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Alternative Trading Venues in the United States
Incentives for Innovation in the US Stock Market

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Is something wrong with the structure of our stock market? Recent scholarship faults the equity market for its lack of innovation.¹ In particular, commentators stringently criticize the continuous nature of modern trading for baking in a wasteful arms race for speed among high-frequency traders.² Under their current structure, stock exchanges process incoming instructions to trade in the order they arrive and as quickly as possible, which means in millionths of a second or less. The result is a race for technological speed because market participants can earn profits from being the first to trade on new information, even when that information is widely and simultaneously available. This race would be eliminated if continuous trading was replaced with discrete, periodic auctions, say once per thousandth of a second.³ The problem, it is argued, is that the market will not fix itself because the nation’s stock exchanges lack the incentives to appropriately innovate, principally because they earn so much revenue from the sale of products dependent on speed.⁴

¹ Thanks to Benjamin Connault, Jens-Hinrich Binder, Nicholson Price, Adam Pritchard, and Paolo Saguato for helpful comments, and to Matthew Garry and Samuel Jaksa for research assistance.
This picture, however, is incomplete. There are other trading venues in the modern equity market than its exchanges, including the neglected cousins of the stock market, alternative trading systems ('ATSs'). While over 200 billion shares were traded on U.S. ATSs last year—more volume than the entire Canadian stock market—popular and academic discussion of equity market structure overwhelmingly emphasizes the national stock exchanges. Like stock exchanges, ATSs are electronic markets in which participants can trade the stock of public companies, but when attention turns to them, a single fact about ATSs dominates discussion—they are 'dark' (hence their popular moniker 'dark pools'). 'Dark' simply means that 'quotes' posted by traders/orders expressing their willingness to trade at a specific price—on these trading venues are not included in the public quotation feed that distributes quote data to all market participants. While this fact is important, emphasizing it has confined analysis of ATSs to an unduly narrow range of debates.

I focus on a dimension that is not usually considered in the same breath as ATSs—innovation. Innovation is both an important and timely lens for analysing ATSs. Innovation has historically been a major ambition for equity markets, whether to ensure that market participants rapidly receive information, that they can act on it promptly, or that trading interests interact in a structure that effectively balances the competing goals of market quality.

The technological transition from manual to electronic markets is widely credited with generating secular increases in the quality of trading outcomes. The present moment also highlights the importance of innovation in equity market structure. In early 2020, the Securities and Exchange Commission ('SEC') proposed a major rule change that would effectively reinvent major parts of the stock's market structure. The rule would expand what data exchanges must include in public feeds and which actors distribute it. According to the SEC, the changes would benefit 'market participants by increasing the amount of innovation in the consolidation and

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9 For an important exception emphasizing other aspects of ATSs, see Kevin S. Haeberle, 'Discrimination Platforms', J. Corp. L. 42 (2017), 809 (emphasizing ATSs' ability to restrict trading access to specific market participants).


dissemination of consolidated market data.\textsuperscript{13} Lastly, as noted above, faulting the market for a failure to innovate is a major theme of recent scholarship.

9.04 It is worth discussing ATSs and innovation because the innovation calculus for ATSs differs markedly from exchanges. My central claim will be that ATSs have stronger incentives to innovate in trading market structure than stock exchanges, especially with respect to innovations that reduce the market's emphasis on speed.\textsuperscript{14} ATS's innovation incentives are stronger for two principal reasons. First, regulation directly affects trading venues' ability to innovate in a number of ways.\textsuperscript{15} Most simply, initiating and changing operations is procedurally cumbersome and costly for exchanges, but inexpensive for an ATS. More subtly, certain legal rules, some of which are in principle applicable to both ATSs and exchanges, turn out only to restrict exchanges' ability to innovate and not any current ATSs. The exacting disclosure requirements imposed on exchanges, but not ATSs, also mean that it is far harder for an exchange to maintain an innovation as a trade secret than an ATS.

9.05 Second, the economics of ATSs and exchanges differ significantly.\textsuperscript{16} Exchanges garner a large portion of their revenue from the sale of so-called 'speed technologies' that enable purchasers to receive and act on information faster than other market participants. As a result, the exchanges benefit from features of market structure that make speed important.\textsuperscript{17} ATSs do not sell these speed technologies and thus benefit less from the status quo market design's emphasis on speed. This difference in revenue-driven incentives matters acutely for a specific class of important innovations—namely, those that reduce opportunities for latency arbitrage and the importance of speed in trading, like frequent batched auctions. I use recently available data on ATSs to inform and illustrate these arguments, including to show that ATSs offer a broad swath of innovations. Strikingly, at least two ATSs already operate market structures that replace continuous trading with frequent batched auctions. They illustrate the conceptual argument's point—ATSs have stronger incentives to innovate, and in fact they innovate more.

9.06 The natural question to ask next is whether ATSs will 'fix' the stock market, if in fact it needs fixing. Or, put less tendentiously, will desirable ATS innovations attract the trading volume they would if adopted by an exchange or at least will their innovations

\textsuperscript{13} Id. at 452; see also id. at 334, 351.

\textsuperscript{14} By market structure innovation, I mean innovation involving any of the technological and mechanical dimensions of a trading venue that affect market participants' trading outcomes, and are controlled by the operator of the trading venue, whether an ATS or exchange. Examples would include the rules governing how orders interact (e.g., ranking of orders for priority to transact, rules governing the timing of when incoming orders arrive); when trade occurs (e.g., discrete versus continuous trading); and the technology available (e.g., microwave towers, fibre optic cables, artificially intelligent matching procedures). Exchanges undeniably provide more innovation than ATSs along other dimensions. For instance, corporations going public cannot list on an ATS, only on an exchange. ATSs thus do not compete with exchanges along the listing dimension, nor in providing governance rules for listed companies or generally regulating member conduct. For an exploration of exchanges' incentives in the context of deterring securities fraud, see A.C. Pritchard, 'Markets as Monitors: A Proposal to Replace Class Actions with Exchanges as Securities Fraud Enforcers', Va. L. Rev. 85 (1999), 924.

\textsuperscript{15} See infra Section II.A.

\textsuperscript{16} See infra Section II.B.

\textsuperscript{17} This is perhaps the central policy insight developed in Budish, Lee, and Shim, supra note 4.
be adopted by exchanges? Doing full justice to this question raises profound issues about the structure of the market that seem to have been mostly overlooked, especially as to why certain trading venues transition between operating as an ATS to an exchange. ATS innovations could affect market participants widely if the ATS can attract significant transaction volume or if its innovations migrate to exchanges. I address these issues, but my conclusions are profoundly ambiguous as to the broader welfare consequences of ATS innovations for the stock market as a whole.

Nonetheless, appreciating ATSs’ innovation dynamics has several direct implications for theory and policy. In terms of policy, ATSs’ innovations provide a reason in favour of having a tiered classification system in which some trading venues enjoy a lighter regulatory touch. Recent regulatory moves impose greater disclosure obligations on ATSs. They represent a healthy development, but too much disclosure could have a serious downside for ATS innovation. In terms of theory, I suggest that economic models should push further than the state-of-play to endogenize trading venues’ choice of legal status. In particular, excluding ATSs from analysis leads to an incomplete picture of stock market innovation. The result is that we fail to ask difficult and important questions about why, historically, some ATSs have become exchanges, while others have not, and why the business models of ATSs and exchanges differ so dramatically. Lastly, engaging with ATSs highlights the need for greater empirical study of how transaction volume flows among different trading venue types.

I proceed as follows. In Section I, I provide an overview of ATSs. In Section II, I turn to my central claim and argue that ATSs have stronger incentives to innovate than exchanges. In Section III, I discuss the welfare implications of the different innovation incentives of ATSs and exchanges, before concluding.

I. The place of ATSs in the U.S. stock market

In this section, I first describe the basic architecture of the U.S. equity market, organized around the types of trading venues; and then analyse some of the criticisms that politicians, media commentators, and scholars have made of ATSs.

A. The basic architecture of the U.S. equity market

The modern stock market is profoundly shaped by, amongst other forces, technology, competition, and law. The market’s central institutions are its trading venues. In

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18 For instance, Budish, Lee, and Shim, supra note 4, argue that if an exchange offered frequent batched auctions it would attract all trading because it would remove the tax imposed on liquidity by the high-frequency arms race for speed.

19 In an Appendix, I briefly note that ATS-like trading venues, called swap execution facilities, exist for swap markets.
regulating those venues, securities law begins, as it often does, with a general definition from which it then makes exemptions. The general definition is that of a stock exchange, which is an organization that ‘brings together the orders for securities of multiple buyers and sellers’, and has established ‘non-discretionary methods’ for how those orders interact.20 A trading venue for stocks that meets that definition has a choice—it can apply to register as a national stock exchange or instead act as an ‘alternative trading system’ operated by a registered broker-dealer instead.21 This classification system is codified in the two most important sets of rules governing the stock market, Regulation National Market System (‘Reg. NMS’) and Regulation Alternative Trading System (‘Reg. ATS’),22 adopted by the SEC pursuant to Congress’s 1975 National Market System (‘NMS’) Amendments to the Securities Exchange Act of 1934 (‘the Exchange Act’).23 A last category of trade occurs at venues that do not fall under the definition of an exchange at all (sometimes referred to as non-ATS off-exchange trading).24 While it can take many forms, much of it consists of ‘internalization’, in which a broker-dealer either transacts directly with its own customers’ incoming order flow by taking the opposite side, or sells its customer order flow to another broker-dealer that internalizes it (so-called ‘payment for order flow’).25

9.11 The main consequence of registering as an exchange as opposed to an ATS, as a matter of law, is that an exchange is its own self-regulatory organization (‘SRO’), with certain quasi-governmental regulatory functions, while an ATS is not an SRO, although it must join the industry-wide SRO, the Financial Industry Regulatory Authority (‘FINRA’).26 It is surprising to many that the differences between an ATS and an exchange are in large measure a matter of regulatory policy, rather than function. As SROs, exchanges

20 Securities Exchange Act of 1934 § 3(a)(1) (1934), 15 U.S.C. § 78c(a)(1) (defining a stock exchange as ‘any organization, association, or group of persons . . . which constitutes, maintains, or provides a market place or facilities for bringing together purchasers and sellers of securities’); 17 C.F.R. § 240.3b-16(a)(2) (2005) (providing rules defining an exchange as also involving ‘established, non-discretionary methods’ for when orders interact).
25 Non-ATS off-exchange trading venues have limited incentives to innovate in terms of market structure for the simple reason that they transact directly with order flow or rapidly interact incoming order flow at prices based on the displayed quotes of exchanges any ECNs (if any). In any event, they seem to have been the locus of little innovation.
27 Section 3 of the Securities Exchange Act requires any entity aiming to run a ‘national securities exchange’ to first register with the SEC and to act as an SRO. Securities Exchange Act of 1934 § 3(a)(26) (1934), 15 U.S.C. § 78c(a)(26) (2012); Regulation ATS Rule 301(b)(1), Requirements for Alternative Trading Systems, 17 C.F.R. § 242.301(b)(1) (‘Every alternative trading system subject to this Regulation ATS . . . shall register as a broker-dealer’ with the SEC); Reg. ATS Adopting Release, supra note 8, at 38770.
are extensively regulated by the SEC, but the law also grants exchanges blanket immunity from liability for various types of legal claims and grants them liability limits as to others. In particular, an exchange ‘when acting in its capacity as an SRO, is entitled to immunity from suit’, and it also possesses rule-based liability limits that are adopted in an exchange’s SEC-approved rulebooks, which cap any damages the exchange may owe third parties when the exchange is performing its ordinary commercial functions.27

The most familiar feature of ATSs operating today is that they are ‘dark’—that any quotations posted on those venues are not included in the public quotation stream, which consolidates displayed quotations from all exchanges and any participating ATSs and distributes them to all market participants. A trader can desire to post a non-displayed or ‘hidden’ order for a number of reasons. Most importantly, she may have a large trading interest and aim for it to transact with one or more contra-side orders, without the size of her order being known beforehand and affecting other participants’ views and prices.28 Naturally, there is a tradeoff. Because the quotation is not displayed, it offers other traders less certitude that there is any liquidity; instead, there is only some probability at any venue and price that there is non-displayed liquidity available.

It is worth quickly being clear about how non-displayed orders work as a legal matter. Any trading venue can offer dark liquidity by providing participants on the venue with the ability to post quotes that are not displayed.29 Exchanges can and do permit traders to post non-displayed quotations. ATSs can as well, and conversely, they can lawfully permit traders to post displayed quotations on the ATS that are included in the public quotation stream, that is publicly displayed. An ATS that publicly displays quotations is known as an ‘electronic communication network’ (‘ECN’).30 Non-display of quotations is thus neither necessary, nor sufficient to be an ATS. Further, all equity trading venues, including exchanges and ATSs, must ‘print’ all their trades, meaning that they must supply all their transaction data to be consolidated and disclosed in the public transaction feed.31 ATSs are also allowed to restrict who trades on the venue, which I will discuss in more detail later.32 As a result, a large uninformed trader who would like to conceal their interest and interact only with uninformed counterparties can seek out a dark pool that caters to that trader type.33

28 Francis A. Lees, Financial Exchanges: A Comparative Approach (2012), 276 (‘Dark pools are used by broker-dealers, institutional investors, and hedge funds to negotiate larger securities transactions’).
29 See Regulation of Non-Public Trading Interest, SEC, at 6 (2010), <https://www.sec.gov/rules/proposed/2009/34-60997.pdf> (stating that the SEC has never sought to prohibit trading venues from offering dark liquidity services to investors).
30 SEC, Electronic Communication Networks (ECNs), <https://www.sec.gov/fast-answers/answersecn.htm.html> (‘Unlike dark pools, another type of ATS, ECNs display orders in the consolidated quote stream’).
31 Regulation NMS, Rules 601 and 603(b), 17 C.F.R. §§ 242.601, 603(b) (2005).
32 See supra notes 91–97.
33 An uninformed trader is a trader who lacks a more accurate valuation of an asset than what is currently reflected in its market price. They have no ‘edge’ over the market.
In an interesting turn of events, ECNs were historically important to equity markets during the later decades of the twentieth century, but there is currently no active ECN operating in the stock market. All currently operating equity ATSs include no quotations in the public quotation stream. They are all 'dark pools'. As a result, this chapter—whose focus is on innovation in contemporary market structure—focuses on dark pools. However, there are at least two distinct and important sets of questions about ECNs that seem to have been overlooked by the literature. The first is the need for a definitive history of how ECNs helped bring about the distinctive features of the 'new' stock market. Before they became widely adopted by exchanges, the core novel features of the contemporary market—co-location, proprietary data feeds, heavily electronic trading infrastructure, and even a nascent form of high-frequency trading—were embraced by ECNs. A significant number of those ECNs then transitioned to operating as exchanges, and with that transition brought about other exchanges' move from operating as nonprofit member mutuals, in terms of ownership structure, to standard for-profit investor-owned business corporations. The second is why no ECNs operate right now. At a mechanical level, an ECN can function almost precisely like an exchange. Yet no venue chooses to so operate. A plausible inference is that conditioned on a venue choosing to widely and publicly disseminate its quotes, the advantages of exchange status come to dominate operating as an ECN. Why that is, is an important open question.

Returning to dark pools, it is worth spending a moment on the distinctive services they provide. First, many dark pools offer essentially 'niche' market products aimed at a select group of traders with specific needs, such as large institutions seeking to trade large blocks of trades. The lower cost of operating an ATS means it is cost-effective to offer a highly niche product, and dark pools' greater legal latitude to restrict certain traders' access and offer all non-displayed liquidity mean that ATSs can offer niche products that exchanges cannot. Second, historically, many dark pools have been operated by broker-dealers and tied the to the broker-dealer's business as execution venues for their customers' order flow, such as Goldman Sachs operating its Sigma-X dark pool, where its institutional clients could discretely trade in large size. In this case, the business model is fundamentally about catering to preexisting clients, rather than extracting data fees from a large class of fast participants.
At the level of trading mechanics, most ATSs, and all exchanges, are electronic limit order books. A 'limit order book' is a market structure in which quotes are posted by market participants and these quotes constitute the prices at which other traders can transact. It is called a 'limit order book' because it is limit orders (i.e., directives to buy or sell at a stipulated price) that have not yet executed that constitute the queue or 'book' of orders standing on an exchange against which incoming orders can transact. The other main type of order is a market order—an unconditional directive to buy or sell at whatever is the best available price. All of this is a reminder that it is not the fundamental mechanics of trade that formally distinguishes ATSs and exchanges. Rather, it is the regulatory classification the venue enjoys as an SRO exchange, or as an ATS operated by a broker-dealer.

The majority of transactions still occur on exchanges. There are currently 13 exchanges operating, although 12 of them are owned by three parent companies. Two more exchanges have been approved and may begin operation in 2020. In aggregate, two-thirds of trading volume occurs on the exchanges. The remaining volume occurs off-exchange.

Current data suggests there are about 30 ATSs active in equities. There is some concentration in the ATS market. Of 30 ATSs, slightly over 75% of order flow occurs on the ten highest volume venues (as measured by total shares traded), and more than a third occurs on the three highest volume ATSs (UBS ATS, CROS Crossfinder, and SGMT Sigma X2).


41 New ATS Adopting Release, supra note 36, at 38770 ("ATSs, which meet the definition of an exchange but are not required to register as national securities exchanges, compete with, and operate with complexity akin to, national securities exchanges.").

42 In Section 3(a)(26), the Exchange Act defines a self-regulatory organization to include any national securities exchange. See 15 U.S.C. 78c(a)(26).

43 As noted above, ATSs satisfy the definition of an exchange under Section 3(a)(1)(a) of the Securities Exchange Act, but Reg. ATS provides an exemption from falling under it if a venue complies with its rules. See Rule 3a1–1, 17 C.F.R. § 242.3a1–1: Reg. ATS Adopting Release, supra note 8, at 70847 (the SEC 'gives securities markets a choice to register as exchanges, or to register as broker-dealers and comply with Regulation ATS'). See also SEC Proposed Amendments, 80 Fed. Reg. at 8110; FINRA Comment Letter on Securities Exchange Act Release No. 76474—Proposed Regulation of NMS Stock Alternative Trading Systems, 2 ('ATSs must register as broker-dealers with the [SEC] .... Currently, all ATSs are registered with FINRA.").


45 Cboe Global Markets, 'U.S. Equities Market Volume Summary', Cboe Glob. Mkts., <https://markets.cboe.com/us/eqities/market_share/> (five-day average as of Nov. 9, 2019). The five exchanges owned by NYSE account for 25%; the three exchanges owned by NASDAQ for 18%; the four exchanges owned by Cboe for 17%; and IEX for about 3%.

46 FINRA, OTC Transparency Data, ATS Data (Weekly Report for Sept. 9 30 2019). A larger number of entities have filed Form ATSs with the SEC. See New ATS Adopting Release, supra note 36, at 38770 ("As of March 31, 2018, there were 21 registered national securities exchanges and 87 ATSs with a Form ATS on file with the Commission. Of these, there were ... 41 ATSs that had noticed on Form ATS that they expect to trade NMS stocks").

47 FINRA, OTC Transparency Data, ATS Data (for the months of May and September combined for NMS Tier 1 and Tier 2 stocks). For non-ATS OTC trade, market concentration is higher. FINRA reports data for 41 entities. The largest two entities account for significant total share volume (Citadel Securities and Virtu Americas), <https://otctransparency.finra.org/otctransparency/OtcData>. In fact, Citadel and Virtu account for more than
B. Policy controversies involving ATSSs

9.19 A number of noteworthy criticisms have been made of dark pools, but for reasons of length I discuss two as illustrations. First, there is concern about the potentially detrimental effects of off-exchange trade on the quality of the entire equity market system, especially in terms of price discovery.\(^{48}\) The argument begins with the normative premise that it is a major objective of the equity market to have accurate stock prices meaning that the prices reflect the risk-adjusted expected value of a company's future cash flows based on available information.\(^{49}\) Because firms' economic prospects change frequently, the equity market benefits from and needs a constant flow of trading based on new information. Informed traders, who gather and trade on the basis of information giving them a more accurate view than the current market price, require profits to induce them to engage in costly information gathering and analysis.

9.20 The structural worry about dark pools turns on the potential reduction in price accuracy that could result if dark pools make informed trading more expensive. The argument runs through four basic moves.\(^{50}\) First, it claims, plausibly, that dark pools attract a disproportionately high percentage of uninformed order flow. Uninformed trading could flow to dark pools because they can (and at least sometimes do) discriminate among traders, and thus can attempt to exclude informed traders, and because large uninformed traders could be attracted by the prospect of keeping their quotations dark. Second, insofar as dark pools attract a higher percentage of uninformed orders than exist in the market as a whole, the percentage of informed orders remaining on stock exchanges must increase. Third, the predictable consequence of increasing informed order flow is that liquidity providers on exchanges lose more money as the higher percentage of informed trade results in greater losses to liquidity providers. This increase in adverse selection leads liquidity providers to rationally increase the cost of liquidity offered to traders on exchanges to recoup their greater losses. The argument concludes that informed trading on the exchanges will be less profitable due to the increased cost of liquidity, leading to a decrease in the amount of informed trading. Less informed trading makes for less accurate prices.

9.21 This argument—that off-exchange trade ultimately leads to inferior price discovery on exchanges—is plausible enough as a conceptual matter. Empirically, however, the existence or magnitude of this effect does not seem to have been rigorously demonstrated.

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\(^{49}\) See Fox, Glosten, and Rauterberg, supra note 10.

\(^{50}\) For a version of the argument, see Haeberle, supra note 53.
Further, while the percentage of transaction volume occurring off-exchange increased for a period, it has held constant for half a decade now. As a result, this criticism has lost some steam, but it remains a plausible concern.

Second, several distinct criticisms centre on potential agency problems at broker-dealers who operate ATSs. These agency problems could lead to customers receiving inferior executions at ATSs. One alleged practice is that large brokerages that operate ATSs route customers’ orders to their own dark pools even when inferior execution will result. A second criticism alleges that banks do this even when it contradicts customers’ express instructions for their orders. Both practices are clearly economically destructive and inappropriate. The SEC has brought some actions against dark pools along these lines, which suggests that improper conduct at least sometimes occurs. Recent empirical analysis provided by FINRA further suggests ATS broker-dealer conflicts may be widespread. As a result, recent SEC rulemaking that requires ATSs to disclose their conflicts of interest in greater depth is a helpful step in the direction of greater customer awareness and potential enforcement actions.

II. The ATS/exchange innovation calculus

Innovation is widely accepted as a major policy goal for equity market structure. Regulators promote its value when considering policy, market participants advocate for it, and as one important paper on equity market structure put it, ‘technological innovation has been a key component of the success of U.S. capital markets’. The NMS

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Amendments stressed technological innovation as a signal benefit of a multi-venue trading architecture.  

9.24 It is important to discuss ATSs and innovation because they face a different innovation calculus. My main argument is that ATSs have stronger incentives to innovate than stock exchanges. In Section A, I consider reasons that flow from regulation, broadly construed, and in Section B, reasons that relate to the different business models of ATSs and exchanges.

A. The Regulatory Costs of Innovation

9.25 Regulation is a significantly greater hurdle for exchanges than ATSs. It is worth beginning with a simple way in which innovation is easier for an ATS than an exchange—it involves significant cost to begin operations as an exchange, and once operating to change the exchange’s structure, while both of these costs are quite low for an ATS. The expected cost of obtaining exchange status and making any changes is both a barrier to entry as well as an ongoing tax on structural changes.

9.26 To begin operating as an ATS, its owner simply needs to file an initial confidential operation report with the SEC 20 days or more before trading begins. Until recently, that filing did not even require SEC review or approval, and filing the form satisfied the ATS’s obligation to provide the SEC with notice. Even after a rule change in 2019, the SEC only reviews ATS filings for their completeness under a new form, rather than providing substantive review of the propriety of an ATS’s operations.  

9.27 As an SRO, a prospective national security exchange must file Form 1 with the SEC, and the process is quite different. Form 1 requires extensive disclosure of how the exchange will operate—an applicant must provide the SEC with a ‘copy of all written ... rules, or trading practices of the applicant’ and the submission is followed

61 See, e.g., Regulation of Exchanges, 62 Fed. Reg. 30485–01 (‘Congress clearly intended the 1975 Amendments to encourage innovation by exchanges and recognized that future exchanges may adopt diverse structures’); id. (‘the Commission has regulated many alternative markets as broker-dealers, rather than as exchanges, in order to foster the development of innovative trading mechanisms within the existing statutory framework’).
63 New ATS Adopting Release, supra note 36, at 38773 n. 53. See also 17 CFR 242.301(b)(2)(vii); Form ATS. ATSs were not required to make publicly available the information on Form ATS until recently. In re Inv. Tech. Grp, Inc. Sec. Litig., 251 F.Supp. 3d 596, 602 n.1 (2017) (‘Form ATS is a confidential document filed with the SEC. An ATS could choose to publicly disclose it, but it need not and most ATSs did not. IEX periodically disclosed its Form ATS and updates to it. It was 34 pages long. See IEX Form ATS, <https://iextrading.com/docs/IEX+ Form+ ATS+ July+ 24.pdf>.
66 Form 1 Exhibit B. See, e.g., Investors’ Exchange LLC Form 1 Application Exhibits A-E, 45, 150–69 (2015), <https://www.sec.gov/rules/other/2015/investors-exchange-form-1-exhibits-a-e.pdf> (providing IEX’s rule book for Exhibit B, which included descriptions of the type of orders that could be submitted to the proposed exchange).
by a public notice and comment process. The requirement to disclose all rules and trading practices is itself quite significant as it provides competitors with a thorough window into an exchange's proposed operations. Indirect evidence suggests that the costs of the exchange registration process are consequential. When Intercontinental Exchange (‘ICE’), the owner of the NYSE exchanges, purchased the Chicago Stock Exchange (‘CHX’), CHX had trivial volume, such that commentators noted that ICE was principally purchasing an exchange license. This suggests a rough estimate of the cost of registration as an exchange at CHX’s purchase price of $70 million.

Depending on an exchange’s operations, the notice and comment process can also prove costly and long. For instance, when the ATS IEX applied to become a stock exchange in autumn 2015, its application was followed by months of dispute during which almost 500 comment letters were submitted to the SEC addressing the application. IEX felt compelled to respond with its own letters to the SEC 12 times. Yet, IEX’s proposed market structure was in most ways the same as its previous structure during its operation as an ATS. The time from applying to register as an exchange to eventual SEC approval took nine months. That delay was almost certainly due to both SEC consideration of the permissibility of its structure as an exchange as well as the intensive comment process addressing its innovations.

If approved as an exchange, subsequent disclosure requirements are exacting. Section 19(b) of the Exchange Act and Rule 19b-4 thereunder mandate that exchanges must file an application to the SEC for approval to amend any rule of the exchange, including

67 15 U.S.C. § 78s(a)(1) (2012) (‘The Commission shall, upon the filing of an application for registration as a national securities exchange... publish notice of such filing and afford interested persons an opportunity to submit written data, views, and arguments concerning such application.’).


69 See also Budish, Lee, and Shim, supra note 4, at 57 (‘the Chicago Stock Exchange (CHX) was purchased for a reported $70 million, when the main asset of CHX was thought to be its ‘medallion’, i.e., its stock exchange license.’).


73 15 U.S.C. § 78s(b)(1) (2012) (‘Each self-regulatory organization shall file with the Commission... copies of any proposed rule or any proposed change in, addition to, or deletion from the rules of such self-regulatory organization. The Commission shall publish notice thereof together with the terms of substance of the proposed rule change... and shall give interested persons an opportunity to submit written data, views, and arguments concerning such proposed rule change. No proposed rule change shall take effect unless approved by the Commission or otherwise permitted in accordance with the provisions of this subsection.’).

74 Registered exchanges must... file their proposed rule changes for approval with the Commission. These proposed rule changes publicly disclose, among other things, the trading services and fees for exchanges. Fed. Reg. 3598 (SEC Concept Release on Equity Market Structure); see also 17 C.F.R. § 240.19b-4 (2018). The exact level of granularity with which a trading service must be disclosed is not defined by any rule but practice suggests the SEC is demanding and the level of disclosure extremely broad.
disclosing in depth the nature of any new rule or structure. These filings are similarly followed by a public notice and comment period. In contrast, ATSs have traditionally operated under a far lighter system for adopting new mechanisms. Under Reg. ATS, an ATS files an amendment to its initial Form ATS report at least 20 days before making a material change to its operations. There is no automatic review process by SEC staff regarding the permissibility of any proposed changes. There is also no public notice and comment process on proposed changes. From a trading venue’s perspective, operating as an ATS offers a far nimble legal status than operating as an exchange.

9.30 As or more important than these differences of disclosure and procedure are certain substantive rules of Reg. NMS that apply to ATSs and exchanges differently. The results are consequential for the ability of these venues to innovate. Probably the most important regulatory difference, in terms of scope of experimentation, lies in the importance of protected quotes to exchanges. A centrepiece of Reg. NMS is that the best eligible quotations for each security (i.e., the highest eligible buy order and the lowest eligible sell order) become legally protected, meaning that transactions are not allowed to occur at prices inferior to those best quotations at any venue. A transaction at a price inferior to a protected quote is called a ‘trade through.’ Quotes are only eligible for protection if, inter alia, they are displayed in the public quotation stream, and if they are ‘automated quotations,’ which requires that the quotation be displayed by a trading centre that ‘immediately and automatically executes’ an incoming order against the quotation. For obvious reasons, protected quotation status is desirable. Many market participants want to trade immediately and unless a broker-dealer knows of liquidity with a better price available at a venue (but that is for some reason ineligible for protection), then the broker-dealer will direct an order to the venue offering the best quotation. Providing protected quotes is a central part of the modern stock market.

9.31 The issue with the definition of protected quotations is that it arguably deters various forms of experimentation with time. This was sharply illustrated when IEX, then operating as an ATS, applied to become a stock exchange. The most famous part of IEX’s market structure was its ‘speed bump’, which intentionally delayed orders arriving at the exchange by 350 microseconds before they were available to be processed by the exchange’s matching engine and delayed any outgoing data about changed quotes or

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76 Concept Release on Equity Market Structure, Exchange Act Release No. 61358, 75 Fed. Reg. 3594, 3599 (Jan. 21, 2010) (‘[A]n ATS is not required to file proposed rule changes with the Commission or otherwise publicly disclose its trading services and fees.’).

77 See 17 CFR 242.301(b)(2)(ii). Examples of a ‘material change’ include any change to the trading system or subscriber types. See Reg. ATS Adopting Release, supra note 8, at 70864.

78 See also 17 CFR 242.301(b)(2)(vii) (Form ATS is ‘deemed confidential’).

79 To be more precise, trading venues are required to establish policies and procedures reasonably designed to prevent the occurrence of trade throughs. See 17 C.F.R. 242.611.

80 17 C.F.R. 242.611.

81 See 17 C.F.R. 242.600(b)(61)-(62) (defining protected quotations), (b)(4) (defining an ‘automated quotation’).
transactions by 350 microseconds. The key legal question was whether IEX displayed quotations could qualify as protected quotes if access to them was intentionally delayed, rendering those quotations no longer ‘immediately and automatically’ executable. In the case of IEX, the SEC ultimately approved its application and stated that an intentional delay of less than one millisecond constituted a ‘de minimis’ delay that left quotations subject to the speed bump eligible to be protected quotations. Similarly, it is arguable that quotations that are matched during frequent batched auctions, rather than serially processed, are intentionally delayed. As a result, batched auctions might need to occur at one millisecond intervals or less to qualify under the de minimis exception. Because dark pools do not publicly display quotes, they have no protected quotes at all and need not worry about qualifying under the protected quote definition, unlike an exchange.

A second important difference is that ATSs have a far greater ability to discriminate among market participants. Reg. NMS requires that an exchange allow any registered broker-dealer to become a member, and requires that an exchange allow any trader to access their displayed quotations. As a result, an exchange must permit any and all market participants to freely transact on its platform. If a participant engages in provably improper conduct under law or SEC-approved exchange rules, the exchange can of course seek to sanction the trader. But outside of that extreme circumstance, the exchanges are barred from discriminating among traders or barring them access to the venue. An ATS, however, can discriminate among traders freely. In this way, ATSs fill in part of the historical role of stock exchange specialists, who possessed substantial discretion over executing and submitting customers’ orders, but who are no longer important to equity markets.

Their ability to discriminate among traders allows ATSs to innovate in a number of ways that are unlawful for exchanges. CitiBLOC is an ATS that seeks to facilitate trade

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82 In the Matter of the Application of Investors’ Exchange LLC for Registration as a National Securities Exchange, SEC Release No. 34–78101 (June 17, 2016). For an explanation of why the speed bump was created and an evaluation of its effects, see Fox, Glosten, and Rauterberg, supra note 87, at Ch. 4.
85 See 17 C.F.R. § 242.610(a) (2005) (prohibiting ‘unfairly discriminatory terms that prevent or inhibit any person from obtaining efficient access through a member of the national securities exchange or national securities association to the quotations . . . displayed’); see Regulation of NMS Stock Alternative Trading Systems, Exchange Act Release No. 34–76474, 81057 (Dec. 28, 2015) (ATSSs are not required to provide fair access unless they reach a 5% trading volume threshold in a stock, which almost all . . . ATSSs currently do not’); see Haeberle, supra 9, at 823–27.
in large volumes of stock. More striking is that the ATS Coda allows its subscribers to simply blacklist any number of counterparties, whether by name or by reference to the party’s history of executions. The result of blacklisting is that the subscriber will not trade with that participant on the venue. Controlling the counterparties with whom you trade can be enormously attractive. The stock market is driven in part by certain market participants’ informational edge over the market as a whole because they have developed a more accurate view of an asset’s value than what is currently reflected in its trading price. Market participants would prefer not to trade with the better informed for the simple reason that the informed will generally only trade when it is to their counterparties’ detriment (i.e., when someone is willing to buy for too much or sell for too little). ATSs actively market their right to exclude specific market participants from trading on the platform for reasons unrelated to improper conduct by the trader. All of these forms of discrimination—whether of a venue prioritizing certain traders or enabling participants to restrict trade against certain counterparties—would almost certainly be rejected by the SEC if done by an exchange.

9.34 Regulation affects trading venues’ incentives in a last, somewhat indirect way. Innovating in market structure is costly both because innovation can require extensive market research or technological breakthroughs, but also because it can require a costly process of obtaining SEC approval where the legal permissibility of the innovation is unclear. In fact, it has been argued that the main cost an exchange would face in adopting frequent batched auctions would be the cost of obtaining SEC approval for the structure. The problem is that once the SEC’s approval of a market structure is won, at some significant cost, other participants can free-ride on that approval without incurring the legal cost by adopting the same structure themselves.

9.35 One of the central levers of government policy for promoting innovation is the set of intellectual property rights it provides. Those rights are justified, in part, because they provide the creators of useful products with the opportunity to appropriate revenue from those products even when the product is easily copied or reproduced.

88 CitiBLOC, Form ATS-N. Other interesting features of CitiBLOC are that it permits conditional orders that, given another party’s interests, can then be ‘firmed up’ as a firm order upon invitation, and that ‘[a]ll executions . . . are at the midpoint of the NBBO at the time of execution.’ Id. Item 11.
89 The technical definition incorporates the subscriber’s prevailing months’ normalized firm-up rate and median share size of firmed-up orders. Id.
90 Coda, Form ATS-N, item 14.
91 See Lawrence E. Harris, Trading and Exchanges (2002), 243 (explaining pervasive role of informed trading).
92 See, e.g., Coda, Form ATS-N, Item 14.
93 The reason is that exchanges are barred from imposing ‘unfairly discriminatory terms’ under Rule 610. See supra note 91.
94 Budish, Lee and Shim, supra note 4, at 50.
95 Id.
Innovations in market structure occupy an ambiguous relationship with the main forms of intellectual property protection. The most obvious form of relevant intellectual property is patent protection, and a wealth of market structure innovations are patented. Nonetheless, a number of innovations that are useful to market participants are not patentable or can easily be imitated by similar mechanisms not protected by the creator's patent. For instance, a market could not patent batched auctions because the idea is in the public domain, although they could presumably patent a specific technology for conducting those auctions. As a result, it is valuable for a venue to be able to keep its market structure designs in confidence. Importantly, having a confidential market design or technology may allow the proprietor to protect it as a trade secret.

Treating a market design or technology as a trade secret is effectively impossible for an exchange, however, because exchanges need to publicly disclose their designs and technologies at a sufficient level of depth that other participants can easily copy them. Market participants, and the operators of ATSs in particular, seem keenly aware of this. When the SEC recently heightened disclosure requirements for ATSs, a significant amount of criticism in comment letters on the proposed rule emphasized its effects on innovation. The SEC itself acknowledged that the disclosure of ATS innovations could result in those ATSs losing competitive advantages and thus incentives for future innovations. As it explained, because "[f]or example, to the extent that an [ATS's] competitive advantage in the market is driven by its matching methodology, the disclosure of this information could result in other NMS Stock ATSs implementing similar methodologies, which 'could potentially reduce the incentives for ATSs to innovate.' The recent ATS rule change reduces the gulf between how easily ATSs and exchanges can maintain an innovation as a trade secret. It does not eliminate it, however, because disclosure requirements on exchanges remain significantly more comprehensive and detailed.
B. Business models and innovation

9.37 A prominent part of the argument that exchanges will fail to innovate in desirable ways has been that exchanges not only face costs in creating innovations and obtaining SEC approval of them, but that exchanges have strong incentives not to innovate in certain ways because they obtain supra-competitive profits under the current market structure. Specifically, exchanges obtain substantial rents from the sale of ‘speed technologies’ to market participants that enable purchasing firms to more rapidly cancel and post orders. The two most prominent forms of speed technology are co-location, which enables a firm to locate its servers in the same physical location as the trading venue's servers, thus getting its trading instructions to the exchange interface faster, and proprietary data feeds, which provide the recipient with market data directly from the venue at high speed. The best available evidence suggests that exchanges gain the majority of their revenue from the sale of co-location services and market data.

9.38 Thus, an important question in assessing ATSs' incentives to innovate is whether they also gain substantial revenue from the sale of speed technologies, leading them to preserve certain aspects of the status quo market design. Until recently, it was difficult to determine these facts about ATSs, but as of early 2019, newly mandated ATS disclosures, called Form ATS-N, reveal far more. So far, 34 ATSs have filed Form ATS-N. More broadly, ATS business models should also have a story to tell about the incentives they provide for innovating in market structure. I reviewed all Form ATS-Ns for information relevant to co-location and proprietary data feeds.

9.39 The picture that emerges is of a class of trading venues that are not dependent on the sale of speed technologies. Few ATSs produce their own market data feeds. I observed none that charged for the receipts of those feeds. As for co-location, a

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104 Budish, Lee and Shim, supra note 4, at 3 (‘exchanges can both capture and maintain substantial rents from the sale of speed technology’).
105 Id. at 36.
106 Id. at 36–38.
107 The Form ATS-N filings reveal other ATS practices of broad interest. As one example, most ATSs do not rely exclusively on the public quote and transaction data stream, called the Securities Information Processor (or ‘SIP’). For example, the Crossfinder ATS receives direct data feeds from all 13 exchanges and uses an internal system to construct its own NBBO. Crossfinder, Form ATS-N; see also Instinet BlockCross, Form ATS-N (relying on the SIP data feeds). This constructed NBBO can be used for a variety of purposes, including to determine eligible execution prices for purposes of complying with Reg. NMS as well as the limit price of pegged orders. See, e.g., IBKR Form ATS-N.
108 Form ATS-N Filings and Information, <sec.gov/divisions/marketreg/form-ats-n-filings.htm>. Six additional ATSs filed the form but have ceased operations.
109 For examples of ATSs that produce market data feeds, see IntelligentCross Form, ATS-N, and Pro ATS, Form ATS-N. It might reasonably be suggested that ATS quotation data is less valuable precisely because many ATSs cater to uninformed traders interested in transacting in large size. However, research suggests that market participants who purchase proprietary data feeds also do so to engage in various latency arbitrage practices involving uninvolved traders. See, e.g., Matteo Aquilina, Eric B. Budish, and Peter O’Neill, ‘Quantifying the High-Frequency Trading “Arms Race”: A Simple New Methodology and Estimates’, Financial Conduct Authority Occasional papers Jan. 27, 2020.
110 For example, the ATS IntelligentCross does not directly offer co-location, although trading firms can pay the server company it uses to co-locate by the ATS's servers. IntelligentCross also offers its proprietary IQX Data Feed,
large number of ATSs note that co-location is available, but it is available through the data server facility at which the ATS is housed, rather than the ATS itself. No ATS mentions charging for its co-location services. ATSs thus not only face lower costs in obtaining approval of innovations and maintaining their secrecy, but also enjoy fewer benefits from aspects of the market structure status quo that dilute their incentives to innovate.

The actual operations of ATSs illustrates this difference. Strikingly, at least two ATSs already offer a market structure with frequent batched auctions. OneChronos offers a batched auction: ‘Rather than matching orders continuously as they arrive at the matching engine (as in a continuous limit order book) the ATS periodically holds auctions designed to seek an optimal matching between buyers and sellers across all eligible orders.’ IntelligentCross offers traders two trading structures, both sophisticated batched auctions, where orders execute in discrete, periodic auctions. IntelligentCross’ matching algorithm takes in orders for a stock and then executes them en masse during discrete auctions or ‘matching events’, whose timing is randomized by an artificial intelligence model within defined intervals, determined on an individual security basis, that last between 200 milliseconds and 900 microseconds. The algorithm is designed to minimize both price response to trading and intervals between trades.

Beyond batched auctions, ATSs have introduced multiple other innovations, including different ranking systems for executing orders beyond exchanges’ price, display, and time priority rules; order-initiated auctions; and innovative order types, including ones that allow execution instructions across multiple securities, such as aggregate limits on transactions across many securities.

which disseminates orders. Both subscribers and non-subscribers to the ATS can receive the feed. The ATS does not charge a price for it, although the network provider that facilitates it charges a telecommunications fee of $500 per month. IntelligentCross, Form ATS-N, Items 5(a), 6(a).

111 OneChronos, Form ATS-N, 11(a).
112 IntelligentCross, Form ATS-N 11(a). IntelligentCross calls this its Discrete Bid/Offer Matching Process or Adverse Selection Protection Engine. To think about the multiple structures, it is helpful to realize that the venue maintains two discrete order books that do not interact.
113 Id. at 11(c).
114 Id. (‘When the market response is significant the matching engine needs to widen the intervals between matches to reduce [price impact]; when the response is minimal it needs to shrink the intervals to maximize liquidity.’).
115 On the ATS Coda, the arrival of a marketable, liquidity-seeking order initiates the venue’s ‘micro’ and ‘block’ auctions. Coda sends out an alert requesting trades with only the symbol of the company (not the side or quantity of the initiating order). The initiating order is paused for a duration of 20 milliseconds, or as specified by the liquidity seeker, down to 3 milliseconds. See Coda, Form ATS-N, Item 11(c).
116 Id. at 11(c). Behind the facts about revenue and the structure offered by a market is the deep question of why exactly dark pools and exchanges seem to have such different business models. Choice of trading venue status is after all endogenous. The question is difficult in part because the dark pools and exchanges we observe differ along so many dimensions. As noted earlier, many dark pools offer ‘niche’ market products or cater to a broker-dealer’s preexisting customers.
III. The ambiguous welfare effects of ATS innovation

9.42 Lastly, I consider the effects of ATS innovation on equity market structure as a whole, before surveying other policy implications.

A. Will ATSs 'fix' the market?

9.43 If there is a failure of innovation in the stock market will innovation by ATSs fix it? To help make sense of this question, it is useful to draw on the model recently developed by the most vocal advocates of the frequent batched auction market design, Eric Budish, John Shim, and their co-authors. Their model suggests that if an exchange offered a frequent batched auction structure, then it would attract all order flow because it would remove traders' losses due to latency arbitrage, which currently acts as a tax on transactions.\textsuperscript{117} In Budish, Lee, and Shim's model of the stock exchange industry, market participants frictionlessly search and access quotations across exchanges enabling traders to 'costlessly "stitch together" the order books across the various exchanges', with the result that investor demand is 'perfectly responsive to price differences across exchanges' and trading fees are competed down to zero.\textsuperscript{118} At least two ATSs actually do offer very frequent batched auctions. If market participants can migrate costlessly across all trading venues, including from exchanges to ATSs, then it may not matter much that exchanges' private incentives to innovate are weak compared to social interests in innovation. Market participants who want to trade under a frequent batched auction mechanism can just transact on IntelligentCross. Yet, those two ATSs attract only limited volume. Why? Is the economic model misleading or are ATSs fundamentally different from exchanges, such that even if an ATS offered an improved market structure it might only attract limited order flow?

9.44 In my view, it seems likely that there are powerful limits on transaction volume at dark pools for reasons driven both by market structure and law. A synthetic or virtual single order book is a reasonable approximation of how the 13 exchanges interact, but it cannot be plausibly extended to dark pools. There are two main reasons why. First, it is qualitatively harder to ascertain and transact against non-displayed liquidity than the displayed quotations at exchanges. A market participant seeking speed and certitude of execution is offered an attractive product by the lit quotes of exchanges. Non-displayed liquidity with an equivalent or superior price may be available at a dark pool, but it also might not be, and by the time an order has arrived, failed to execute, and moved on to an exchange, the market may have moved against a trader. Their exclusive use of non-displayed quotations is the main reason for why dark pool liquidity likely has 'natural'

\textsuperscript{117} Budish, Lee, and Shim, supra note 4, at 48.

\textsuperscript{118} Id. at 19–26; see also Lawrence R. Glosten, 'Is the Electronic Limit Order Book Inevitable?', J. Fin. 49 (1994), 1127 (modelling the operation of a synthetic central limit order book).
volume limits compared to a lit venue. Second, dark pools have no protected quotes and thus broker-dealers are likely to seldom, if ever, feel required by their duty of best execution to customers to direct orders there. As a result, it seems unlikely that the amount of volume that would flow to an exchange offering an innovation will flow to an ATS offering the same product because of the difficulty of accessing dark quotes and the lack of a strict requirement to access dark liquidity.\(^{119}\) To sum up, the lack of displayed and protected quotes means that it is not frictionless to search and access dark pool liquidity.

What if an ECN offered the same innovative market structure as a dark pool? ECNs only suffer from the second and lesser of the issues described above. They display their quotes, although their quotes need not receive protection under Rule 611, even if they are equal to the best quotes available.\(^{120}\) Further, historically, ECNs have attracted very significant order flow. The open question then is why a dark pool with an innovative and superior market structure would not transition to functioning as an ECN or even an exchange. Suggestively, the operator of IntelligentCross expressed interest in late 2019 in the ATS either becoming an exchange itself or partnering with one to broaden its appeal.\(^{121}\)

Lastly, if an ATS offers proof of concept for a useful innovation will exchanges adopt it? Here, too, the answer is a close judgment. One reason they may not, as Budish, Lee, and Shim point out, is that major costs of offering an innovation at an exchange seem to be obtaining approval from the SEC and marketing the innovation to market participants. They quote the then-Chief Economist of Nasdaq addressing its potential adoption of batched auctions, and noting that '\([t]\)he big issue . . . when I talked about cost . . . would be getting [the SEC] to approve it, which would take a lot of time and effort, and if we got it approved, it would immediately be copied by everybody else.'\(^{122}\)

The U.S. experience with speed bumps fits in with this narrative. IEX operated with a speed bump for several years as an ATS without uptake by any exchange. Eventually, it began operating as an exchange with its speed bump partly intact. Once IEX obtained approval, however (including for its speed bump), several other exchanges rapidly sought SEC approval for their own variant on a speed bump.\(^{123}\) Those speed bumps

\(^{119}\) As a function of having only non-displayed liquidity and no protected quotes, it seems difficult to imagine a dark pool accruing a large portion of market share.

\(^{120}\) The technical reason for this is the fact that the display facility for ECNs only allows a quote from a single ECN to constitute the protected quote from any ECN.

\(^{121}\) John McCrank, 'AI-Driven Stock-Trading Venue Eyes U.S. Exchange Status, Adds New Pricing,' Reuters (Oct. 2, 2019), <reuters.com/article/us-usa-markets-al-al-driven-stock-trading-venue-eyes-us-exchange-status-adds-new-pricing-idUSKBN1WH21T>. The company’s CEO said, ‘We’re offering products that none of the exchanges are currently offering . . . We demonstrated that we’re creating value, we’re growing, and now we’re graduating to offer this product to the broader market.’ Id.

\(^{122}\) Budish, Lee, and Shim, supra note 4, at 47.

sometimes differed in their ambition, but they adopted the basic market structure idea.  

B. Implications

9.48 Appreciating ATSs' innovation dynamics has several implications for theory and policy. In terms of policy, the innovative character of many ATSs provides a reason in favour of having a tiered classification system in which some trading venues enjoy a lighter regulatory touch. There are obviously many different dimensions on which to assess market structure and its governing rules of which innovation is but one. Nonetheless, it is worth highlighting this benefit of ATS and exchanges' different regulatory treatment because it is a historical artifact. The category of ATSs evolved out of the necessity of regulating new trading venues that eschewed registration as exchanges, and the different treatment of SROs and ATSs has been criticized by many as lacking a clear justification. However, if exchanges are going to retain their current governing regime, a simpler system that eases innovation may be optimal for ATSs.

9.49 It is also worth noting because recent regulation imposes greater disclosure obligations on ATSs. In late 2018, the SEC adopted important changes to the regulatory regime for ATSs by promulgating new Rule 304 under Regulation ATS. Rule 304 significantly increases the disclosure requirements for ATSs. Under it, ATSs must file a new Form ATS-N, rather than the old Form ATS. Form ATS-N requires far more public disclosure of an ATS's operations, and particularly about its potential conflicts of interest. Given that those conflicts have been a major source of controversy for ATSs, this is a notable improvement. Nonetheless, further enhanced disclosure could have a serious


128 The rule only applies to ATSs that facilitate trade of NMS stocks. Because those are the relevant ATSs for the purpose of this chapter, I will simply refer to ATSs above. 17 C.F.R. § 242.300(k) (2018) ("[A]n alternative trading system ... that trades NMS stocks"); 17 C.F.R. § 242.600(b)(47) (2018) ("any NMS security other than an option").

129 The form is reviewed by the SEC and becomes effective either through a lapse of the review period or upon publication of the form by the SEC. The SEC review is limited to the completeness and comprehensibility of the Form ATS-N disclosures and (will not) include a review of the merits of the disclosures or whether such trading functionalities meet industry norms. Regulation of NMS Stock Alternative Trading Systems, Exchange Act Release No. 83663 (July 18, 2018), 83 Fed. Reg. 38,768 (Aug. 7, 2018) ("New ATS Adopting Release"). Upon review, the SEC can declare a Form ATS-N filing ineffective after notice and opportunity for a hearing. An effective Form ATS-N will be posted on the SEC's public EDGAR website. If an ATS does not comply with the rule then it loses its exemption from being required to register as a national security exchange. 17 C.F.R. § 240.3a1-1(2) (2018).
downside if it increased the burdens on innovation for ATSSs either by making it substantially more costly to obtain regulatory approval as an ATS, regulatory approval for an innovation, or by reducing ATSSs' ability to appropriate the benefits of an innovation because disclosure of its details made immediate imitation by other venues possible. Commenters and even the SEC itself recognized these concerns with the effects of increased disclosure on ATS innovation. Since the form only requires review for completeness and not for the merits of an ATS's structure, it probably does not increase costs substantially yet. Nor does the level of disclosure in the forms seem comparable to the disclosure demanded of exchanges.

In terms of theory, I suggest that economic models should push further than the state-of-play to endogenize trading venues' choice of legal status. In particular, excluding ATSSs from analysis leads to an incomplete picture of stock market innovation. It fails to ask difficult and important questions about why, historically, some ATSSs have become exchanges (for instance, many ECNs), while others have not (most dark pools), and why ATSSs generate innovations that fail to resolve market structure pathologies. Lastly, thinking about the patterns of innovation across trading venues highlights the current limits of our empirical understanding of why order flow is directed to certain venues. In particular, it would be valuable to understand which venues attract which trader types beyond impressions that internalization involves largely uninformed order flow. For instance, does IntelligentCross's customer base represent a broad cross-section of market participants or are specific traders especially interested in its auction structure?

IV. Conclusion

Alternative trading systems are an important phenomenon in their own right, but focusing in on them also raises questions about the broader dynamics at play in stock market structure. The market for displayed liquidity exhibits a remarkable degree of integration across venues, driven by some combination of technology and regulation. The world of non-displayed liquidity at ATSSs, on the other hand, arguably remains integrated into the market to a lesser degree. On the other hand, it exhibits a remarkable

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130 See, e.g., Jonathan A. Clark, Chief Executive Officer, Luminex, Regulation of NMS Stock Alternative Trading Systems, at 1–2 ('the rule proposal here would have the . . . [effect of] dissuading some existing ATSSs from continuing due to the exponential increase in regulatory burden and likely discouraging other innovators interested in launching new ATSSs from even coming to market due to the time and expense of doing so under the new regime.'); John A. McCarthy, General Counsel, KCG Holdings Inc., Letter to SEC, at 5 (aspects of the proposed rules 'may stifle ATS innovation as ATSSs may be reluctant to iterate, employ new technologies, and make other changes that would be subject to an approval/disapproval review process by SEC staff'). See also ¶ 82,124 Regulation of NMS Stock Alternative Trading Systems. Exchange Act Release No. 83663 (July 18, 2018), Fed. Sec. L. Rep. P 82,124 (noting 'that there would be costs that accrue to NMS Stock ATSSs as a result of the adopted amendments. For NMS Stock ATSSs, disclosure of previously non-public information could have some impact . . . . If this previously non-public information is valuable to certain NMS Stock ATSSs—to the extent that it drives its revenues—disclosure of this information on Form ATS-N could be costly for these NMS Stock ATSSs'); id. ('[I]f publicly disclosing an NMS Stock ATS's new technological innovations results in the ATS earning less revenue from new innovations it develops, relative to the baseline, the ATS might lose its incentives to innovate').
degree of innovation in market design. Given the current state of our empirical and theoretical grasp of the market, the welfare consequences are ambiguous.

Appendix: swap execution facilities

9.52 A kind of analogue to ATSs under the jurisdiction of the Commodity Futures Trading Commission ('CFTC'), rather than the SEC, is the swap execution facility ('SEF'). SEFs are a regulatory category established by the Dodd-Frank Wall Street Reform and Consumer Protection Act's ('Dodd-Frank') amendments to the Commodity Exchange Act. 131 SEFs are trading facilities for swaps that are designed to regularize swap trading and increase pre-trade price transparency. Core legal principles for SEFs suggest a status short of a stock exchange, but with robust legal oversight obligations, that render the ATS analogy apt. For instance, principles established by Dodd-Frank require that SEFs only permit trading in swaps not prone to manipulation; establish and enforce rules for trading procedures and processing swaps; and position limits to avoid manipulation.132