the current best technology, failing to account for the next update).

122. Duffie, Dworczak & Zhu, *supra* note 11, at 3, 17 (explaining that dealers may be incentivized to introduce a benchmark to obtain increased volume that offsets losses due to reduced information advantages); Duffie & Stein, *supra* note 11, at 194.

123. This relates to a literature on "soft" governance or private regulation, which need not originate with legislative bodies or public rule-making institutions. Most regulation in OTC markets has originated through such governance. A particularly successful example is the growth of the International Swaps and Derivatives Association ("ISDA") as a "private" regulator in derivatives markets. *See, e.g.*, Saule T. Omarova, *Wall Street as Community of Fate: Toward Financial Industry Self-Regulation*, 159 U. PA. L. REV. 411, 444 (2011); Rauterberg & Verstein, *Transnational Regulation*, *supra* note 4, at 20–24 (collecting sources). Self-regulation has been an important feature of financial governance since the inception of markets, and a rich debate continues

while the standardizing effects of such "default" benchmarks can be revolutionary, they can also entrench suboptimal structures, such as faulty benchmarks.

This Part identifies distortions that have arisen in these markets, showing that the persistence of certain benchmarks should not be taken to necessarily indicate their desirability. In particular, the structures explicated thus far—lack of coordination mechanisms, oligopolistic domination by a few dealers, fantastically successful standardization of prices and referents through benchmarks, and deep network effects—can promote inefficient pooling around the "default" benchmark, *even if it is suboptimal*. This Part discusses three main categories of distortions: (a) entrenched oligopolistic structures, (b) the temptation of manipulation and weakened incentives to monitor wrongdoing, and (c) stagnation around a suboptimal benchmark.

A. Entrenchment of Oligopolistic Structures

The first distortion—entrenched oligopolistic structures—arises because there is an outsize stickiness to the structures that have evolved—due to network effects and complexity of markets.[124] This is related to the literature on the first mover advantage, which can be greatly amplified when learning or network externalities are present.[125] Indeed, economists have shown that in cases where substantial network effects exist, there tends to be dominance by one or a few suppliers of a good, creating great inequality between would-be competitors.[126]

Here, the fact that OTC markets are dealer markets and the complexity of transactions in OTC markets fuel dealer concentration, which is amplified

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as to benefits and harms: the increased ability to leverage an industry's expertise and added flexibility to respond to problems without the blunt force of government regulation must be balanced against potential conflicts of interest. This very tension has spurred much of the hybrid self-regulation that occurs in modern financial markets, whereby entities such as FINRA self-regulate (in the case of broker-dealers) with supplemental government oversight imposed by the SEC.

124. Others have observed this in broader contexts. *See generally* Awrey, *Private Ordering*, *supra* note 75 (identifying distortions due to network externalities, path dependency, and power inequality in markets as a whole, and especially ones that are opaque, and noting that the success of certain market structures might paradoxically deter welfare-enhancing innovation).

125. *See, e.g.*, Ian Domowitz, *Electronic Derivatives Exchanges: Implicit Mergers, Network Externalities, and Standardization*, 35 Q. REV. ECON. & FIN. 163, 167 (1995) (in the case of floor trading vs. electronic trading, noting that dominant liquidity effects and a first-mover advantage resulted in lock in to floor trading simply because it was cheaper and came first, a result that was not simply due to irrationality but due to network effects and first mover advantage); Michael L. Katz & Carl Shapiro, *Systems Competition and Network Effects*, 8 J. ECON. PERSPS. 93, 107 (1994).

126. *See* Economides, *supra* note 110, at 12 (explaining that the universe of products offered by firms with large market shares is more valuable to consumers when network effects are present, creating a feedback loop that attracts even more customers (pointing to PC systems markets as an example), and noting that this inequality does not arise due to anticompetitive actions by any one firm).

by dealers' outsize influence over the price discovery functions played by benchmarks. Benchmarks effectively designate the most influential dealers by selecting them to participate in the benchmark setting process. One scholar has even argued "that the most efficient dealers can use a benchmark as a 'price transparency weapon' that drives inefficient competitors out of the market and draws trades to dealers in the 'benchmark club.'"[127] It makes sense for end users to seek out those dealers as counterparties, deeming them most informed, which creates a feedback loop that solidifies those dealers' positional advantages not only vis-à-vis their clients, but vis-à-vis their less powerful competitors as well.[128] Benchmarks can thus create a kind of bottleneck for competition.

Relatedly, dealers may develop additional outsize influence over regulation. Without alternatives, a single benchmark can become "systemically" important in the same way that a bank or financial institution can, reducing the credibility of regulatory or market discipline.[129] In 2018, a Federal Reserve Bank committee report acknowledged as much with respect to LIBOR:

> Because U.S. dollar (USD) LIBOR is used in such a large volume and broad range of financial products and contracts, the risks surrounding it pose a potential threat to the safety and soundness of individual financial institutions and to financial stability. Without advanced preparation, a sudden cessation of such a heavily used reference rate would cause considerable disruptions to and uncertainties around the large gross flows of USD LIBOR-related payments and receipts between many firms. It would also impair the normal functioning of a variety of markets, including business and consumer lending.[130]

This risk is not merely hypothetical. Because LIBOR determines worldwide loan and mortgage rates, systematic underreporting of LIBOR in 2008 resulted in artificially low payments to those banks from borrowers, meaning they were undercompensated for their risks, which potentially exacerbated the crisis.[131]

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127. Duffie, Dworczak & Zhu, *supra* note 11, at 3.

128. *See id.* at 4; Glode & Opp, *supra* note 4, at 1.

129. There is a vast literature on the consequences of systemically important financial institutions ("SIFIs"). *See, e.g.*, FIN. CRISIS INQUIRY COMM'N, THE FINANCIAL CRISIS INQUIRY REPORT: FINAL REPORT OF THE NATIONAL COMMISSION ON THE CAUSES OF THE FINANCIAL AND ECONOMIC CRISIS IN THE UNITED STATES xviii–xix (2011).

130. N.Y. FED. RES., ALTERNATIVE REF. RATES COMM., SECOND REPORT OF THE ALTERNATIVE REFERENCE RATES COMMITTEE 1 (March 2018), https://www.newyorkfed.org/medialibrary/Microsites/arrc/files/2018/ARRC-Second-report.

131. *See* Bainbridge, *supra* note 14, at 797–98 (also noting that artificially low LIBOR rates would have caused losses for investors).

It is not difficult to imagine how, as dealers amass expertise and become indispensable to the benchmark setting process, they can gain some control over legal and regulatory aspects of the market as well.[132] Dealers are in a naturally superior bargaining position, not only because they are experts, but because they are far fewer in number and do not suffer from the collective action problems that end users do.[133] For example, in 2000, the passage of the Commodities Futures Modernization Act ("CFMA") essentially removed swaps and most derivatives from regulation, which some have argued precipitated the 2008 financial crisis.[134] Powerful lobbying by the derivatives industry, the argument goes, stymied regulatory efforts to exercise jurisdiction over derivatives.[135] Just as worryingly, these dealers are usually systemically critical institutions,[136] which may skew regulators' actions even more severely.[137] With benchmarks, the problem has only grown. Evidence has emerged that as early as the middle of 2008, regulators were informed of potential wrongdoing around LIBOR but took no action. Instead, regulators at the Bank of England seem to have implicitly endorsed manipulation out of fears that doing otherwise would have further undermined global confidence in the banks.[138] This kind of influence is only amplified as regulators and public bodies increasingly rely on any given benchmark and that benchmark becomes "systemically" important in the same way that a bank or financial institution can be.

B. Benchmark Manipulation

Manipulation is one of the most obvious distortive consequences of the structures laid out above.[139] In financial markets, manipulation is particularly attractive when a small tweak will have a disproportionately large financial

132. As early as 1993, scholars were identifying the growing knowledge gap between regulators and industry participants. *See, e.g.*, Hu, *supra* note 32, at 1463.

133. *See* Judge, *Intermediary Influence*, *supra* note 59, at 597–98.

134. *See, e.g.*, Stout, *supra* note 27, at 22–29. The argument then goes that rampant speculative trading in derivatives outpaced legitimate hedging activity.

135. *See* Rauterberg & Verstein, *Transnational Regulation*, *supra* note 4 (arguing that ISDA's expertise in standardizing swap practices led to their successful lobby to end the Commodity Futures Trading Commission's ("CFTC") direct supervision of OTC derivatives through enactment of the CFMA).

136. These are usually SIFIs. *See 2018 List of Global Systemically Important Banks (G-SIBs)*, FIN. STABILITY BD. (Nov. 16, 2018), https://www.fsb.org/wp-content/uploads/P161118-1.pdf.

137. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 48 (noting that punishment may not be credible against indices that are socially important).

138. *See* Rauterberg & Verstein, *Transnational Regulation*, *supra* note 4, at 38–39 (detailing documents that demonstrate potential knowledge of Bank of England and Federal Reserve Bank of New York officials); *How Britain's Rate-Fixing Scandal Might Spread — And What to Do About It*, ECONOMIST (July 7, 2012), http://www.economist.com/node/21558260.

139. Manipulation is an age-old phenomenon. *See generally* JERRY W. MARKHAM, LAW ENFORCEMENT AND THE HISTORY OF FINANCIAL MARKET MANIPULATION 14–16 (2014).

effect.[140] Benchmarks have essentially hardwired just such a structural asymmetry into OTC markets.

The same mechanisms through which benchmarks provided ingenious—and inexpensive—ways to overcome otherwise costly information asymmetries also provided inexpensive means of manipulation. First, because benchmarks are so deeply integrated into markets where trading notionals have grown to sizes in the trillions, a would-be manipulator of foreign currency rates, for example, would not need to control the global supply of Japanese yen; they would need only tweak the benchmark rate to which the worldwide exchange rates are indexed.[141] A single benchmark, referenced throughout enormous markets, thus presents a particularly tempting target for manipulation.[142] Second, benchmarks' setting methodologies render them susceptible to influence. Methodologies usually rely on a concentrated sliver of data from a narrow subset of market participants, aggregating massive amounts of financial data in one predictable, repeated calculation.[143] The same dealers who are counterparties to most transactions that reference benchmark rates are also those either tasked with setting those benchmark rates or whose trades will naturally have greater impact on them, creating opportunities to manipulate and incentives to do so.[144]

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140. *See generally* Anthony Lee Zhang, Competition and Manipulation in Derivative Contract Markets (July 28, 2020) (unpublished manuscript), https://ssrn.com/abstract=3413265 (developing a model that predicts susceptibility to manipulation). More traditional market manipulation is otherwise extremely costly. Traditionally, manipulation required obtaining enormous amounts of any given asset and control over a market segment. This is not only resource-intensive, but it is risky. The market could easily move against a manipulator before they have time to unwind their position, undoing any potential profits. *See, e.g.*, Fletcher, *supra* note 9, at 1940–41; Verstein, *Benchmark Manipulation*, *supra* note 12, at 220–24 (discussing the difficulties of traditional market manipulation and its attendant transaction costs, liquidity issues, carrying costs, and general risks of idiosyncratic risk or illiquid markets that will reduce a manipulator's ability to profit). In the past, some academics have even dismissed the necessity of regulating manipulation and deemed it self-deterring due to the cost associated with successful manipulation. *See* Daniel R. Fischel & David J. Ross, *Should the Law Prohibit "Manipulation" in Financial Markets?*, 105 HARV. L. REV. 503, 512–13 (1991) (arguing, famously, that market manipulation is self-deterring for cost and incentive reasons); *cf.* Steve Thel, *$850,000 in Six Minutes—The Mechanics of Securities Manipulation*, 79 CORNELL L. REV. 219, 261 (1994).

141. *See* Fletcher, *supra* note 9, at 1960 (discussing how benchmark manipulation is manifestly not self-deterring for concerns of detection or costliness of upfront investment); Verstein, *Benchmark Manipulation*, *supra* note 12 at 217.

142. *See* LOUIS KAPLOW, COMPETITION POLICY AND PRICE FIXING 282 (2013) (noting an oft-cited benchmark is a tempting manipulation target in the antitrust context).

143. *See* Verstein, *Benchmark Manipulation*, *supra* note 12, at 225 (describing how benchmark providers produce a single benchmark rate, and explaining that "benchmarks represent market prices but they are not identical with them").

144. *See, e.g.*, David Hou & David Skeie, *LIBOR: Origins, Economics, Crisis, Scandal, and Reform*, FED. RESERVE BANK OF N.Y. STAFF REPORT NO. 667, 8 (Mar. 2014), https://www.newyorkfed.org/medialibrary/media/research/staff_reports/sr667.pdf. In

And we have seen various incarnations of manipulation play out with respect to benchmarks—both collusive and unilateral. With respect to LIBOR, banks' derivatives traders benefited if they could convince the LIBOR submitter to over- or underestimate the bank's cost of borrowing on any given day in order to benefit those traders' positions.[145] This was successful due to the disparity between the sampling market and the vast derivatives market tied to LIBOR. Hefty positions for which payments depended on LIBOR made minuscule distortions extremely profitable.[146] For example, Connan Snider and Thomas Youle calculated that in a single quarter, a 25 basis point (0.25%) change in LIBOR could net $337 million in interest revenue for JPMorgan, and $936 million for Citigroup, based on their outstanding exposures.[147] These were clearly not net zero positions.[148] In single loan terms, one loan for $10 million by Bank of America paying LIBOR + 1% would net an additional $25,000 to Bank of America for a mere 0.25% rise in LIBOR.

Manipulation of ISDAFIX operated similarly. If reference banks had swaptions expiring on some day, they could push the ISDAFIX on that day

setting LIBOR, a panel of reference banks were asked, "At what rate could you borrow funds . . . in a reasonable market size just prior to 11 am?" and, after discarding the highest and lowest answers, the average of the remainders was taken. *The Basics*, BBALIBOR, https://web.archive.org/web/20120121102345/http://www.bbalibor.com/bbalibor-explained/the-basics (last visited Feb. 2, 2020) (emphasis omitted). The setting of ISDAFIX was calculated based on a combination of trading in the *interdealer* swaps market followed by submissions from eleven dealer banks. *See, e.g.*, Order Instituting Proceedings Pursuant to Sections 6(c) and 6(d) of the Commodity Exchange Act, Making Findings, and Imposing Remedial Sanctions at 6, 12, In re Goldman Sachs Grp., Inc., No. 17-03 (Commodity Futures Trading Comm'n Dec. 21, 2016), https://www.cftc.gov/sites/default/files/idc/groups/public/@lrenforcementactions/documents/legalpleading/enfgoldmansachsorder122116.pdf. And the WM/Reuters FX rates were calculated by taking the median of the spot currency transactions, and only in the *interdealer* market, during the one-minute window from thirty seconds prior to 4 p.m. to thirty seconds after 4 p.m. *See* FOREIGN EXCH. BENCHMARK GRP., FIN. STABILITY BD., FOREIGN EXCHANGE BENCHMARKS CONSULTATIVE DOCUMENT 7 (2014), https://www.fsb.org/wp-content/uploads/r_140715.pdf?page_moved=1. While the susceptibility to manipulation of LIBOR and ISDAFIX may be obvious, it is important to point out that the transaction-based methodology of the WM/Reuters FX rates does not protect them from influence. "The ability to strategically feed or starve the transactional benchmark of transactional data gives transactors outsized influence." Verstein, *Benchmark Manipulation*, *supra* note 12, at 241; *see also* Duffie & Stein, *supra* note 11, at 194 (noting that when a counterparty is also a benchmark setter it greatly amplifies the manipulation incentive).

145. *See, e.g.*, Press Release No. 15-499, U.S. Dep't of Justice, *supra* note 18; Press Release No. 13-161, U.S. Dep't of Justice, *supra* note 18.

146. Duffie & Stein, *supra* note 11, at 200 (observing the minuscule rate distortions in LIBOR manipulation cases); Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 4 (citing a study demonstrating that a sustained 1.75% raise in the six-month LIBOR (as was the case in 2008) would mean additional thousands of dollars paid in interest on home mortgages a year per borrower, which would increase mortgage defaults when systemic risk was already a huge concern).

147. Snider & Youle, *supra* note 19, at 10.

148. *See, e.g.*, Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 32.

by trading the underlying swaps in a certain direction or submitting a higher or lower ISDAFIX. That would then determine the value of the swaptions and enable the bank to profit illicitly.[149]

In FX, the manipulation took place both unilaterally and via shared information—dealers shared confidential client information ahead of the benchmark setting time so that manipulators could trade to profit at the expense of their clients.[150] For example, if a dealer received an order from a client who wished to purchase a huge number of Japanese yen at the WM/Reuters 4 p.m. fix price (that is, the dealer would be selling yen to the client at 4 p.m.),[151] entering into those trades would likely have some effect on the exchange rate. However, if that dealer shared this intended trade with the other big players in advance of the trade so as to coordinate activity, then that dealer might be able to buy the necessary yen in ways so as to push the 4 p.m. WM/Reuters rate up, and end up selling that yen to its customer at an artificially high rate. Dealers also engaged in front running (trading for their own accounts ahead of filling customers' orders), which was so ubiquitous that some commentators have likened it to a mere cost of doing business.[152]

The widespread hardwiring of benchmarks also dilutes the threat of enforcement. It is almost impossible to measure damages or profits as a result of such schemes,[153] and it may simply be unrealistic to disgorge illicit profits

149. *See, e.g.*, Press Release No. 7180-15, U.S. Commodity Futures Trading Comm'n, CFTC Orders Barclays to Pay $115 Million Penalty for Attempted Manipulation of and False Reporting of U.S. Dollar ISDAFIX Benchmark Swap Rates (May 20, 2015), https://www.cftc.gov/PressRoom/PressReleases/7180-15; Press Release No. 7371-16, U.S. Commodity Futures Trading Comm'n, CFTC Orders Citibank to Pay $250 Million for Attempted Manipulation and False Reporting of U.S. Dollar ISDAFIX Benchmark Swap Rates (May 25, 2016), https://www.cftc.gov/PressRoom/PressReleases/7371-16; Press Release No. 7505-16, U.S. Commodity Futures Trading Comm'n, CFTC Orders Goldman Sachs to Pay $120 Million Penalty for Attempted Manipulation of and False Reporting of U.S. Dollar ISDAFIX Benchmark Swap Rates (Dec. 21, 2016), https://cftc.gov/PressRoom/PressReleases/7505-16.

150. *See* Press Release No. 7065-14, U.S. Commodity Futures Trading Comm'n, CFTC Orders Five Banks to Pay over $1.4 Billion in Penalties for Attempted Manipulation of Foreign Exchange Benchmark Rates (Nov. 12, 2014), https://cftc.gov/PressRoom/PressReleases/7056-14; Press Release No. 15-643, U.S. Dep't of Justice, Five Major Banks Agree to Parent-Level Guilty Pleas (May 20, 2015), https://www.justice.gov/opa/pr/five-major-banks-agree-parent-level-guilty-pleas#:~:text=Five%20major%20banks%20%E2%80%93%20Citicorp%2C%20JPMorgan,plead%20guilty%20to%20felony%20charges.

151. In the FX market, if a customer places an order with, say, Citibank at 3:30 p.m. to purchase two billion yen at the 4 p.m. fix, Citi will purchase the two billion and then sell them to the counterparty at the 4 p.m. fixing price. *See, e.g.*, Matt Levine, *Banks Manipulated Foreign Exchange in Ways You Can't Teach*, BLOOMBERG (Nov. 12, 2014), https://www.bloomberg.com/opinion/articles/2014-11-12/banks-manipulated-foreign-exchange-in-ways-you-can-t-teach [hereinafter Levine, *Banks Manipulated Foreign Exchange*].

152. *See* Duffie & Stein, *supra* note 11, at 195 n.2.

153. This is especially true given that in cases such as LIBOR, damages models will need to ascertain the counterfactual or "true" cost of borrowing that ought to have been reported instead. Moreover, in all these cases, determining how and when gains might have offset losses will be

(the "too big to litigate" problem).[154] Any downside to manipulation may also be deemed remote because of confused applicability of legal regimes.[155] Thus far, regulators and civil plaintiffs involved in benchmark-related actions have relied on, varyingly, the Sherman Antitrust Act,[156] the Commodity Exchange Act,[157] state antitrust laws, tort, contract, fraud, unfair business practice laws,[158] federal and state securities laws,[159] and even the Employee Retirement Income Security Act ("ERISA").[160] Applicability of any or all such regimes has been far from obvious. Federal district courts have disagreed widely on whether the benchmark setting process was a competitive one, whether a benchmark constitutes a "price," and whether "antitrust injury" under the antitrust laws can result.[161] These uncertainties do little to foster optimal deterrence levels and instead can result in both over- and under-deterrence.[162] The applicability of such legal regimes is discussed further in Part IV.A.

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additionally difficult. *See, e.g.*, James Kavanagh & Reinder Van Dijk, *LIBOR Damages: Key Emerging Issues*, INT'L COMPARATIVE LEGAL GUIDES (Oct. 17, 2012), http://www.cdr-news.com/categories/expert-views/libor-damages:-key-emerging-issues.

154. Rauterberg & Verstein, *Transnational Regulation*, *supra* note 4, at 40–41. This is exacerbated by the fact that benchmark setters are usually SIFIs. *Id.*

155. For example, a traditional understanding of antitrust activity focuses on output: restricting output or flooding the market with output, to affect supply, demand, and prices in relatively clear ways. *See, e.g.*, *Price Fixing*, FED. TRADE COMM'N, https://www.ftc.gov/tips-advice/competition-guidance/guide-antitrust-laws/dealings-competitors/price-fixing (last visited Feb. 2, 2020). But measuring alleged antitrust activity around LIBOR or FX by looking at "output" is difficult: what is the "output," what is supplied, what is demanded, what is the price?

156. *See* Gelboim v. Bank of Am. Corp., 823 F.3d 759, 770–71 (2d Cir. 2016); *Alaska Elec. Pension Fund v. Bank of Am. Corp.*, 175 F. Supp. 3d 44, 53–54 (S.D.N.Y. 2016); *In re* Foreign Exch. Benchmark Rates Antitrust Litig., 74 F. Supp. 3d 581, 590–91 (S.D.N.Y. 2015); Press Release No. 15-643, U.S. Dep't of Justice, *supra* note 150.

157. *See* Press Release No. 7794-18, U.S. Commodity Futures Trading Comm'n, CFTC Orders Bank of America, N.A. to Pay $30 Million Penalty for Attempted Manipulation and False Reporting of U.S. Dollar ISDAFIX Benchmark Swap Rates (Sept. 19, 2018), https://www.cftc.gov/PressRoom/PressReleases?7794-18.

158. *See Alaska Elec. Pension Fund*, 175 F. Supp. 3d at 49; *In re Foreign Exch. Benchmark*, 74 F. Supp. 3d at 585–86; *In re* Libor-Based Fin. Instruments Antitrust Litig., 935 F. Supp. 2d 666, 677 (S.D.N.Y. 2013).

159. *See In re LIBOR-Based Fin. Instruments*, 935 F. Supp. 2d at 677 (S.D.N.Y. 2013).

160. *See* Allen v. Credit Suisse Sec. (USA) LLC, 895 F.3d 214, 217 (2d Cir. 2018).

161. *See* Gelboim v. Bank of Am. Corp., 823 F.3d 759, 771–77 (2d Cir. 2016) ("In urging otherwise, the Banks argue that LIBOR is not itself a price, as it is not itself bought or sold by anyone. The point is immaterial. LIBOR forms a component of the return from various LIBOR-denominated financial instruments, and the fixing of a component of price violates the antitrust laws.").

162. For example, some banks have attempted to withdraw from LIBOR setting. David Enrich, *Banks Warned Not to Leave LIBOR: U.K. Regulator Seeks to Protect Benchmark Rate as Lenders Threaten to Quit Panel After Scandal*, WALL ST. J. (Feb. 13 2013), https://www.wsj.com/articles/SB10001424127887324432004578302164058534372. Optimal deterrence more broadly depends on forcing wrongdoers to internalize the costs of their misconduct.

Finally, the lack of sufficient incentives for benchmark providers to properly monitor the benchmark setting process exacerbates these weaknesses. As Gabriel Rauterberg and Andrew Verstein have pointed out, benchmarks are byproducts of their providers' businesses, which may result in both underproduction and malproduction of those benchmarks if their providers cannot fully capture gains from their promulgation.[163] Markets that are already difficult to monitor due to their opacity—and because the actual misconduct is difficult to detect, as a small tweak to a benchmark value that causes outsize harm might otherwise fall within some band of ordinary fluctuation[164]—then also lack monitors that are adequately incentivized, overall decreasing the perceived threat of enforcement and lowering its effectiveness as a deterrence mechanism.

C. Suboptimal Stagnation

The two distortive effects discussed thus far—entrenchment of oligopolistic structures and incentives to manipulate—relate to a third effect, and one that has received very little scholarly or regulatory attention.[165] A benchmark can itself be inefficient, yet markets might substitute towards it anyway simply due to its widespread use. Dealer-promulgated benchmarks that benefit from network effects and path dependencies can promote inefficient pooling around the "default" benchmark, *even if it is suboptimal.* And this is precisely more likely to occur when the markets throughout which benchmarks are so deeply integrated depend so heavily on harmonization—when network effects are strong.[166] Thus, the persistence of certain benchmarks should not be taken necessarily to indicate their desirability. It may be tempting to look at OTC markets and conclude that the results of private orders within them are indicative of optimal or efficient outcomes, but doing so would be a mistake. A useful analogy here may be the

Uncertainty in measuring those costs due to imprecision in the law and accompanying enforcement do little to optimize ex ante assessments of the cost of wrongdoing.

163. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 25–26, 36–42.

164. *See id.* at 45 (observing the difficulty in both detection and proof: the huge scale of the markets means that a minuscule deviation—one that might seem within the normal band of price fluctuation—in the benchmark value could result in enormous profits).

165. There has been some attention paid to this phenomenon in the corporate context. *See* Klausner, *supra* note 113, at 789 (observing that network externalities may render the equilibrium competitively reached suboptimal, and classifying the result into four types: an equilibrium with many products where one would be optimal, an equilibrium with one or too few products, an equilibrium adopting the wrong product, or an equilibrium that "lock[s] out" beneficial innovation).

166. *See* Rauterberg & Verstein, *Transnational Regulation*, *supra* note 4, at 26 n.101 (noting that network power might be particularly concerning where markets place great value on harmonization). *See* Charles J. Goetz & Robert E. Scott, *The Limits of Expanded Choice: An Analysis of the Interactions Between Express and Implied Contract Terms*, 73 CAL. L. REV. 261 (1985) (providing classic explications of standardization contracts); Kahan & Klausner, *supra* note 118.

persistence of the QWERTY layout for keyboards, developed in 1868, which due to network effects and first-mover stickiness still endures today, over 150 years later.[167]

In benchmark markets, suboptimal stagnation can occur for reasons both to do with users' transaction choices and promulgators' lack of incentives to introduce alternative benchmarks or update benchmark methodology in response to changing market conditions. First, the perceived price transparency benefits of a benchmark might outweigh lack of fit with an institution's transactional needs, such that, for example, market participants may choose to transact at the 4 p.m. WM/Reuters FX rates even if transacting at some other time would be more optimal.[168] This may also occur due to the liquidity benefits offered by that benchmark, as high trading volume often garners faster execution, lower prices, and less onerous search.[169] These liquidity benefits will draw parties away from less-actively traded products.[170] The "basin of attraction [of a benchmark] can thus become larger and larger, given the positive feedback effects of informational transparency and liquidity."[171]

In addition, entire ecosystems of additional products can sprout up around a particularly successful benchmark, in large part due to the network effects previously discussed.[172] As a benchmark becomes more commonly referenced, additional products will tend to incorporate that benchmark, and standardization throughout the product ecosystem will attract additional use by market participants. LIBOR's established dominance in the 1980s led to the introduction of many LIBOR-based hedging instruments, which only amplified the "magnetic qualities of LIBOR-based trading."[173]

These effects may dominate and cause extra stickiness of a benchmark, even if the market is aware of its potential for manipulation. The switching

167. *See* Di Noia, *supra* note 112, at 9; Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 43 (observing that network effects with indices mean that a single index will likely dominate); Craig Pirrong, Bund for Glory, or It's a Long Way to Tip a Market 3 (Feb. 23, 2005) (unpublished manuscript), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=672504 (with respect to liquidity providers facing adverse selection, noting that they will tend to congregate on a single exchange in order to minimize transaction costs, i.e., that markets are "tippy").

168. *See, e.g.*, Duffie & Stein, *supra* note 11, at 195.

169. *See id.*

170. *See id.*

171. *Id.* at 196; *see also* Ian W. Marsh, Panagiotis Panagiotou & Richard Payne, *The WMR Fix and its Impact on Currency Markets*, NORGES BANK 6 (Sept. 29, 2017), https://www.norges-bank.no/contentassets/619c8b75e1ed4ba691e8ad6a006855e6/39-panagiotou—-the-wmr-fix-and-its-impact-on-currency-markets-.pdf.

172. *See supra* Part II.B.4.

173. Duffie & Stein, *supra* note 11, at 196. Innovation can also be driven by supply characteristics, rather than demand. *See generally, e.g.*, Dan Awrey, *Toward a Supply-Side Theory of Financial Innovation*, 41 J. COMPARATIVE ECON. 401 (2013).

costs become enormous, a direct result of the very aspect that made benchmarks so successful: their widespread adoption and use.[174] Some market participants may even choose not to switch, despite understanding the susceptibility of benchmarks to manipulation.[175] Powerful dealers can then take advantage of a benchmark's weaknesses without fear of market discipline. One need only look at the status of reforms for financial benchmarks to understand the magnitude of the problem. As the President of the Federal Reserve Bank of New York stated in a recent speech, "[c]ontracts that reference U.S. dollar LIBOR continue to be written, which only serves to increase the level of systemic risk."[176] Switch has only begun to come about because the government has mandated such, and doing so has proven so complicated that the largest, most sophisticated dealers and their law firms have devoted huge resources to managing the process.[177]

As network effects proliferate and the same benchmarks are used over and over again, the likelihood of competition in the form of other benchmarks or referents becomes vanishingly small. Not only will a dominant benchmark provider lack adequate incentive to promulgate additional benchmarks, it might also fail to invest in improvements to the existing benchmark.[178] For example, LIBOR was reported for multiple currencies and multiple tenors (term periods) for years.[179] Certain combinations were extremely thinly traded, and bankers often fabricated estimates when surveyed.[180] This was not (always) due to the attempt to manipulate, but simply due to lack of underlying data. And yet, perhaps because of LIBOR's dominance, no participant thought it worthwhile to consider alternative reporting mechanisms. And why would they? No financial benefit would have come of the added effort. Rauterberg and Verstein have argued that the fact that most benchmarks were created as byproducts of their providers' businesses reduces these incentives even further, as does the fact that these benchmark

174. *See* Clayton P. Gillette, *Lock-In Effects in Law and Norms*, 78 B.U. L. REV. 813 (1998); Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 479, 562–86 (1998); Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 43 ("Some users may prefer a malproduced or manipulated index to one that is less liquid or well-known."); Joseph Farrell & Paul Klemperer, Coordination and Lock-In: Competition with Switching Costs and Network Effects (May 2006) (unpublished manuscript), https://ssrn.com/abstract=917785.

175. *See* Klausner, *supra* note 113, at 815 (discussing this phenomenon in the context of contracts).

176. Williams, *supra* note 21.

177. *See, e.g.*, Levine, *The Libor Change Is Coming*, *supra* note 66, at 2.

178. Katz & Shapiro, *supra* note 125, at 106 (describing how firms' incentives to innovate are changed when network effects exist).

179. *See The Basics*, BBALIBOR, https://web.archive.org/web/20120121102345/http://www.bbalibor.com/bbalibor-explained/the-basics (last visited Feb. 2, 2020).

180. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 48–49 (describing this phenomenon for the eleven-month Swedish krona).

providers currently do not charge for use of their benchmarks, an issue explored further in Part IV.C.[181]

Overall, this means that even if users would prefer to switch away from the most widely used benchmark, the lack of viable alternatives effectively locks them into the single existing benchmark, even if it is faulty or outdated. This can also help explain, for example, why no "tamper-proof" benchmark evolved on its own—the choice to promulgate any additional benchmark will be distorted by the tradeoff between the immediate benefits conferred by using an established, if suboptimal benchmark, and the benefits of an alternative benchmark with uncertain, possibly non-existent, network benefits and even potential costs.[182] As previously alluded to, markets with network effects can see substantial path dependence, and as more and more transactions reference a few benchmarks, "lock-in" can easily occur, as each iterative decision may "look[] optimal given past decisions, but is sub-optimal if earlier investment decisions had been delayed and all the decisions were taken at once."[183] It becomes difficult, and a risky financial endeavor, to "coordinat[e] the simultaneous defection of large numbers of" market participants.[184]

D. "Default" Benchmarks

At this point, it is useful to address the potential counterargument that rents resulting from the structures described above are costs that the market is willing to tolerate in return for the flexibility provided by OTC markets, and that sophisticated entities have determined the extant structures to be the most efficient for their purposes. This argument would follow from the dominant paradigm in law and economics, which assumes that agents engage in welfare-maximizing behavior with one another, without significant effects on third parties, reaching optimal contractual arrangements that lower the cost of transacting or attaining equilibria that are overall socially optimal given achievable alternatives.[185] Indeed, this view prevailed for much of the history of OTC market (de)regulation. Regulators viewed market participants as "sophisticated and informed," and as such, best positioned to

181. *See id.* Network effects have been known to cause similar effects in exchange self-regulation. Craig Pirrong has observed that self-regulation among exchange members is less likely when the exchanges do not bear the full costs or internalize the benefits from manipulation or wrongdoing. *See* Stephen Craig Pirrong, *The Self-Regulation of Commodity Exchanges: The Case of Market Manipulation*, 38 J.L. & ECON. 141, 157, 164 (1995) [hereinafter "Pirrong, *Self-Regulation*"].

182. *See* Klausner, *supra* note 113, at 790–91 (describing this phenomenon in product markets).

183. *See supra* Part II.B.4; Economides, *supra* note 110, at 23; *see also generally* Farrell & Klemperer, *supra* note 174.

184. Pirrong, *Self-Regulation*, *supra* note 181, at 155.

185. *See* Klausner, *supra* note 113, for a general description of this theory.

assess risks and rewards in financial transactions, with a dealer market perceived as "highly efficient" in hedging risk, among other activities.[186] As a result, regulators have historically deferred to the consequent transactional arrangements seen in OTC markets.

But this model does not capture the whole story. Importantly, there is a countervailing phenomenon, and one that scholars such as Klausner, Economides, and Ian Domowitz have pointed out in the contracting, products, and trading contexts: assuming that observed equilibria are the most optimal ones is not always prudent, and less so when network effects exert strong pulls.[187] In a similar vein, Scott has pointed out that in multilateral markets, the very "factors that generate efficiencies in the production of contracts—standardization and economies of scale—are the same factors that produce inefficiencies in the very contract terms that parties rely on to motivate performance."[188]

In other words, simply because OTC markets have historically been dominated by private ordering does not necessarily mean that the results of such private orders are indicative of optimal or efficient outcomes, and the persistence or dominance of certain benchmarks should not be taken to necessarily indicate their desirability.

Instead, as we have seen, benchmark-dominated markets tend to promote network formation, which can lock in potentially distortive or suboptimal structures. Moreover, the pull of network effects and existing power structures will likely deter any single actor from acting differently. While an institution such as Delta is certainly not powerless or unsophisticated, its informational capabilities (at least vis-à-vis a dealer such as Goldman Sachs) and ability to coordinate with other end users is limited, creating collective action issues. Nor are there currently sufficient incentives for additional benchmarks or providers to enter the market or improve existing benchmarks. This is explored more fully in the next Part.

186. Letter from Donald L. E. Ritger to Senator Herman E. Talmadge, Chairman of the Senate Comm. on Agric. and Forestry (1974), *reprinted in* U.S. Code Cong. & Admin. News at 5887–89.

187. *See* Domowitz, *supra* note 125, at 167; Klausner, *supra* note 113, at 814–15, 830 ("If network externalities are present, . . . actual contracts are imperfect indicators of optimal contracts."); Economides, *supra* note 110, at 23.

188. Robert Scott, *The Paradox of Contracting in Markets*, 83 L. & CONTEMP. PROBS. 71, 72 (2020) (also pointing out that "the reverse is true: the factors that produce more efficient contract design—bespoke efforts to motivate investment and trade—are the same factors that generate the loss of scale and the resulting inefficiencies in the production of contracts"). As Scott notes, because standardization of contracts lowers contracting costs and results in more reliable terms, network benefits result, making it easier for markets to price the contract, further lowering transaction costs, and so forth. *Id.* at 77–78. As this occurs, inefficiencies in boilerplate become ossified, and lack of coordination prevents markets from self-correcting. *Id.* at 77–84.

IV. IMPLICATIONS AND REFORM

The above discussion illustrates in detail how certain structures in benchmark markets and accompanying path dependencies can encourage inefficient lock-in and facilitate wrongdoing, and why such effects are especially potent when markets are otherwise opaque, decentralized, and dominated by a few powerful players. "Systemically" important benchmarks may result; incentives to monitor wrongdoing can weaken; and so long as a benchmark remains so entrenched in an ecosystem dominated by powerful institutions, there is little likelihood of innovation or competition from socially beneficial alternative benchmarks, and market-based discipline will remain ineffective.

This Part interrogates the optimal "default" benchmark structures in OTC markets. In addition to the enforcement or governance-based reforms proposed by others, which overwhelmingly assume that a single benchmark will continue to dominate, this Part advocates for a more fundamental approach, and proposes an alternative competitive equilibrium—one where multiple benchmarks compete.

To be clear, this Article does not advocate wholesale restructuring of OTC markets. There are, as set out above, defensible reasons for the dominance of large dealers. Their cost of providing liquidity in bespoke, decentralized markets remains far lower than that of end users and, for the most part, end users benefit from dealers' expertise and the ease with which they are able to take on and hedge risks. The inquiry focuses instead on the distortions caused by the dominance of certain benchmark rates as they interact with OTC market structures, and the implications for credible private market discipline. It is unrealistic to expect counterparties to credibly demand better behavior from dealers. As discussed above, counterparties are diffuse, suffer from coordination problems, and usually make use of OTC markets for discrete transactions or for discrete business needs. It is also risky to continue relying on the incentives of dealers, as doing so is sensible only so long as those dealers' incentives are aligned with the markets' as a whole.

Instead, with the understanding that benchmark weaknesses began with the basic market forces that gave rise to benchmark development, the above insights help illuminate an important avenue for reform: the expansion of benchmark choices. This would, I argue, better align private incentives with more socially optimal outcomes. In considering this proposal, this Part first considers other existing reform proposals. Second, it explores the benefits to benchmark competition. Finally, it discusses mechanisms for transition.

A. Existing Benchmark Alternatives

Existing benchmark reform proposals overwhelmingly contemplate that a single benchmark rate will continue to dominate. Before addressing this Article's main proposal, to increase the number of benchmarks, it is worth reviewing the existing proposals. As discussed below, these largely fall into three buckets—refining the calculation methodology of existing benchmarks, relying on enforcement and compliance to improve benchmark governance, and turning to the government to provide and oversee benchmarks.

The first category, which focuses on calculation methodology reform, is a worthy endeavor. The majority of such proposals advocate enlarging sampling windows or randomizing samples, such as by widening the window during which transactions may affect a benchmark setting, as in the case of the WM/Reuters FX benchmark rates, or turning to a transactions-based methodology and eliminating submission components of a benchmark, as with the ICE swap rate.[189] Any of these reforms would almost certainly reduce a benchmark's susceptibility to manipulation, but they are not without their own costs. Studies have shown that, for example, widening the sampling window for the WM/Reuters FX benchmark calculation has introduced tracking error and potentially lowered the utility of such a rate to end users.[190] Moreover, total immunity to manipulation is impossible, and attempting to achieve it would be exceedingly costly. Expecting that current benchmark administrators bear such costs runs into the same incentive problems discussed in this Article.[191]

Enforcement and compliance will no doubt remain an important part of discipline. However, the patchwork applicability of fraud, manipulation, antitrust regimes, and difficulty or impossibility of measuring harm or disgorging profits, as alluded to in Part III.B, pose a significant obstacle to either ex ante deterrence or ex post discipline.[192] There have been some excellent proposals to address this and refine ex post governance. Verstein has proposed that benchmarks be protected as price reports under the Commodity Exchange Act,[193] Gregory Scopino has argued for an expansion

189. *See, e.g.*, *Foreign Exchange Benchmarks: Final Report*, FIN. STABILITY BD. 23–31 (Sept. 30, 2014), https://www.fsb.org/wp-content/uploads/r_140930.pdf (observing recommendations for reforming calculation methodologies for FX benchmarks); *Benchmark Statement: ICE Swap Rate*, INTERCONTINENTAL EXCH. 1–2 (last updated Oct. 19, 2020) https://www.theice.com/publicdocs/ISR_Benchmark_statement.pdf (describing the transition from being a polled submission-based rate to a transactions-based one).

190. Evans, O'Neill, Rime & Saakvitne, *supra* note 87, at 1–2, 37.

191. *See generally* Rauterberg & Verstein, *Index Theory*, *supra* note 9.

192. *See supra* Part III.B.

193. *See* Verstein, *Benchmark Manipulation*, *supra* note 12, at 261–62.

of the Commodity Exchange Act's antitrust reach,[194] and Rosa M. Abrantes-Metz, Rauterberg and Verstein advocate for the use of empirical tools such as manipulation screens in pleading.[195] Gina-Gail S. Fletcher has proposed a framework modeled on self-regulatory organizations, where a non-governmental organization would have disciplinary authority over members—benchmark administrators and data contributors—with regulatory oversight from either the United States Securities and Exchange Commission ("SEC") or the CFTC.[196] While these proposals certainly merit consideration, a closer look reveals that the confusion runs deeper.

For one, and as recognized by other scholars, the legal frameworks that exist—fraud, antitrust, and manipulation—are both over- and under-inclusive.[197] With respect to fraud, the workhorse elements—material misstatement or omission, intent, reliance and harm—are difficult to prove.[198] Enforcement under the securities laws has all but collapsed the concept of manipulation into that of fraud.[199] Antitrust laws demand an injury to the forces of competition itself.[200] Were dealers in a competitive process? Interestingly, civil plaintiffs and the CFTC had diametrically opposing theories of wrongdoing in the ISDAFIX cases. Plaintiffs alleged an antitrust conspiracy, while the CFTC fined dealers for unilateral manipulation.[201] Finally, stand-alone manipulation—poorly defined in regulation and statute—includes an intent element that is almost comically difficult to prove.[202] Outstanding questions abound. If a transaction is motivated at least in part by a legitimate reason, can it ever be manipulative? Does manipulation require deceit? Is an artificial price required? What constitutes an artificial price? These questions plague scholars, courts, and

194. *See* Gregory Scopino, *Expanding the Reach of the Commodity Exchange Act's Antitrust Considerations*, 45 *HOFSTRA L. REV. 573* (2016).

195. *See* Rosa M. Abrantes-Metz, Gabriel Rauterberg & Andrew Verstein, *Revolution in Manipulation Law: The New CFTC Rules and the Urgent Need for Economic and Empirical Analysis*, 15 U. *PA. J. BUS.* L. 357 (2013).

196. *See* Fletcher, *supra* note 9, at 1937–40.

197. *See, e.g.*, Verstein, *Benchmark Manipulation*, *supra* note 12, at 252–59.

198. Indeed, courts are split on whether open market trading behavior can ever constitute manipulation. *Compare* GFL Advantage Fund, Ltd. v. Colkitt, 272 F.3d 189, 205 (3d Cir. 2001), *with* Markowski v. SEC, 274 F.3d 525, 529 (D.C. Cir. 2001). *See also* Verstein, *Benchmark Manipulation*, *supra* note 12, at 252–53.

199. *See, e.g.*, Santa Fe Indus., Inc. v. Green, 430 U.S. 462, 476 (1977) ("[Manipulation] refers generally to practices, such as wash sales, matched orders, or rigged prices, that are intended to mislead investors by artificially affecting market activity."); Ernst & Ernst v. Hochfelder, 425 U.S. 185, 199 (1976) (characterizing manipulation as "conduct designed to deceive or defraud investors").

200. Sherman Antitrust Act of 1890, 15 U.S.C. §§ 1–38.

201. *See* Alaska Elec. Pension Fund v. Bank of America N.A., 175 F. Supp. 3d 44 (S.D.N.Y. 2016); Press Release No. 7794-18, U.S. Commodity Futures Trading Comm'n, *supra* note 157. '

202. *See* Abrantes-Metz, Rauterberg & Verstein, *supra* note 195, at 369, 375–85.

regulators—and will continue to do so as long as these frameworks are not updated to reflect current market practices. Indeed, the European General Court recently overturned a 33.6 million euro fine imposed against HSBC by the European Commission, stating that the regulator provided "insufficient reasoning" for the fine.[203]

The confusion across legal regimes has been echoed in the defenses proffered by traders and banks, who routinely plead that they did not think they were acting inappropriately.[204] Indeed, some forms of manipulation, such as that concerning the WM/Reuters FX benchmark, could plausibly be cast as pre-trade hedging.[205] And there is certainly sympathy in the law for trading activity that comprises legitimate hedging activity.[206] Regardless of the ultimate credibility of such defenses, that they are put forth at all helps highlight larger difficulties of policing "new" forms of financial wrongdoing. Relying solely on compliance levers within a firm and adjusting them after wrongdoing comes to light will always be reactive, and often miss some category of misconduct. Compliance is most effective when the conduct is clearly prohibited ex ante.

Nor do such proposals address the problem of regulatory capture due to the systemic importance of a benchmark, as occurred with LIBOR in 2008. A failure of governance due to the overwhelming importance of a single aspect of the financial system cannot be solved simply by tweaking legal frameworks.

Relying on the government as a benchmark provider (similar to utility provision) is also problematic, and likely to be slow, cumbersome, and costly. Nor is there any guarantee the government will get it "right." As a specific example, let us consider the slow path to reforming LIBOR. A decade after

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203. Hugo Miller, *HSBC's Gamble Pays Off as $37 Million Euribor Fine Scrapped*, BLOOMBERG (Sept. 24, 2019), https://www.bloomberg.com/news/articles/2019-09-24/hsbc-wins-eu-court-fight-over-37m-fine-for-euribor-rigging.

204. *See, e.g.*, Enrich, *supra* note 16 (noting that defendant Hayes stated he was "very, very, very open, very transparent," that "[a]ll [his] managers knew," and that he "had no reason to think that it was wrong").

205. *See, e.g.*, Citibank – Final Notice, FIN. CONDUCT AUTH. 7–8 (Nov. 11, 2014), https://www.fca.org.uk/publication/final-notices/final-notice-citi-bank.pdf ("A firm legitimately managing the risk arising from its net client orders at the fix rate may make a profit or a loss from its associated trading in the market. Such trading can, however, potentially influence the fix rate. For example, a firm buying a large volume of currency in the market just before or during the fix may cause the fix rate to move higher."); Levine, *Banks Manipulated Foreign Exchange'*, *supra* note 151(explaining the blurry line between manipulation and hedging). Nor did the conduct at issue here occur in the dead of night, where traders were engaging in obviously illegal conduct that harmed their employers as well as the market. *See, e.g.*, Kadhim Shubber & David Keohane, *SocGen Executives Ordered Libor Rigging, US Prosecutors Believed*, FIN. TIMES (June 7, 2018) https://www.ft.com/content/05dfb112-6a53-11e8-b6eb-4acfcfb08c11.

206. *See, e.g.*, CFTC v. Wilson & DRW Investments, No. 13 Civ. 7884 (RJS), 2018 WL 6322024 (S.D.N.Y. Nov. 30, 2018).

the actual manipulation, the U.S., the U.K., Europe, Japan, and Switzerland have only just begun to creakily transition to a designated alternative.[207] These alternatives are not scheduled to fully replace their country's Interbank Offered Rate ("IBOR") until 2021 at the earliest, when the BBA is expected to cease production of LIBOR.[208] In the U.S., regulators have settled on the Secured Overnight Financing Rate ("SOFR"), a measurement of banks' overnight borrowing rate (secured by Treasury securities), as the sole designated LIBOR replacement.[209] LIBOR had flaws, to be sure. But so too does SOFR: the markets for SOFR can be finicky and overly sensitive to funding market idiosyncrasies, such as the due date for corporate taxes, Treasury securities entering the market for unrelated reasons, and the level of a bank's reserves. For example, on September 17, 2019, SOFR jumped three percentage points in a single day, a huge amount for an index rate, simply because corporate investors' tax obligations coincided with a large net Treasury issuance.[210]

Nor should SOFR, a secured overnight rate based on repurchase agreement transactions, be viewed as a perfect, or necessarily even close, substitute for LIBOR, a credit-sensitive term rate. Importantly, SOFR is backward-looking, while LIBOR is forward-looking by embedding banks' estimations of their borrowing costs, which are inherently future-oriented.[211] For many borrowers, interest rates pegged to future economic movements will be much more useful than those that lag the market.[212] These differences mean that, should market participants in fact fully transition to SOFR, they will need to understand and calculate *multiple, dynamic* mathematical relationships between the two rates for many contracts with payment obligations extending far into the future.[213] Any issues will be exacerbated

207. *See* Dan McCrum, *Life After Libor, a Cut-Out-and-Keep Guide*, FIN. TIMES (Apr. 6, 2018), https://ftalphaville.ft.com/2018/04/06/1523007997000/Life-after-Libor—a-cut-out-and-keep-guide/.

208. *See id.*

209. *See* Matt Levine, *Libor's Replacement Is a Little Too Real***,** BLOOMBERG (Feb. 13, 2019), https://www.bloomberg.com/opinion/articles/2019-02-13/libor-s-replacement-sofr-is-a-little-too-real. [hereinafter Levine, *Libor's Replacement*]

210. *See, e.g.*, Matt Levine, *Interest Rates Shouldn't Be Interesting*, BLOOMBERG (Sept. 18, 2018), https://www.bloomberg.com/opinion/articles/2019-09-18/interest-rates-shouldn-t-be-interesting; [hereinafter Levine, *Interest Rates*]; Levine, *Libor's Replacement*, *supra* note 209.

211. *See* Andreas Schrimpf & Vladyslav Sushko, *Beyond LIBOR: A Primer on the New Reference Rates*, BIS Q. REV. 43 (2019).

212. *See id*.

213. *See, e.g.*, Marcus Burnett, *Response to AARC's Consultation on Potential Spread Adjustments*, SOFR ACADEMY (Mar. 25, 2020), https://sofracademy.com/response-to-arrcs-consultation-on-potential-spread-adjustments/. While ISDA recently promoted relying on a five-year median of the historical difference between LIBOR and the SOFR fallback rate, this spread is certainly not one size fits all, as some market participants are already concerned it will not work for them.

because the main players in OTC markets—banks—are better off when they can match their lending revenue with their borrowing costs. LIBOR, which measures precisely banks' cost of borrowing from each other, was actually an excellent rate at which to lend: banks' revenue from loans given out at LIBOR would match their cost of borrowing from each other, allowing a match between assets and liabilities.[214] Thus, "if a bank wants to sell an adjustable rate mortgage, defining its cost as a spread over LIBOR allows it to minimize its basis risk between the rate it charges the consumer and the cost of the bank's funds."[215] The introduction of SOFR will create basis risk between a bank's borrowing costs and its lending revenue (now tied to SOFR).[216] It is not a stretch to imagine that any additional risks will be passed on to end users (for example, Delta and its customers) in the form of higher costs. These uncertainties will create additional risk for financial transactions—risk that the government is likely ill-equipped to advise on or manage.[217] Moreover, in a crisis, a rate such as LIBOR has proven a much better measure of cost of borrowing than a risk-free rate, a concern that some banks specifically flagged to regulators in 2019.[218] The impact of COVID-19 illustrates this: LIBOR and SOFR diverged substantially in value, as the two benchmarks responded to very different market stimuli.[219] If banks'

214. *See* Levine, *Banks Will Miss Libor*, *supra* note 10.

215. Rosa M. Abrantes-Metz & David S. Evans, Will the Wheatley Recommendations Fix LIBOR? 3 (Nov. 29, 2012) (unpublished manuscript), https://ssrn.com/abstract=2182855.

216. *See, e.g.*, Schrimpf & Sushko, *supra* note 211, at 41, 45 (also noting that SOFR-notes issuers would then turn around and hedge with LIBOR-SOFR basis swaps).

217. *See, e.g.*, CFTC Letter No. 19-26, Division of Swap Dealer and Intermediary Oversight (Dec. 17, 2019) (entitled "No-Action Positions to Facilitate an Orderly Transition of Swaps from Inter-Bank Offered Rates to Alternative Benchmarks"); CFTC Letter No. 19-27, Division of Market Oversight (Dec. 17, 2019) (entitled "Staff No-Action Relief from the Trade Execution Requirement to Facilitate an Orderly Transition from Inter-Bank Offered Rates to Alternative Risk-Free Rates"); CFTC Letter No. 19-28, Division of Clearing and Risk (Dec. 17, 2019) (entitled "Staff No-Action Relief from the Swap Clearing Requirement for Amendments to Legacy Uncleared Swaps to Facilitate Orderly Transition from Inter-Bank Offered Rates to Alternative Risk-Free Rates").

218. *See* Marcus Burnett, *How Regional Banks Could Shape US LIBOR Replacement*, RISK.NET (Apr. 21, 2020), https://www.risk.net/comment/7527776/how-regional-banks-could-shape-us-libor-replacement (noting the formation of the Credit Sensitivity Group by regulators in response to banks' concerns); Abrantes-Metz & Evans, *supra* note 215, at 3.

219. *See* Jeffrey Armstrong, *COVID-19 Crisis Exposes Libor Replacement's Weaknesses*, LAW360 (Mar. 27, 2020), https://www.law360.com/articles/1256813/covid-19-crisis-exposes-libor-replacement-s-weaknesses ("By contrast, while USD 3-month Libor initially fell substantially and quickly moved below 3-month SOFR, it then abruptly reversed course and began a sharp climb. Every day since March 12 [until March 27], the two benchmarks have moved in opposite directions. The increasing USD 3-month Libor is likely responding to some degree to perceived elevated banking system risk. On the other hand, 3-month SOFR appears to be responding to a combination of U.S. Federal Reserve liquidity intervention and the flight to safe-haven U.S. Treasury securities.").

funding costs were high while their lending revenue remained low, they would be exposed to enormous basis risk.[220]

Not only may the government suffer from lack of expertise,[221] it will always have its own agenda.[222] The SOFR example also illustrates that the story is not one simply about conflicts of interest. If it were, simply divorcing the benchmark providers from dealers who are counterparties to indexed transactions would seem an obvious solution. But as this Article has shown, there are legitimate reasons to keep dealers involved in both benchmark setting and as counterparties to indexed transactions—not least because of market efficiencies produced through their information and expertise.[223] Doing so, as pointed out by others, would also likely result in underproduction of benchmarks.[224] Nor would such a proscription adequately address issues such as suboptimality or a systemically important benchmark.

Thus, we have, again, a benchmark that is likely suboptimal, where markets, again, have *no real alternative*. To wit, regulators continue to issue COVID-19 loans with timelines extending years into the future tied not to SOFR, but *to LIBOR*.[225]

Nor is it clear that SOFR would be immune to manipulation (a transactions-based index is by itself certainly no guarantee of integrity, as the WM/Reuters foreign exchange manipulation has taught us). Instead, why not have a LIBOR-like rate *and* SOFR? Eighty percent of market participants surveyed in 2017 in fact preferred that LIBOR remain.[226]

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220. *See* Burnett, *supra* note 218; Marcus Burnett, *For Businesses Libor Transition Efforts Must Move Ahead*, SOFR ACADEMY (Apr. 18, 2020), https://sofracademy.com/for-businesses-libor-transition-efforts-must-move-ahead/.

221. *See, e.g.*, Farrell & Klemperer, *supra* note 174, at 93 (concluding governments are best suited to provide standards in industries without rapid innovation, such as driving, currency, weights and measures and so on, but cautioning against government standards in cases where competing standards are unclear, the government may lack expertise, or where the industry is rapidly evolving).

222. *See, e.g.*, Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 38 (noting that "many market participants flocked to Libor precisely to avoid government-controlled indices") (citing Michael Carsella, *The LIBOR Controversy Part II: Focusing Attention on Basis Risk and Loan Profitability*, SECURED LENDER, May/June 2010, at 44, 45, http://www.thesecuredlenderdigital.com/thesecuredlender/20100506#pg46.

223. Abrantes-Metz and Evans also recognize this in noting that by placing lawyers and compliance officers in charge of setting LIBOR, the Wheatley recommendations substantially reduce LIBOR's flexibility and representativeness in response to changing market conditions. Abrantes-Metz & Evans*, supra* note 215, at 6.

224. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 49.

225. *See Libor Goes from Dying to in Demand with Fed Pushing Fast Loans*, AM. BANKER (May 6, 2020), https://www.americanbanker.com/articles/libor-goes-from-dying-to-in-demand-with-fed-pushing-fast-loans.

226. *See, e.g.*, Schrimpf & Sushko, *supra* note 211, at 47.

The point is not one about SOFR's suitability as a replacement for LIBOR (although that is certainly in question).[227] SOFR may be better suited for certain transactions.[228] Instead, the point is to illustrate that a one-size-fits-all benchmark is not a realistic goal—and staying within that paradigm will likely only replicate existing problems or result in unanticipated and unnecessary cost and risk to the financial system. While reform to calculation methodology can certainly make it more difficult to manipulate benchmarks, doing so only targets one aspect of the problem. Compliance-based systems risk failing to anticipate wrongdoing before the fact. Existing legal frameworks are plainly insufficient. Reliance solely on enforcement is also unlikely to be sufficient, for reasons made clear by the capture of regulators in 2008 regarding LIBOR manipulation. Nor would a prohibition on benchmark provision by the same entities who are counterparties to transactions referencing those benchmarks make sense—doing so would likely reduce incentives to participate in a benchmark setting so severely that benchmarks would simply disappear. Government provision of benchmarks is likely to be slow, costly, and cumbersome. The pathologies identified in this Article are deeper and begin with OTC market structures and incentives themselves. The next Part discusses the potential significant benefits to having more than one benchmark.

B. Benefits to Competition

Competition can have significant benefits for participants market-wide and increase efficiency, by incentivizing socially beneficial innovation, fostering transparency and better information, and encouraging entry by more efficient providers.[229] With respect to OTC benchmark markets in particular, even if dealers remain dominant due to natural accumulation of expertise, additional benchmarks can lead to benchmarks that are more tailored, nimbler, less systemically important, and less tempting and more difficult to manipulate.

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227. *See* Daniel Kruger & Vipal Monga, *Repo-Market Tumult Raises Concerns About New Benchmark Rate: Volatility in Funding Markets Sparks a Jump in the Rate that the Fed Has Proposed to Replace LIBOR*, WALL ST. J. (Sept. 23, 2019), https://www.wsj.com/articles/repo-market-tumult-raises-concerns-about-new-benchmark-rate-11569247352.

228. *See, e.g.*, Schrimpf & Sushko, *supra* note 211, at 43 (noting that SOFR is better suited when market participants are more concerned with avoiding volatility).

229. *See, e.g.*, *Competition and Financial Markets: Key Findings*, ORG. FOR ECON. CO-OPERATION AND DEV. (2009), https://www.oecd.org/daf/competition/43067294.pdf. For an account of the costs of concentrated markets, see, e.g., Rory Van Loo, *Making Innovation More Competitive: The Case of Fintech*, 65 UCLA L. REV. 232, 247 (2018); Economides, *supra* note 110, at 3-4; Robert J. Jackson, Jr., Commissioner, U.S. Sec. & Exch. Comm'n, "Competition: The Forgotten Fourth Pillar of the SEC's Mission"' (Oct. 11, 2018), http://www.sec.gov/news/speech/speech-jackson-101118 (noting that concentration in financial markets correlates with higher costs for participants).

First, the addition of benchmarks would cut down on the number of transactions tied to any given benchmark. This could reduce incentives to manipulate by lowering the potential upside to doing so. For example, two interest rate benchmarks might halve the potential gains to Citibank and JPMorgan from a 25 basis point (0.25%) change in LIBOR discussed in Part III.B. So long as a single benchmark dominates huge market segments, there will be a significant incentive to manipulate.[230] This is, of course, assuming that additional benchmarks could be created that are more resilient to manipulation in calculation methods. Similarly, to the extent there are fixed costs to wrongdoing, increasing the number of benchmarks might increase the overall costs of cheating and make it less attractive. This would be especially true for transaction-based benchmarks, a feature that dominates proposed or ongoing benchmark reforms already. Let us assume that there are costs to manipulating a single benchmark, for example, the WM/Reuters FX rate. If a dealer preferred that the 4 p.m. benchmark set at an artificially high rate, so that the dealer could sell some currency to its customer at an inflated rate, the dealer would (simplistically speaking) need to purchase a sufficient quantity of currency in the small window of time leading up to 4 p.m.[231] This is risky and requires resources and effort. If other dealers are in the market engaging in trades that will tend to move the rate in the opposite direction, the manipulating dealer will need to exert even more effort to see their manipulation through. So long as the potential benefits to manipulation outweigh these costs, however, manipulation will remain tempting.[232] If multiple benchmarks existed and manipulating each additional benchmark required the same level of effort or risk, the potential costs might quickly outweigh the benefits (especially if there were fewer transactions tied to a single benchmark, and a consequent reduction in potential gain from a single manipulation). And, beyond the costs to engaging in the mechanics of manipulation, there may be reputation costs, personnel costs, and so forth. Thus, if multiple benchmarks co-existed, manipulation might become less attractive ex ante.

Second, additional benchmarks might make market discipline more effective by lowering the cost of switching for end users. Currently, market participants are stuck with a single benchmark, even if that benchmark is faulty, prone to manipulation, or known to be manipulated. For example, its awareness of LIBOR's manipulation did not stop the U.S. Treasury from

230. Duffie & Stein, *supra* note 11, at 211.

231. *See, e.g.*, Levine, *Banks Manipulated Foreign Exchange'*, *supra* note 151.

232. *See, e.g.*, Brian Coulter, Joel Shapiro & Peter Zimmerman, *A Mechanism for LIBOR*, HARV. L. SCH. FORUM ON CORP. GOVERNANCE (Oct. 29, 2017), https://corpgov.law.harvard.edu/2017/10/29/a-mechanism-for-libor/.

issuing TARP loans indexed to LIBOR during the financial crisis.[233] Nor is it stopping regulators from issuing COVID-19-related loans linked to LIBOR today.[234] Contrast this with the equities markets, where indices operate in a multiple-benchmark competitive equilibrium that allows investors and institutions to select the index that best fits their needs, switching away from suboptimal benchmarks as prudent. For example, the S&P 500, the Dow Jones, NASDAQ, Russell 2000 all serve to provide varying but similar measures of the stock markets' performance. If the Dow Jones were compromised, alternatives exist that make the prospect of opting out of referencing the Dow Jones more realistic and comparatively much less costly. This also illustrates a related point about comparability between benchmarks: while this Article advocates for benchmarks that are more tailored, this would not necessarily come at the cost of comparability between benchmarks, as illustrated both by the coexistence of multiple equities indices as well as comparisons drawn between LIBOR and SOFR as discussed in the previous Part.

Similarly, additional benchmarks and consequently less widespread hardwiring of a single benchmark could reduce a benchmark's systemic impact and loosen powerful dealers' influence over regulatory behavior. Multiple benchmarks, simply because each one would be less widely referenced, could reduce the systemic risk posed by any single benchmark. And, if a single benchmark became compromised, regulators may be less hesitant to publicly discipline those responsible when there are others whose integrity remains intact. In other words, a situation such as the one in 2008, where Bank of England regulators appear to have implicitly blessed LIBOR manipulation for fear of undermining confidence in the banks, could be avoided. One could also hypothesize that such pathologies might not infect stock indices. If the S&P 500 were compromised, markets would conceivably understand to discount its numbers and much more easily look toward another index as a reference; or if production of the Dow Jones ceased, the likelihood of systemic market risk ensuing would be far lower.

Additional benchmarks could also reduce the tendency towards suboptimal standardization. As noted above, there is emerging evidence that a single dominant benchmark is not always optimal. To return to the LIBOR example, it is not clear that LIBOR is itself necessarily the most desirable benchmark in some cases.[235] Darrell Duffie and Jeremy Stein have pointed

233. *See* Verstein, *Benchmark Manipulation*, *supra* note 12, at 266.

234. *See Libor Goes from Dying to in Demand with Fed Pushing Fast Loans*, AM. BANKER (May 6, 2020), https://www.americanbanker.com/articles/libor-goes-from-dying-to-in-demand-with-fed-pushing-fast-loans.

235. Duffie & Stein, *supra* note 11, at 195. Similar phenomena have been observed in other markets: for example, participants might select a suboptimal contract term that does not maximize the value of their contract but which is standardized and thus will benefit from network effects,

out the suboptimal nature of LIBOR as a reference rate used across the entirety of the interest rate derivatives market.[236] They have posited that, "if we could start the world from scratch, we would aim for a two-rate model, with a transactions-based LIBOR+ serving as the reference rate for most on-balance-sheet bank lending contracts, and with some low-credit-risk reference rate . . . serving as the reference rate for the majority of interest-rate derivatives."[237] Similarly, in identifying suboptimal aspects of LIBOR, Rebecca Tabb and Joseph Grundfest have observed some shift away from unsecured interbank lending in markets more broadly, and that an environment comprising several benchmarks co-existing with LIBOR may be more optimal: "it makes little sense, on a prospective basis, to require a single substitute for LIBOR when the market may rationally prefer any of several viable alternatives."[238] Thus, we can move away from a world in which LIBOR, or a dominant benchmark, meets all market needs poorly, towards one where multiple benchmarks can each meet a specific market need more optimally.[239]

Further empirical work could be undertaken on this score, in particular with respect to whether a single benchmark may in fact represent an optimal equilibrium. Thus far, with the exception of a few commentators, the idea that markets may benefit from a greater variety of benchmarks has not received sufficient scholarly or regulatory attention. For example, the first major step to overhaul the LIBOR submission system, the Wheatley Report, undertaken in the U.K., involved consideration of alternative benchmarks, including, among others, the Sterling Overnight Index Average and the Overnight Index Swap rates and repurchasing agreement rates.[240] But the Wheatley Report ultimately recommended maintaining LIBOR, in large part

lowering the levels of uncertainty and making the contract easier to price. *See, e.g.*, Stephen J. Choi & Mitu Gulati, *Innovation in Boilerplate Contracts: An Empirical Examination of Sovereign Bonds* 53 EMORY L.J. 929, 930–31 (2004).

236. Duffie & Stein, *supra* note 11, at 192 (documenting the "accident of history" where market participants continually chose to trade in higher liquidity markets, which has led to a "massive agglomeration of trade based on the IBOR benchmarks").

237. *Id.* at 209.

238. Rebecca Tabb & Joseph A. Grundfest, *Alternatives to Libor*, 8 CAP. MKTS. L.J. 229, 230 (2013); Floyd Norris, *Finding A Rate That's Fairer Than Libor*, N.Y. TIMES (Apr. 5, 2013), https://www.nytimes.com/2013/04/05/business/steering-a-better-course-past-the-fiction-of-libor.html?ref=business&_r=0 ("Libor has clearly become ridiculous. But long before that happened, it became ubiquitous.").

239. *See* Tabb & Grundfest, *supra* note 238, at 26 ("Indeed, one of the ironies of LIBOR is that, despite meeting the needs of different segments of the market imperfectly and potentially less well than alternatives, LIBOR's ubiquity in diverse market settings provides it a dominant market position with network effects that are challenging for alternatives to overcome.").

240. *The Wheatley Review of LIBOR: Final Report*, HM TREASURY (2012), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/191762/wheatley_review_libor_finalreport_280912.pdf.

due to its sheer dominance.[241] Since then, governments have only slowly moved to replacing LIBOR. The United States, U.K., Europe, Japan, and Switzerland have begun to creakily transition to a designated alternative.[242] Yet the chosen alternatives are not free from flaws. In the United States, as discussed, SOFR has been designated as LIBOR's replacement.[243] But as discussed above, the markets for SOFR can be finicky and prone to idiosyncratic fluctuations,[244] and SOFR may be fundamentally suboptimal in certain circumstances—especially in times of economic stress—as well. Indeed, the very reason LIBOR came into existence was to avoid overreliance on a government-produced index.[245]

In LIBOR markets, at least a few jurisdictions have since raised the possibility of transitioning to a two-benchmark status quo, where one is based on an overnight risk-free rate, while the other incorporates the credit risk component that enables banks to match their assets with their liabilities (e.g., their lending revenues with their borrowing costs).[246] In the United States, the ICE Benchmark Administration has announced the intention to create a "a forward-looking, credit-sensitive benchmark designed specifically as a potential replacement for LIBOR for U.S. dollar lending activity," although its viability remains uncertain.[247] Another benchmark candidate, Ameribor, seeks to reflect the "the actual borrowing costs of thousands of small, medium, and regional banks across America."[248] There currently seems to be a window for innovation, one in which it makes sense to encourage benchmark competition, rather than simply let markets deal with the expensive fallout from transitioning to SOFR or relying on other suboptimal short term interest rates, such as the prime rate (which is a good deal more expensive than LIBOR), both of which would likely impose costs across the

241. *See id.*

242. *See* McCrum, *supra* note 207.

243. *Transition from LIBOR*, *supra* note 17.

244. *See, e.g.*, Schrimpf & Sushko, *supra* note 211, at 38–39 (observing SOFR's volatility caused by Treasury market fluctuations and bank and corporate balance sheet management); Levine, *Interest Rates*, *supra* note 210.

245. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 38.

246. *See, e.g.*, Schrimpf & Sushko, *supra* note 211, at 45.

247. *U.S. Dollar ICE Bank Yield Index Update*, ICE BENCHMARK ADMIN. 3 (Oct. 2019), https://www.theice.com/publicdocs/iba_us_dollar_ice_bank_yield_index_third_update.pdf ("The Index has been developed to measure the average yields at which investors are willing to invest U.S. dollar funds over one-month, three-month and six-month periods on a wholesale, senior, unsecured basis in large, internationally active banks.").

248. *See* Ameribor, *Background*, https://ameribor.net/background; Ameribor, *The New Benchmark*, https://ameribor.net/assets/resources/AMERIBOR_Brochure.pdf; Jason Brett, *Federal Reserve Endorses Ethereum-Backed Alternative To Libor*, FORBES (June 3, 2020), https://www.forbes.com/sites/jasonbrett/2020/06/03/federal-endorses-ethereum-backed-alternative-to-libor/#6c54936c69f3.

market.[249] This relates to another point: the argument that introducing multiple benchmarks would create additional, unmanageable complexity ignores the vast amounts of resources that are already being sunk into the transition from LIBOR to SOFR—including by the government.[250] A clumsy transition risks externalized costs to the whole market.

There is an additional, related benefit to benchmark competition: reduced risk of the persistence of an outdated benchmark. For example, while LIBOR may have once reflected borrowing costs in liquid markets, over time trading in certain segments of the underlying market that LIBOR was designed to measure became problematically thin.[251] Yet the BBA took no action in response, nor did they have any incentive to. Why incur the costs of adjusting or updating a benchmark when markets have little ability to cease reliance on that benchmark? Healthy competition in benchmark markets, on the other hand, could incentivize beneficial updates in response to changing market conditions.[252] Thus, increased competition could have other cascading benefits, such as encouraging quality enhancing innovation.

Finally, it is unlikely that additional benchmarks would cause a loss of the standardization, price-related, and hedging benefits provided by benchmarks in the first place. This is presuming that markets will likely not calibrate to an equilibrium with more than a handful of benchmarks (too many competing benchmarks would undercut much of their standardizing benefits and run into administrability issues), ensuring that each will still retain substantial harmonization and pricing benefits. While a full treatment of this eventuality is beyond the scope of this Article, the example in the cross-currency swap between Apple and Sony discussed in Part II.C.3 may be illustrative. There, allowing parties to choose between two interest rate benchmarks that each maintain some critical threshold of market influence (rather than defaulting to LIBOR) should not negatively impact harmonizing, informational, and liquidity benefits of an alternative benchmark.

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249. *See, e.g.*, Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 39 (noting the perils of relying on the existence of the prime rate).

250. *See, e.g.*, *Reforming Major Interest Rate Benchmarks: Progress Report*, FIN. STABILITY BD. 16-17 (Nov. 14, 2018), https://www.fsb.org/wp-content/uploads/P141118-1.pdf; Mark Maurer, *U.S. Companies Advised to Prepare for Multiple Benchmark Rates in Transition from Libor*, WALL ST. J. (Oct. 22, 2019), https://www.wsj.com/articles/u-s-companies-advised-to-prepare-for-multiple-benchmark-rates-in-transition-from-libor-11571776045 (reporting a $155 billion estimate in spending to transition away from LIBOR). Indeed, some companies are beginning to realize that it is simply not practical to expect to graft LIBOR-linked contracts over to SOFR.

251. *See, e.g.*, Hou & Skeie, *supra* note 144. Verstein notes a similar phenomenon in the markets for crude oil. Verstein, *Benchmark Manipulation*, *supra* note 12, at 244–45.

252. In this vein, Rauterberg and Verstein note that indices produced for profit will be more likely to "maintain index quality" in response to market pressures. Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 40.

C. Transition Mechanisms

Retaining the benefits introduced by benchmarks will require ensuring that the alternative benchmark has enough of a market, meaning that mechanisms of transition will need to be carefully considered. Of course, transition toward additional benchmark usage is not a simple process, especially when network effects are so strong.[253] Nor is it the purpose of this Article to detail a prescription for such processes. However, a few insights that flow from this Article's analysis bear mention. First, the introduction of fees could significantly promote competitive incentives, both to create additional benchmarks and to adequately innovate around and update existing ones. Second, the existence of "mix and match" compatibility across contracts could substantially help support such a system. Finally, regulatory support may be necessary, as well as support from private market forces such as ISDA.

Fees could greatly enhance the robustness of a multi-benchmark system in a few ways. If benchmark promulgators or administrators were to charge fees, benchmark administrators might be incentivized to create and monitor rival benchmarks.[254] To date, little incentive exists because new benchmark providers will be forced to internalize all costs with uncertain or partial benefits.[255] The threat of competition as well as the inherent profit-seeking motives of benchmark administrators might also spur beneficial updates to existing benchmarks. This parallels Rauterberg and Verstein's insight that, because existing benchmarks are largely provided as byproducts of a bank's main profit-making activity, the lack of a financial return lowers the incentive to monitor or innovate.[256] It also ties in well with their proposal to bolster the intellectual property framework to allow benchmark providers to capture financial gains so as to incentivize better monitoring and quality control.[257] Indeed, the scheduled disappearance of LIBOR stems in part from the unwillingness of banks to continue providing inputs to the daily survey—

253. *See, e.g.*, Levine, *Banks Will Miss LIBOR*, *supra* note 10; Joe Rennison, *The Loan Market Loves Libor…*, FIN. TIMES (Apr. 9, 2018), https://ftalphaville.ft.com/2018/04/09/1523300140000/The-loan-market-loves-Libor—-/.

254. *See* Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 43 (noting the potential for market competition to incentivize providers of "product" indices "to maintain quality on pain of losing their users to another provider").

255. *See* Awrey, *Private Ordering*, *supra* note 75, at 237.

256. Rauterberg & Verstein, *Index Theory*, *supra* note 9, at 51–52 (noting the limitations of protections for index providers, and the feebleness of the "hot news" and "indices as securities" protections).

257. Rauterberg and Verstein propose an intellectual property framework to be applied to benchmarks, arguing that market solutions, enforcement, and governance mechanisms will not sufficiently incentivize adequate benchmark monitoring. This is because as byproducts, benchmark providers are not able to internalize the benefits. Thus, they argue for reinstating those protections to incentivize better index production. *See id.* at 51–61.

largely because there is little financial upside and enormous downside due to unpredictable and expensive enforcement actions.[258] Fee-based healthy competition could introduce enough of a financial incentive for participants to continue providing inputs. Indeed, fees, or certain kinds of pricing schemes, are a recognized way of overcoming inefficient inertia.[259]

Innovation could also be promoted through "mix-and-match compatibility."[260] As economists have noted, while unequal market power and monopolies tend to exist in markets with network effects, this is the truest when there is incompatibility between (potentially) competing networks.[261] Domowitz has also done work on this in the exchange context, discussing the "tipping" required to move from floor trading to electronic trading, noting the incompatibility between the two.[262] This literature has generally demonstrated that with compatibility, social surplus is greater and "component" innovation is incentivized.[263] This is because compatibility lowers switching costs and reduces coordination issues.[264] Competition between multiple benchmarks can be thought of similarly, where there is compatibility between the contracts themselves, but with different benchmarks, leading to "mix-and-match compatibility [that] encourages component innovation."[265]

This "mix-and-match" compatibility can be observed in the equities markets. Funds have a plethora of indices to choose from and pay licensing fees to those such as the S&P 500 for the ability to incorporate their indices.[266] Indices such as the Dow Jones Industrial Average and S&P 500 are "products for sale," able to generate hundreds of millions of dollars in fees collected from those wishing to use the index (ETFs, for example).[267] As they note, the "product" nature of equities indices has been able to reduce lock-in effects, allowing competition to exist between the S&P, the Dow Jones, and so forth for clients.[268]

258. *Id.* at 36 (characterizing this as underproduction).

259. *See generally* Farrell & Klemperer, *supra* note 174.

260. *See id.* at 71.

261. Economides, *supra* note 110, at 21 (concluding that compatibility is key to increasing welfare).

262. Domowitz, *supra* note 125, at 167.

263. *See, e.g.*, Economides, *supra* note 110, at 14 (noting that consumer surplus, total surplus, and production profits are generally highest under compatibility).

264. *See* Farrell & Klemperer, *supra* note 174, at 6-7.

265. *Id.* at 71.

266. Rauterberg & Verstein, *Index Theory*, *supra* note 9 at 43, 27–28.

267. *Id.* (calculating that the S&P made almost $22 million in 2010 from a single fund, and extrapolating it would make around $400 million annually, and noting that MSCI had $350 million in annual revenue).

268. *Id.* at 43–44.

Another lesson can be drawn from the equities universe. Across stock exchanges, the order protection rule in Regulation National Market System ("NMS") prohibits the execution of an order at an exchange if a better quote exists elsewhere.[269] This not only protects investors, but it has the added benefit of promoting competition between exchanges by ensuring that the ability of an exchange to receive executions depends on its prices, not on its size or market power. One could envision an analogous rule in benchmark markets as follows. Dealers, in pricing contracts to counterparties, might charge less for incorporating a benchmark that is more widely used. A newer benchmark will naturally have a smaller network of adoption and may be—all else being equal—more expensive for an end user to select. A rule requiring equal pricing for both benchmarks could remove dealers' ability to discriminate against a new benchmark on the basis of cost. If the market then deems that benchmark useful, that benchmark's barriers to amassing additional market share are significantly reduced.[270]

Governments might thus play a role (as they have already).[271] Under regulation in the process of being implemented, the European Union has begun requiring that (a) benchmark administrators become authorized or registered, with adequate governance mechanisms in place; (b) benchmark contributors (of input data) must comply with the benchmark administrator's code of conduct and avoid conflicts of interest; and (c) benchmark users only rely on authorized benchmarks, i.e., those included in the European Securities and Markets Authority Benchmarks Register.[272] Such users will also need to have in place a written plan for contingency actions in the case of a benchmark materially changing or ceasing to be provided.[273] To the extent it is feasible, benchmark users must also have an alternative benchmark as a substitute as necessary.[274] The International Organization of Securities Commissions' ("IOSCO") *Principles for Benchmarks* encourage similarly.[275] One can imagine that other jurisdictions may engage in

269. 17 C.F.R. § 242.611.

270. Fees could also be imposed so as to avoid overly burdening end users, especially if the fees were imposed asymmetrically onto dealers or onto large institutions. Dealers might be required to pay some nominal fee to reference a benchmark in a contract, for example. Perhaps this fee would only be imposed if an institution were of a certain size, mitigating any concern that smaller users would be negatively impacted in an outsize way.

271. *See, e.g.*, *Transition from LIBOR*, *supra* note 17.

272. *Benchmarks*, EUROPEAN SEC. AND MKTS. AUTH., https://www.esma.europa.eu/policy-rules/benchmarks (last visited Feb. 2, 2020).

273. *See id.*

274. *See id.*

275. *Principles for Financial Benchmarks: Final Report*, INT'L ORG. OF SEC. COMM'NS. 24–25 (July 2013), https://www.iosco.org/library/pubdocs/pdf/IOSCOPD415.pdf.

responsive action.[276] As they stand, current contracts would either not have workable alternatives if LIBOR were stopped (such as cash products), convert to other instruments still tied to LIBOR, or revert to the prime rate (corporate loans), which would be a lot more expensive than LIBOR.[277] However, the kind of registration regime contemplated by the EU could facilitate the adoption of additional benchmarks.[278] Registering with some centralized repository of "approved" benchmarks and requiring that benchmark users have contingency plans for alternative benchmarks could certainly bolster acceptance of alternative benchmarks.[279]

Nor should the very same institutions—large dealers—that have had such a profound impact in shaping OTC market structures be overlooked. Dealers could encourage use of alternative benchmarks, lessening coordination and switching problems by leveraging the same market forces that led to such wide adoption of the original benchmarks promulgated.[280] For example, one group of institutions with a particularly influential and dynamic role in the interest rate derivatives market—ISDA—could help facilitate transition to alternative benchmarks, or lend legitimacy to additional ones, through the issuances of protocols.[281] Currently, many older ISDA contracts provide that in the event that an IBOR is discontinued, calculations will depend on quotes obtained from major dealers in the market.[282] This is most obviously problematic because the feasibility of obtaining such quotes under such circumstances is highly questionable, to say the least. Contracts often contemplate a long schedule of future payments conditioned on future settings of a benchmark, and obtaining consistent, informative quotes for many years into the future seems unlikely as well as

276. Anu Bradford provides a compelling explication of what she terms the "Brussels Effect," where because the EU tends to promulgate the strictest standards, its regulations and standards tend to become entrenched or powerfully influence legal frameworks of developed and developing markets across the globe. *See* Anu Bradford, *The Brussels Effect*, 107 NW. U. L. REV. 1, 3 (2012).

277. *Reforming Major Interest Rate Benchmarks: Progress Report*, *supra* note 250, at 31.

278. *See Benchmarks*, *supra* note 272.

279. Support through governmental regulation can thus bolster a multiple benchmark system. To the extent the U.S. adopted regimes similar to those promulgated abroad, or explicitly incorporated IOSCO principles for benchmarks, it could help ensure fair access to multiple benchmarks and shore up the integrity of each benchmark. *See, e.g.*, Bainbridge, *supra* note 14, at 842 (advocating for FSA oversight to accompany Rauterberg and Verstein's intellectual property regime to ensure fair access to LIBOR).

280. This can be analogized to the role of underwriters—who are also powerful and concentrated—in assisting issuers when drafting contracts: because they have great expertise and influence over the choice of contract terms, they can advise firms that they will recommend the same contracting terms in the future, ensuring the network utility of that term. *See, e.g.*, Kahan & Klausner, *supra* note 118, at 738–40. Kahan and Klausner also discuss the possibility of cross-subsidies from early to later adopters of a contract term. *Id.* at 739–40.

281. *See* Tabb & Grundfest, *supra* note 238, at 27. This is already being contemplated to some extent. *See* Williams, *supra* note 21.

282. *See Reforming Major Interest Rate Benchmarks: Progress Report*, *supra* note 250, at 30.

time-consuming and costly. However, one could imagine a scenario in which such contracts provided for a new reference rate as a fallback.

Ultimately, while it is not the purpose of this Article to delineate specific frameworks for transitioning to multiple benchmarks, it bears mentioning that (a) a "mix-and-match" compatibility structure through which benchmark administrators could charge fees might incentivize benchmark promulgation and competition; (b) benchmark registration and regulation as to prices and fees could promote adoption of additional benchmarks, with additional policy intervention as necessary, without being too intrusive or requiring massive regulatory overhaul; and (c) market forces could help generate a new equilibrium, with subsequent updating and adjustments in response to changing market conditions.

Finally, it is worth noting that these proposed reforms should not displace those aimed at strengthening monitoring and deterrence. For example, certain regulators are already periodically reviewing submission and transaction data that is used to set benchmarks.[283] Banks have been required to turn over large amounts of data in enforcement actions.[284] Dealers could also provide data as to their exposure to a benchmark, which could provide information as to potential incentives to manipulate (the more exposure, the greater potential benefit).[285] Moreover, it is possible that simply knowing that regulators have the option of accessing data or scheduling audits could deter wrongdoing.[286] Similarly, regulators could consider installing monitors at dealer banks, a step that has already been taken by some regulators in some circumstances.[287] With respect to cost, having this monitor be funded by the bank, or imposing potential liability or

283. *See, e.g.*, Press Release No. 15-499, U.S. Dep't of Justice, *supra* note 18 ''(documenting that Deutsche Bank must retain a corporate monitor for three years); Press Release No. 6289-12, U.S. Commodity Futures Trading Comm'n, CFTC Orders Barclays to pay $200 Million Penalty for Attempted Manipulation of and False Reporting concerning LIBOR and Euribor Benchmark Interest Rates' (June 27, 2012), https://www.cftc.gov/PressRoom/PressReleases/6289-12 (requiring Barclays to, among other things, install firewalls, retain communications and documents, audit and monitor submissions, regularly submit compliance reports to the CFTC).

284. Press Release No. 12-815, U.S. Dep't of Justice, Barclays Bank PLC Admits Misconduct Related to Submissions for the London Interbank Offered Rate and the Euro Interbank Offered Rate and Agrees to Pay $160 Million Penalty' (June 27, 2012), https://www.justice.gov/opa/pr/barclays-bank-plc-admits-misconduct-related-submissions-london-interbank-offered-rate-and.

285. *See, e.g.*, Bainbridge, *supra* note 14, at 821 (arguing that banks should disclose their exposure to benchmark administrators).

286. *See, e.g.*, Rory Van Loo, *Regulatory Monitors: Policing Firms in the Compliance Era*, 119 COLUM. L. REV. 369, 414–19 (2019).

287. *See, e.g.*, Consent Order Under New York Banking Law Sections 39 and 44, *In re* Barclays Bank PLC, (NY State Dep't of Fin. Servs. May 20, 2015), https://www.dfs.ny.gov/system/files/documents/2019/01/ea181218_barclays.pdf
(noting the independent monitor installed at Barclays that will report to the DFS); Press Release No. 15-499, U.S. Dep't of Justice, *supra* note 18 (documenting that Deutsche Bank must retain a corporate monitor for three years).

sanctions if a monitor fails to report wrongdoing could be extremely effective.[288]

Ultimately, the focus of any reforms should be on bolstering efficiencies already achieved in OTC markets and better aligning incentives. An important means for doing this lies in encouraging multiple benchmarks in conjunction with any reform targeting the robustness of benchmarks.

V. CONCLUSION

This Article has advocated for a bottom-up approach to conceptualizing OTC market structures and their attendant efficiencies and inefficiencies. By resisting the assumption that observed equilibria are the most optimal ones, this Article shows that the persistence of certain benchmarks should not be taken to necessarily indicate their desirability. In markets that are otherwise opaque, decentralized, and dominated by a few powerful players, overreliance on default structures can lead to inefficient lock-in, facilitate wrongdoing, and reduce the effectiveness of discipline around benchmarks. In such markets, the network effects of benchmarks can be revolutionary, but can also entrench a single "default" benchmark across vast market segments. Thus, careful consideration should be given to alternative competitive equilibria containing multiple benchmarks. The ambition of this Article is not to prescribe a number of benchmarks or detail a new competitive equilibrium—rather, it is to urge skepticism of current structures and demonstrate the benefits of additional benchmarks and different competitive equilibria.

288. *See, e.g.*, Stavros Gadinis & Colby Mangels, *Collaborative Gatekeepers*, 73 WASH. & LEE L. REV. 797, 840–41 (2016).