Boston College Law Review

Volume 59 | Issue 1 Article 4

1-25-2018

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Abstract: Contract law and the formal models of contract economics assume that agreements are fully customized. On the other hand, recent legal research highlights the role standardized terms play in contract design. Those lines of research overlook an important class of contracts between those extremes. Many contracts, such as the merger agreements studied here, are complex combinations of customized and standardized terms, and thereby achieve economies of both scale and scope. Such contracts are "mass customized," to borrow a term from engineering research. This Article introduces a theoretical framework for understanding how mass customization of such complex agreements is achieved. It adds to recent scholarship that applies modularity theory to the design of complex agreements by introducing an alternative approach—flexible specialization. It then introduces empirical methods for studying the structure of complex agreements. Using hand-collected data from samples of public company merger agreements and of the teams of deal lawyers that designed them, this Article presents the results of a preliminary empirical study that finds that the architecture of mass customized contracts reflects the logic of flexible specialization rather than modular design. The picture of contract design that emerges is of agreements built upon a flexible architecture provided by a dynamic cluster of experts, more similar to the industrial districts of Emilia-Romagna in Italy than Ford Motor Company's fabled Highland Park assembly line. Those preliminary results suggest important implications for doctrine, policy, and research. In regard to doctrine, this Article

* Associate Professor of Law, BYU Law School. Many thanks to Afra Afsharipour, Rob Andersen, Curt Anderson, Clark Asay, Stephanie Plamondon Bair, Patrick Bolton, Brian Broughman, Albert Choi, Jorge Contreras, Kevin Davis, Vic Fleischer, Merritt Fox, Bernhard Ganglmair, George Georgiev, Jeff Gordon, Gillian Hadfield, Christine Hurt, Cathy Hwang, Avery Katz, Kate Judge, Jeff Manns, Florencia Marotta-Wurgler, Jeremy McClane, Sean O'Connor, Elizabeth Pollman, Bob Scott, Gordon Smith, Henry Smith, Paul Stancil, Eric Talley, Tim Wu, and participants at presentations at the 2017 Annual Meeting of the Society for Institutional & Organizational Economics, the 2017 Annual Meeting of the American Law & Economics Association, Columbia Law School's Center for Contract and Economic Organization, the Law & Entrepreneurship Association's 2016 Annual Meeting, the AALS Transactional Law Section's 2016 panel, and the 2015 Rocky Mountain Junior Scholars Forum for helpful thoughts and comments. Brandon Andersen, Jillaine Chaston, Marcus Gamboa, Nic Jeter, Ailsa Lilywhite, Jon McPherson, Mariah Moody, Paul Roberts, and Melanie Williams provided excellent research assistance. All errors are the author's. This research was generously supported by a BYU Law internal research grant.

adds a missing dimension to recent attempts to articulate a non-unitary theory of U.S. contract law. With respect to policy, evidence that flexible specialization underpins the infrastructure of the mergers and acquisitions (M&A) market challenges deterministic accounts of the legal industry's transformation, and illuminates the overlooked trade-offs presented by recent arguments to further standardize complex contracting. Finally, in regard to research, this Article provides a basis for much needed theoretical and empirical work on the interaction effects between governance mechanisms within an agreement.

INTRODUCTION

This Article develops a novel theoretical framework and introduces new methods for studying the design of complex contracts. In so doing, it breaks new ground for positive contract scholarship. Complexity has always played an important role in contract research. Contract economics has long recognized that complex decision landscapes, in which contracting parties struggle to appreciate all of the implications of their choices, contribute to contractual incompleteness.[1] Relatively little attention, however, has been paid to complexity within contracts themselves—or *infra-transactional* complexity—and how it affects agreement design and enforcement decisions. Legal researchers and social scientists have attempted to address infra-transactional complexity on occasion, but the efforts have been neither entirely satisfactory nor sustained.[2] This Article is a step toward filling that gap in the scholarship.

Evidence suggests that infra-transactional complexity has been increasing dramatically in recent years. Consider, for example, a simple comparison of early twentieth century and early twenty-first century merger agreements. A template agreement for the merger of two publicly held railroad companies taken from a 1930 treatise numbers only three-and-a-half pages and focuses primarily upon delineating the consideration exchanged, transferring liabilities, and executing corporate formalities, such as bylaw

[1] *See* PATRICK BOLTON & MATHIAS DEWATRIPONT, CONTRACT THEORY 572–74 (2005); *see also infra* notes 67–92 and accompanying text.

[2] *See generally, e.g.*, Karen Eggleston et al., *The Design and Interpretation of Contracts: Why Complexity Matters*, 95 NW. U. L. REV. 91 (2000) (providing a multidimensional definition of contractual complexity, and discussing how contractual complexity should shape enforcement decisions); John Hagedoorn & Geerte Hesen, *Contractual Complexity and the Cognitive Load of R&D Alliance Contracts*, 6 J. EMPIRICAL LEGAL STUD. 818 (2009) (analyzing a sample of R&D alliances with a measure of contractual complexity that focuses upon the "cognitive load" the agreement demands during interpretation); David T. Robinson & Toby E. Stuart, *Financial Contracting in Biotech Strategic Alliances*, 50 J.L. ECON. 559 (2007) (measuring contractual complexity as the byte length of the electronic files summarizing each R&D agreement in their sample).

amendments and shareholder voting.[3] By the twenty-first century, the typical public company merger agreement would be approximately twenty times longer, setting forth a lengthy list of representations and warranties, allocating an array of pre-closing risks, and carefully determining when the agreement may be terminated.[4] Systematic research confirms that anecdote: for instance, a recent analysis of a large sample of merger agreements found that they have grown dramatically more complex over the last two decades.[5]

Infra-transactional complexity matters because it challenges our models of how market participants privately order their exchanges, which in turn has implications for court intervention in contract disputes. The challenge arises from a puzzle that infra-transactional complexity raises. On one hand, increasing the complexity of a contractual system gives transaction designers more options for addressing exchange hazards, allowing them to tinker with different combinations of governance mechanisms from deal to deal. On the other hand, an increase in infra-transactional complexity raises the prospect that change to one term will require adjustments to related terms, raising transaction costs.[6] The costs of complexity also extend to back end enforcement, where courts are often called upon to interpret a provision embedded within a complicated latticework of obligations.[7]

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[3] 1 LEONARD A. JONES, ANNOTATED LEGAL FORMS: CONTRACTUAL BUSINESS AND CONVEYANCING FORMS, COMPLETE FORMS FOR ORDINARY USES AND SUGGESTIVE CLAUSES FOR UNUSUAL REQUIREMENTS 833–36 (Dale F. Stansbury ed., 8th ed. 1930).

[4] *See* John C. Coates IV, *Why Have M&A Contracts Grown? Evidence from Twenty Years of Deals* 14 (Eur. Corp. Governance Inst., Working Paper No. 333, 2016) (noting that the average length of the 564 M&A agreements sampled is eighty-eight pages) [hereinafter Coates, *Why Have M&A Contracts Grown?*]; *see also* AM. BAR ASS'N, MODEL MERGER AGREEMENT FOR THE ACQUISITION OF A PUBLIC COMPANY (2011) (providing an example of a typical contemporary merger agreement).

[5] Coates, *Why Have M&A Contracts Grown?*, *supra* note 4, at 14–15.

[6] *See* Stephen J. Choi et al., *Evolution or Intelligent Design? The Variation in* Pari Passu *Clauses* 25 (N.Y. Univ. Law & Econ., Research Paper No. 16-30, 2016) (referring to the possibility of "'network' related inertia" between terms in an agreement) [hereinafter Choi et al., *Intelligent Design*]. Choi and his associates raise this as a possibility in their recent work on the evolution of *pari passu* clauses in sovereign debt instruments. *Id.* The costs of delay that such complexity introduces can be significant because, as the old adage goes, "time is the enemy of the deal." *See* Mark Suster, *Time Is the Enemy of All Deals*, BOTH SIDES OF THE TABLE (Feb. 25, 2010), https://bothsidesofthetable.com/time-is-the-enemy-of-all-deals-205c6add3d25#.rwjqz56vy [https://perma.cc/E6K2-QRHD].

[7] *See* Verified Consolidated Shareholder Class Action Complaint ¶¶ 83–99, *In re* NYSE Euronext S'holders Litig., C.A. No. 8136-CS (Del. Ch. Feb. 1, 2013). Recent shareholder litigation challenging NYSE Euronext's 2012 merger with Intercontinental Exchange provides an example. *E.g.*, *id.* There, the Delaware Court of Chancery denied a request to invalidate certain lock-up provisions in a merger agreement on the grounds that, although the lock-up provisions were "unsavory," they were connected to a number of related terms advantageous to shareholder interests, and the court was therefore reluctant to "pull a thread in a merger agreement and still bind the

How then do transaction designers manage the costs of changing elements of an agreement without being overwhelmed by the complexity of the contractual system? Current theory suggests that parties may resort to standardizing terms as the costs of complexity increase.[8] If the costs of infra-transactional complexity are so high, then all the better to standardize the contract and thereby rationalize the web of interconnections between provisions once and for all. Such an approach allows, for example, a law firm junior associate to design a sovereign bond indenture in three and a half minutes.[9] Indeed, use of boilerplate contract terms may be exactly what explains how deal lawyers cope with the mergers and acquisitions (M&A) market's highly compressed timelines—examples ranging from Pritzker's infamous negotiation of the Trans Union deal in approximately one week[10] to Facebook's more recent one-billion-dollar acquisition of Instagram over a long weekend.[11]

Curiously, however, the M&A market displays limited standardization despite high levels of infra-transactional complexity.[12] Instead of significantly standardizing agreements as in the market for sovereign debt, M&A

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buyer." Rulings of the Court from Oral Argument on Plaintiffs' Motion for a Preliminary Injunction at 17, *In re* NYSE Euronext S'holders Litig., C.A. No. 8136-CS (Del. Ch. May 10, 2013). Such issues are not uncommon, and a significant portion of the Delaware Court of Chancery's well-deserved reputation is earned in its analyses of intertwining contractual provisions—one need look no further than the court's classic material adverse change cases, such as its careful parsing of related contract terms in the classic *Hexion Specialty Chemicals, Inc. v. Huntsman Corp.* and *In re IBP, Inc. Shareholders Litigation* decisions, as examples. *See generally* Hexion Specialty Chems., Inc. v. Huntsman Corp., 965 A.2d 715 (Del. Ch. 2008) (interpreting material adverse effect provision in merger agreement); *In re* IBP, Inc. S'holders Litig., 789 A.2d 14 (Del. Ch. 2001) (interpreting material adverse effect provision in merger agreement).

[8] *See infra* notes 83–84 and accompanying text.

[9] MITU GULATI & ROBERT E. SCOTT, THE THREE AND A HALF MINUTE TRANSACTION: BOILERPLATE AND THE LIMITS OF CONTRACT DESIGN 6, 9, 89 (2013); *see* Claire A. Hill, *Why Contracts Are Written in "Legalese,"* 77 CHI.-KENT L. REV. 59, 60–69 (2003) (describing use of forms and the process of contact drafting).

[10] *See* Smith v. Van Gorkom, 488 A.2d 858 (Del. 1985). The behavior of Trans Union's board of directors in its negotiations with Pritzker led to the landmark Delaware case of *Smith v. Van Gorkom*. *Id.*

[11] Shayndi Raice & Spencer E. Ante, *Insta-Rich: $1 Billion for Instagram*, WALL ST. J., Apr. 10, 2012, at B5–B6; Evelyn M. Rusli, *Facebook Buys Instagram for $1 Billion*, N.Y. TIMES (Apr. 9, 2012, 1:15 PM), https://dealbook.nytimes.com/2012/04/09/facebook-buys-instagram-for-1-billon/ [https://web.archive.org/web/20171125073632/https://dealbook.nytimes.com/2012/04/09/facebook-buys-instagram-for-1-billion/]; Kara Swisher, *The Money Shot*, VANITY FAIR (May 6, 2013, 12:00 AM), http://www.vanityfair.com/news/business/2013/06/kara-swisher-instagram [perma.cc/VHS3-EY6X].

[12] Robert Anderson & Jeffrey Manns, *The Inefficient Evolution of Merger Agreements*, 85 GEO. WASH. L. REV. 57, 60–61 (2017); John Coates, *M&A Contracts: Purposes, Types, Regulation, and Patterns of Practice* 6–7 (Eur. Corp. Governance Inst., Working Paper No. 292, 2015) [hereinafter Coates, *M&A Contracts*].

attorneys design hybrid agreements by starting with standardized templates and then materially altering the language to fit the specific circumstances of a deal, mixing bespoke and boilerplate terms.[13] Merger agreements exhibit "constrained variation," in which transaction designers recombine elements from a common menu of governance mechanisms to produce contracts that are neither entirely unique nor carbon copies of earlier precedent.[14] Such agreements are the transactional equivalent of mass customizable products, achieving economies of both scale and scope.[15]

The mass customization of merger agreements only deepens the puzzle of how deal lawyers handle infra-transactional complexity. If transaction designers are not fully standardizing merger agreements, how are they then not falling victim to the challenge of coordinating changes across a series of customized contractual provisions? How does contractual mass customization work?

Answering that question requires supplementing our theory of how parties privately order exchange. Understanding how the costs of infra-transactional complexity are managed requires further analysis of the *process* by which contracts are designed. The literature on contract economics typically abstracts away from the contract design process—assuming that contract terms map onto parties' preferences, subject to the limits of human foresight and differentials in bargaining power.[16] Recent legal scholarship on the standardization of contract terms has taken an important step toward unpacking the contract design process, but that research's primary emphasis has been upon understanding how network effects shape and even inhibit design changes.[17] This emphasis has led to theories of contractual evolution reminiscent of punctuated equilibrium models of institutional change.[18] There is not yet a theory that explains the middle ground, where significant customization occurs at scale.

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[13] *See* Victor Fleischer, *Deals: Bringing Corporate Transactions into the Law School Classroom*, 2002 COLUM. BUS. L. REV. 475, 483 ("Forms and precedent are undoubtedly the backbone of corporate practice and there is often no reason to start from scratch.") [hereinafter Fleischer, *Deals*]; *infra* notes 53–66 and accompanying text.

[14] Coates, *M&A Contracts*, *supra* note 12, at 6–8.

[15] *See* Rebecca Duray et al., *Approaches to Mass Customization: Configurations and Empirical Validation*, 18 J. OPERATIONS MGMT. 605, 607–09 (2000); James H. Gilmore & B. Joseph Pine II, *The Four Faces of Mass Customization*, HARV. BUS. REV., Jan.–Feb. 1997, at 91.

[16] *See infra* notes 67–92 and accompanying text.

[17] *See infra* notes 67–92 and accompanying text.

[18] *See infra* notes 67–92 and accompanying text. For a discussion of punctuated equilibrium theory and institutional change, see generally Scott E. Robinson, *Punctuated Equilibrium Models in Organizational Decision Making*, *in* HANDBOOK OF DECISION MAKING 133 (Göktuğ Morçöl ed., 2007); Carla M. Flink, *Rethinking Punctuated Equilibrium Theory: A Public Administration Approach to Budgetary Changes*, 45 POL'Y STUD. J. 101 (2017).

This Article addresses that middle ground by introducing a more comprehensive theoretical framework of how contracts are designed. That framework includes two paradigmatic approaches that transaction designers might pursue in order to manage infra-transactional complexity. First, as has already been recognized by some scholars, designers may use a "modularity" strategy to manage the costs of infra-transactional complexity.[19] Modular designs manage complexity by isolating discrete sub-systems from one another.[20] So long as all sub-systems comply with a standard interface rule, they can be adjusted independently and asynchronously of one another, thus reducing the costs of change within the system.[21] The second approach, which has largely been overlooked in legal literature, is "flexible specialization," whereby thick connections between sub-systems are maintained and the costs of changing those interlocking components are managed by fostering organizational routines that allow transaction designers to quickly coordinate adjustments across the integrated system.[22] Those routines reduce the costs of change by making information transparent throughout the system, reducing barriers to communication, and learning among the designers tasked with maintaining the system.[23]

Whether modular design or flexible specialization is used has important implications for doctrine, policy, and research.[24] Therefore, this Article undertakes a preliminary empirical study of the process of contract innovation in the M&A market. Whereas recent scholarship has persuasively argued that the broad collection of contracts memorializing an M&A transaction are "unbundled" according to a modular logic,[25] this study focuses squarely on the merger agreement at the heart of the deal, asking whether that contract and

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[19] Cathy Hwang, *Unbundled Bargains: Multi-Agreement Dealmaking in Complex Mergers and Acquisitions*, 164 U. PA. L. REV. 1403, 1417–27 (2016); *see infra* notes 104–119 and accompanying text.

[20] 1 CARLISS Y. BALDWIN & KIM B. CLARK, DESIGN RULES: THE POWER OF MODULARITY 63 (2000).

[21] *See id.* at 63–75.

[22] *See* JAMES G. MARCH & HERBERT A. SIMON, ORGANIZATIONS 197–203 (2d ed. 1993); MICHAEL J. PIORE & CHARLES F. SABEL, THE SECOND INDUSTRIAL DIVIDE: POSSIBILITIES FOR PROSPERITY 17 (1984); Susan Helper et al., *Pragmatic Collaborations: Advancing Knowledge While Controlling Opportunism*, 9 INDUS. & CORP. CHANGE 443, 444 (2000); Charles F. Sabel, *Learning by Monitoring: The Institutions of Economic Development*, *in* THE HANDBOOK OF ECONOMIC SOCIOLOGY 137, 137–41 (Neil J. Smelser & Richard Swedberg eds., 1993). The term "flexible specialization" emphasizes the importance of problem-solving routines in innovation processes involving complex systems, a theme in March and Simon's classic work and also in Sabel's more recent research. *See generally* MARCH & SIMON, *supra*; Sabel, *supra*. For a fuller discussion of the foundations of this concept, see *infra* notes 120–132 and accompanying text.

[23] *See infra* notes 120–132 and accompanying text.

[24] *See infra* notes 238–292 and accompanying text.

[25] *See* Hwang, *supra* note 19, at 1417–27.

the multi-lawyer team that designs it exhibit evidence of modularity or flexible specialization. The available evidence suggests that flexible specialization plays a significant role in the design of complex merger agreements, and, in turn, that the application of modular design to these complex contracts has its limits.[26]

This Article uses methods from systems engineering and network analysis to study the structure of both merger agreements and the law firms that designed them for evidence supporting either the modularity thesis or flexible specialization thesis. This Article is the first to employ such methods, and it is important to underscore the preliminary nature of the results reported here. The methods introduced here complement a small but growing body of research using natural language processing techniques to study contract design, and an important project for subsequent work is to combine both approaches to achieve more detailed and rigorous analyses.[27]

First, a sample of merger agreements, hand-collected from public company Securities and Exchange Commission (SEC) filings, is analyzed for evidence of modular subdivisions.[28] The results of that analysis reveal contracts with thickly interconnected sub-systems, providing limited evidence that merger agreements are purely modular, and support for the argument that flexible specialization plays a role in agreement design. Second, the law firms that designed the sampled merger agreements are analyzed for evidence of modular or integrated structure. A sample of M&A deal teams, hand-collected from the publicly available press releases of three major New York law firms, is examined, resulting in little evidence of discernable modules within the three firms. Rather, it appears that deal teams repeatedly recombine in unique configurations from deal to deal, promoting the dissemination of design-relevant information throughout the firm and, in turn, the tacit routines that foster rapid learning among the transactional lawyers. Taken together, those preliminary results suggest that flexible specialization is an important part of

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[26] *See infra* notes 120–132 and accompanying text.

[27] *See generally* Anderson & Manns, *supra* note 12 (examining the language in contracts through textual analysis algorithm); Gabriel Rauterberg & Eric Talley, C*ontracting Out of the Fiduciary Duty of Loyalty: An Empirical Analysis of Corporate Opportunity Waivers*, 117 COLUM. L. REV. 1075 (2017) (examining provisions through textual analysis algorithm); Eric Talley & Drew O'Kane, *The Measure of a MAC: A Machine-Learning Protocol for Analyzing Force Majeure Clauses in M&A Agreements*, 168 J. INSTITUTIONAL & THEORETICAL ECON. 181 (2012) (examining provisions through textual analysis algorithm).

[28] Note that this is a static analysis of the agreements in the sample—i.e., the interdependencies between provisions in each agreement are analyzed separately. An important task for future research is to undertake a longitudinal analysis of patterns across contracts, which may reveal, for example, consistent patterns in design choices from deal to deal. That dynamic analysis is deferred to subsequent research.

deal lawyers' strategy for achieving the mass customization of merger agreements.[29]

The vision of private ordering that emerges from the analysis emphasizes the role that the network of deal lawyers plays. Path dependencies appear to be moderated by fluid organizational routines, which simultaneously interrogate prior practice as they provide stability for the innovation process. The preliminary results here should not, of course, be construed to suggest that modularity plays no role in the design of complex agreements. Additional research, ranging from more rigorous quantitative analyses to detailed ethnographic studies, beyond the preliminary analysis here is required to determine whether modularity plays a more nuanced role, perhaps at different stages of the design process. It is quite possible that subsequent research will find that a sophisticated combination of flexible specialization and modularity is often employed. Thus, the results here make a subtler and, ultimately, more intriguing point: flexible specialization should be considered one important factor among many to be considered in the diverse production system that designs complex commercial transactions.

Complex markets with contract design regimes that include a flexible specialization strategy demand infrastructure as dynamic as they are. In that respect, this Article underscores recent calls for a contingent approach to contract enforcement, with the appropriate interpretive regime determined by the underlying characteristics of a given transaction.[30] This study adds an important dimension to that argument by demonstrating that the integrated nature of complex agreements is a variable that may restrict or amplify, in unexpected ways, the scope of court intervention in a contract dispute.

Second, the preliminary results suggesting that the M&A market includes a logic of flexible specialization challenge deterministic accounts of the legal industry's transformation and highlight the overlooked trade-offs that disruption of the market for contract design services presents. This issue is important because many markets are currently undergoing a period of significant change. For the past generation, the organization of production has been changing, as an economic landscape dominated by vertically-integrated companies engaged in arm's-length supply relationships has given way to hand-in-glove collaborative contracting arrangements.[31] If the

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[29] *See infra* notes 138–237 and accompanying text.

[30] *See infra* notes 244–268 and accompanying text. *See generally* Ronald J. Gilson et al., *Text and Context: Contract Interpretation as Contract Design*, 100 CORNELL L. REV. 23 (2014) (examining the relationship between contract design and interpretation) [hereinafter Gilson et al., *Contract Interpretation*].

[31] *See* Lisa Bernstein, *Beyond Relational Contracts: Social Capital and Network Governance in Procurement Contracts*, 7 J. LEGAL ANALYSIS 561, 563–65, 610–13 (2015); Matthew C.

story of contract institutions during 19th and 20th century industrialization is one of scaling a universal set of governance institutions across a new national market,[32] then one of the stories of contract in the 21st century economy is the dramatic scaling of governance institutions *within* exchange relationships between leaner companies inhabiting innovation networks.[33] That revolution in economic organization is accompanied by new technological developments that present the possibility of new forms of market infrastructure. For instance, the advent of blockchain technology as a potential (if largely untested) disruptive technology for "smart contracting" emphasizes the need to understand the design and evolution of contract institutions by presenting the possibility of parties using an entirely different platform from traditional legal infrastructure for creating and enforcing agreements.[34]

Third, and finally, in order to improve our models of contractual innovation, this Article demonstrates the need for more detailed theoretical and empirical research on the interaction effects between governance mechanisms in an agreement.[35] That work would, for example, explore how interdependencies affect the evolution of a given provision or set of provisions over time, providing a finely-grained mapping of contractual innovation and moving beyond the single-governance mechanisms studies that currently

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Jennejohn, *The Private Order of Innovation Networks*, 68 STAN. L. REV. 281, 297–98 (2016). *See generally* Ronald J. Gilson et al., *Contracting for Innovation: Vertical Disintegration and Interfirm Collaboration*, 109 COLUM. L. REV. 431 (2009) (examining the shift to collaborative arrangements and its effect on contracts).

[32] *See* MORTON J. HORWITZ, THE TRANSFORMATION OF AMERICAN LAW: 1780–1860, at 198–201 (1977).

[33] *See* JOSH WHITFORD, THE NEW OLD ECONOMY: NETWORKS, INSTITUTIONS, AND THE ORGANIZATIONAL TRANSFORMATION OF AMERICAN MANUFACTURING (2005) (analyzing collaborative production models among equipment suppliers of heavy equipment). The transformation from monolithic, vertically integrated companies in the semiconductor industry to contractually-governed production models is indicative of the trend. *See* ASHISH ARORA ET AL., MARKETS FOR TECHNOLOGY: THE ECONOMICS OF INNOVATION AND CORPORATE STRATEGY 105–09, 255–58 (2001).

[34] The Ethereum platform is one example of how blockchain technology may be used to facilitate "smart contracts." *E.g.*, ETHEREUM, https://www.ethereum.org [https://perma.cc/C73E-BYMB]. Real-time statistics of activity on the Ethereum platform are available at https://ethstats.net. Blockchain technology has matured to some extent, with large companies and investment banks investing in it. *See, e.g.*, Jemima Kelly, *Thirteen More Top Banks Join R3 Blockchain Consortium*, REUTERS (Sept. 29, 2015, 11:31 AM), http://www.reuters.com/article/banks-blockchain-idUSL5N11Z2QE20150929 [https://perma.cc/Y6G5-L6LG]; IBM BLOCKCHAIN, http://www.ibm.com/blockchain/what-is-blockchain.html [https://perma.cc/2Y7B-F7LZ] (describing IBM's project to use blockchain technology to develop a "hyperledger").

[35] The positive study of contractual innovation is not limited to this issue but serves broader questions also, as Suchman has thoughtfully argued. *See generally* Mark C. Suchman, *The Contract as Social Artifact*, 37 L. & SOC'Y REV. 91 (2003) (arguing that contracts themselves should be studied to learn about both individual contracts and contract regimes).

dominate the literature.[36] The empirical methods outlined here for mapping the network topology of complex agreements provide a foundation for that subsequent work.

This Article proceeds as follows. Part I explains the motivation behind this study, outlining the existing literature on contract design and demonstrating the need for new approaches to analyze complex contracts.[37] Part II outlines the empirical methods employed here and tests the hypotheses that complex contracts are either modular or integrated systems by applying those methods to a sample of merger agreements.[38] The results of those tests suggest that merger agreements and the organizations that design them are integrated, rather than modular, systems. Part III discusses the implications of those preliminary results for (1) doctrines of contract interpretation, (2) industrial policy with respect to the market for corporate control, and (3) next steps in the positive study of contract design.[39]

I. THE ENIGMA OF MASS CUSTOMIZATION

This Part of the Article outlines a theory of how transactional lawyers attempt to achieve both scope and scale economies when designing commercial agreements. At first glance, economies of scope and scale may appear to be mutually exclusive. Economies of scope occur where the costs of producing one good decrease when another good is added to the production line. They depend upon a comprehensive process capable of making more than one type of discrete product.[40] In the legal industry, the classic country lawyer, equally comfortable with, say, drafting a will, negotiating a lease, and litigating a civil dispute, pursues a business model built around scope economies. Economies of scale occur where the costs of producing a good decrease as the level of output increases, typically because the fixed costs of production are distributed across more units.[41] Standardized, or mass, production, such as that captured in the folklore that has arisen around the production of Ford's Model T, is a common example of economies of scale.[42]

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[36] *See generally* Jeffrey T. Macher & Barak D. Richman, *Transaction Cost Economics: An Assessment of Empirical Research in the Social Sciences*, 10 BUS. & POL. 1 (2008) (reviewing empirical literature in transactional cost economics).

[37] *See infra* notes 40–137 and accompanying text.

[38] *See infra* notes 138–237 and accompanying text.

[39] *See infra* notes 238–292 and accompanying text.

[40] *See* ALFRED D. CHANDLER, JR., SCALE AND SCOPE: THE DYNAMICS OF INDUSTRIAL CAPITALISM 17 (1994).

[41] *Id.*

[42] *See* DAVID A. HOUNSHELL, FROM THE AMERICAN SYSTEM TO MASS PRODUCTION, 1800–1932: THE DEVELOPMENT OF MANUFACTURING TECHNOLOGY IN THE UNITED STATES 217–61 (1984) (analyzing the historical development of mass production in the United States); WAYNE

In the legal context, the production of boilerplate financing contracts is a good example of scale economies.[43] The disjunct between the two approaches arises where adding scale overwhelms the production system built upon scope economies because it cannot toggle between goods efficiently enough to meet the increased demand. Production can be cheap or customized, but not both.

The current state of the art in contract theory provides explanations that fit stories of either the scope or scale economies, but not both. Conventional contract economics, which relies extensively upon game theory to understand bargaining outcomes, assumes that agreements are fully customizable, which is consistent with a production model focused upon scope economies. A growing literature on the economics of boilerplate provisions emphasizes the role economies of scale play in contract design. An important implication of that research is that standardization in pursuit of scale economies produces network effects that may lock in (even inefficient) terms. Therefore, the conventional assumption that contracts are customized does not necessarily hold.[44]

This Part contributes a new perspective to positive contract theory by providing a framework that explains how transaction designers manage complex collections of contractual terms to achieve scope and scale economies simultaneously, a phenomenon referred to as "mass customization."[45] Social science, strategy, and engineering research have identified two paradigmatic approaches to managing the complexity inherent in mass customization. The first strategy, modular system design, segments a complex product into a number of sub-assemblies (or "modules"), isolates those modules from one another, and then ensures interoperability across the entire system through a standardized interface.[46] This approach allows the individual modules to be

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LEWCHUK, AMERICAN TECHNOLOGY AND THE BRITISH VEHICLE INDUSTRY 33–36, 42–65 (1987) (analyzing the historical development of mass production in the US and UK automobile industries). *See generally* STEPHEN MEYER III, THE FIVE DOLLAR DAY: LABOR MANAGEMENT AND SOCIAL CONTROL IN THE FORD MOTOR COMPANY 1908–1921 (1981) (discussing the development of technology and organization of labor in the Ford Motor Company). For a second generation of historical analysis, which provides more nuanced accounts of the moving assembly line's effect on Ford's productivity gains, largely based on data unavailable in earlier works, see generally Daniel M.G. Raff, *Productivity Growth at Ford in the Coming of Mass Production: A Preliminary Analysis*, 25 BUS. & ECON. HIST. 176 (1996); Karel Williams et al., *The Myth of the Line: Ford's Production of the Model T at Highland Park, 1909–16*, 35 BUS. HIST. 66 (1993); James M. Wilson & Alan McKinlay, *Rethinking the Assembly Line: Organisation, Performance and Productivity in Ford Motor Company, c. 1908–27*, 52 BUS. HIST. 760 (2010).

[43] *See supra* notes 12–23 and accompanying text.

[44] *See infra* note 83 and accompanying text.

[45] *See supra* note 15 and accompanying text.

[46] *See infra* notes 104–119 and accompanying text.

changed independently and asynchronously, making it possible to reconfigure the product according to each customer's wishes.[47] The second strategy, flexible specialization, takes the opposite approach. Flexible specialization maintains thick connections between sub-systems. Then, to ensure interoperability across the system when a change to a sub-system is made, it relies upon organizational routines that reduce the costs of information transfer and learning within the team of engineers who are responsible for coordinating adjustments across the system.[48]

This Part proceeds as follows. First, a brief summary of the M&A market, including a description of a merger agreement's key provisions, is provided to orient the reader and to demonstrate that merger agreements are mass customizable products.[49] Second, current theory is discussed and its inability to fully explain mass customization is demonstrated.[50] Third, the Article's primary theoretical contribution, that transaction designers employ either modular design or flexible specialization to manage infra-transactional complexity, is outlined by describing the two strategies,[51] and a summary of this Part is given.[52]

A. Merger Agreements as Mass Customizable Products

The market for corporate control has been a vibrant component of the American economy for well over a century,[53] and the contracts used to accomplish change of control transactions have grown in complexity over that time.[54] Over the years, a body of commentary has grown to navigate the

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[47] *See infra* notes 104–119 and accompanying text.

[48] *See infra* notes 120–132 and accompanying text.

[49] *See infra* notes 53–66 and accompanying text.

[50] *See infra* notes 67–93 and accompanying text.

[51] *See infra* notes 95–132 and accompanying text.

[52] *See infra* notes 133–136 and accompanying text.

[53] Several distinct "waves" of merger activity have come and gone over the years, with the latest born from the ashes of the recent financial crisis. *See* Kenneth R. Ahern & Jarrad Harford, *The Importance of Industry Links in Merger Waves*, 69 J. FIN. 527, 542 (2014); Jarrad Harford, *What Drives Merger Waves?*, 77 J. FIN. ECON. 529, 530–32 (2005); *see also* Martin Lipton, Merger Waves in the 19th, 20th, and 21st Centuries, Davies Lecture at York University Osgoode Hall Law School (Sep. 14, 2006) (providing a distinguished practitioner's perspective).

[54] Part of the complexity arises from the increasingly complicated organizations that are being combined. Coordinating the combination of two business entities, which are often complex systems unto themselves, introduces a significant level of complexity in the merger documentation. The risk of information spillovers is a second concern. Leaks into the market can negatively affect deal negotiations, and information spillovers between the merging parties prior to receiving applicable regulatory clearances and/or consummation of the transaction can result in antitrust violations. *See* 1 IRVING SCHER & SCOTT MARTIN, ANTITRUST ADVISER §§ 4:79–4:80, Westlaw (5th ed. 2016). In addition, as relationship specific investments are made prior to closing, the threat that one party will use those investments as leverage to "hold-up" another grows. Alan Schwartz

practitioner through the details of these complex contracts.[55] This literature outlines the basic elements of a typical acquisition agreement as follows:[56]

- the operative terms of the transaction, including identification of the assets or stock to be exchanged, the consideration to be paid, and the mechanics for executing the deal;
- seller's and buyer's representations and warranties, which essentially ensure that the buyer gets what it pays for and that the buyer has the ability to pay the seller what is expected;
- covenants of the seller and the buyer pending the closing of the transaction, which often oblige the seller to operate the business in the ordinary course prior to closing and may allocate the risks of certain regulatory processes to one party or the other;
- post-closing covenants, involving matters that affect both seller and buyer after the closing, such as tax matters, obligations on the buyer to protect existing employees, non-competition obligations of sellers, and access to information and cooperation over known risks such as litigation;
- conditions precedent to the seller's and buyer's obligations to close the transaction, which usually provide, among other things, that all representations and warranties must be true, all covenants have been per-

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& Robert E. Scott, *Precontractual Liability and Preliminary Agreements*, 120 HARV. L. REV. 661, 682–85 (2007). Finally, mergers are regulated by a constellation of regulatory regimes, including state contract law, state corporate law, federal antitrust law, and federal securities law, and those differing regimes shape the elements of a common public company merger agreement differently. *See* Coates, *M&A Contracts*, *supra* note 12, at 18–19; Fleischer, *Deals*, *supra* note 13, at 490.

[55] The classic account is found in Freund's 1975 treatise. *See generally* JAMES C. FREUND, ANATOMY OF A MERGER: STRATEGIES AND TECHNIQUES FOR NEGOTIATING CORPORATE ACQUISITIONS (1975) (explaining the details of these complex contracts). A number of excellent overviews have followed. *See generally*, *e.g.*, PRACTICING LAW INST., MERGERS & ACQUISITIONS 2015: TRENDS AND DEVELOPMENTS (2015) (discussing, through a compilation of presentations, issues in M&As in 2015); CHRISTOPHER S. HARRISON, MAKE THE DEAL: NEGOTIATING MERGERS & ACQUISITIONS (2016) (describing how deals are made combining both legal framework and business strategy); CLAIRE HILL ET AL., MERGERS AND ACQUISITIONS: LAW, THEORY, AND PRACTICE (2016) (recent M&A casebook); PRACTICING LAW INST., DOING DEALS 2014: THE ART OF M&A TRANSACTIONAL PRACTICE (2014) (discussing, through a compilation of presentations, M&A deals in 2014).

[56] M&A transactions are roughly accomplished in one of two ways. In the first, the management of one entity negotiates the acquisition of another entity with the management of the selling company, subject to board approval and often shareholder ratification. *See* STEPHEN M. BAINBRIDGE, MERGERS AND ACQUISITIONS 16–20, 71 (3d ed. 2012). In the second, the acquiring entity makes a tender offer directly to the selling entity's shareholders proposing to buy their shares at a certain price. *Id.* at 20–24. In the former, a contract—such as a merger agreement, stock purchase agreement, or asset purchase agreement, depending upon the characteristics of the transaction—is entered into to effectuate the acquisition. *See id.* at 71–85.

formed at the time of closing, third party consents have been received, and other deal-required transactions were completed;

- indemnification provisions, which typically delineate the seller's obligations in the event a representation or warranty is found to be breached after closing, or allocate risk among the parties for specific matters such as pending litigation;[57] and
- termination provisions, which may determine those situations where one or both of the parties may terminate the agreement and whether such a termination results in the terminating party paying a termination fee or reimbursement of expenses to the other party.[58]

It is not unusual for those provisions to occupy over one hundred pages in a single agreement. That length does not include disclosure schedules, which are an expansion of the representations and warranties and may also be over one hundred pages.[59] In addition to the provisions of the merger agreement, parties will often negotiate a series of ancillary contracts, such as confidentiality agreements, licensing agreements, transition services contracts, etc.[60]

Because of their sheer size, one might expect merger agreements to be highly standardized. Yet, standardization of merger agreements is surprisingly limited. Early research depicts the M&A lawyer as having a large amount of leeway to customize a transaction.[61] Subsequent empirical analysis confirms that merger agreements are not completely standardized. For instance, one study of choice of law provisions in a wide range of commercial contracts found that, unlike some agreement types such as bond indentures or underwriting agreements, merger agreements did not exhibit a dominant preference for a single jurisdiction's law.[62] This research suggests that parties are not attempting to maintain standardized interpretations of their agreements' terms by repeatedly adjudicating disputes in a particular juris-

[57] Where the seller is a publicly held company, buyers typically do not bargain for indemnification provisions, which are difficult to enforce upon a dispersed shareholder base. *See* FREUND, *supra* note 55, at 159–61.

[58] *Id.* at 147–48, 159–61; *see* BAINBRIDGE, *supra* note 56, at 71–85.

[59] *See* DealStage LLC, *Doing the Deal 101: Disclosure Schedules in Acquisition Transactions*, WOLTERS KLUWER (Oct. 8, 2014), https://ct.wolterskluwer.com/resource-center/articles/doing-deal-101-disclosure-schedules-acquisition-transactions [https://perma.cc/ECH9-2QLW].

[60] *See* Hwang, *supra* note 19, at 1413–16.

[61] *See* Ronald J. Gilson, *Value Creation by Business Lawyers: Legal Skills and Asset Pricing*, 94 YALE L.J. 239, 243, 254–64 (1984). This research began with Gilson's path breaking article on transaction cost engineering. *See id.*

[62] Theodore Eisenberg & Geoffrey P. Miller, *The Flight to New York: An Empirical Study of Choice of Law and Choice of Forum Clauses in Publicly-Held Companies' Contracts*, 30 CARDOZO L. REV. 1475, 1491 (2009). In their data, 32.28% of merger agreements chose Delaware law, 16.75% chose New York, 12.38% chose California, and 38.59% chose other jurisdictions. *Id.*

diction. A recent study of the differences found within a large sample of 12,000 merger agreements also confirms that merger agreements are not fully standardized.[63] That study found that most agreements in the sample had approximately fifty percent of the same text as their predecessor contracts.[64] It also constructed a "phylogenetic" analysis that plots contracts within a "family tree" of merger agreements. The evidence suggested that a family line of contracts within a law firm often forks as attorneys introduce variations to precedent language, suggesting that standardization exists but only to a limited extent.[65] In short, as one scholar noted:

> M&A contracts can be fairly described as *boilerplate exhibiting constrained variation*. Only a small number of terms are truly deal specific terms. That is, while M&A contracts are negotiated, and so are not purely form contracts, most of their contents—90% would be a conservative estimate—of the "negotiated" terms are "negotiated" between the parties by agreeing upon a term from a closed subset of standard variants. At the same time, a large fraction of the terms—a speculative guess would be roughly 50%—can and do vary within a typical sample of M&A contracts.[66]

Thus, instead of being highly standardized, merger agreements appear to occupy a space somewhere between the two extremes of bespoke and boilerplate contracting outlined above.

B. Current Theory's Limited Ability to Explain Mass Customization

Current theory struggles to explain mass customization because it has not focused squarely upon infra-transactional complexity. Conventional contract economics does not recognize the costs of tailoring agreements in its models of contract design, assuming instead that all deals are readily customizable.[67] The growing legal literature on the design of boilerplate contract provisions marks an important departure from that assumption by acknowledging complexity *across* deals and how that leads parties to standardize terms.[68] But the boilerplate literature has yet to address complexity *within* deals and how that may affect design decisions.

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[63] Anderson & Manns, *supra* note 12, at 60–61.
[64] *Id.* at 75.
[65] *Id.* at 76–80.
[66] Coates, *M&A Contracts*, *supra* note 12, at 6 (emphasis added and citations omitted).
[67] *See infra* notes 83–84 and accompanying text.
[68] *See infra* notes 83–84 and accompanying text.

Contract economics is rooted in the fundamental insight that markets do not operate as smoothly as general equilibrium models theorize.[69] The complex and uncertain decision environments of modern markets often limit humans' ability to foresee future events, which makes determining and enforcing performance obligations often easier said than done.[70] As Coase pointed out, transactions are costly, and the neoclassical assumption that markets regularly clear does not necessarily hold.[71] Thus, a tension arises between the need for sufficient certainty to support investment, on one hand, and the ability to adapt to changing, unforeseeable circumstances, on the other.[72]

To be clear, complexity plays an important role in conventional contract economics. But it is primarily environmental complexity—i.e., the extent to which a complicated decision landscape prevents parties from specifying obligations ex ante—that economists have focused upon.[73] Other

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[69] Neoclassical models assumed that markets cleared and treated firms as little more than a production function. *See* DANIEL F. SPULBER, MARKET MICROSTRUCTURE: INTERMEDIARIES AND THE THEORY OF THE FIRM 83–85 (1999).

[70] *See* Herbert A. Simon, *Theories of Bounded Rationality*, *in* DECISION AND ORGANIZATION 161, 170–74 (C.B. McGuire & Roy Radner eds., 1972).

[71] *See generally* R.H. Coase, *The Nature of the Firm*, 4 ECONOMICA 386 (1937) (considering transaction costs in the creation of firms). Coase's original conception of transaction costs was capacious, and one of subsequent scholarship's first moves was to focus it to make the contracting problem more tractable. *See* R.H. Coase, *The Acquisition of Fisher Body by General Motors*, 43 J.L. & ECON. 15, 17–19 (2000). One strategy for facilitating tractability was simplifying the exchange problem to focus on asset specificity. Williamson considered uncertainty and counterparty opportunism to be the roots of the contracting problem, but it was "relationship specific investment"—i.e., investing in non-generic assets that cannot be traded on an open market at the same price as with a specific counterparty—that was the crux of the issue. *See* Benjamin Klein et al., *Vertical Integration, Appropriable Rents, and the Competitive Contracting Process*, 21 J.L. & ECON. 297, 297–98, 301–07 (1978); Oliver E. Williamson, *Transaction-Cost Economics: The Governance of Contractual Relations*, 22 J.L. & ECON. 233, 246–47 (1979) [hereinafter Williamson, *Transaction-Cost Economics*]. *See generally* OLIVER E. WILLIAMSON, THE ECONOMIC INSTITUTIONS OF CAPITALISM: FIRMS, MARKETS, RELATIONAL CONTRACTING (1985) (discussing transaction costs, asset specificity, and organizations). Asset specificity was seen as critical to explaining the choice of governance mechanisms because it resulted in "hold-up" problems, whereby one party uses threats to underperform or terminate an agreement to extract a greater portion of a contract's surplus from a counterparty, which is vulnerable because it has invested in relationship-specific assets. *See* Benjamin E. Hermalin et al., *Contract Law*, *in* 1 HANDBOOK OF LAW AND ECONOMICS 84–85 (A. Mitchell Polinsky & Steven Shavell eds., 2007). *See generally* Williamson, *Transaction-Cost Economics*, *supra* (explaining idiosyncratic goods and services and governance mechanisms).

[72] *See* Herbert A. Simon, *A Formal Theory of the Employment Relationship*, 19 ECONOMETRICA 293, 297–304 (1951).

[73] *See* Ilya Segal, *Complexity and Renegotiation: A Foundation for Incomplete Contracts*, 66 REV. ECON. STUD. 57, 58 (1999); *see also* BOLTON & DEWATRIPONT, *supra* note 1, at 572–74. *See generally* Yeon-Koo Che & Donald B. Hausch, *Cooperative Investments and the Value of Contracting*, 89 AM. ECON. REV. 125 (1999) (examining the design of agreements in situations of environmental complexity).

types of complexity, such as the interaction between different agreements in the same market, which is the focus of the boilerplate literature, and infra-transactional complexity, which is this Article's concern, have been overlooked. This is largely due to methodological imperatives. For several decades, economists have employed game theory to explore how contracting parties might address that tension. This approach studies the conditions in which bargaining equilibria between contracting parties are achievable, and points to organizational solutions—classically, integration of production within the boundaries of a single firm—when bargaining breaks down.[74] To render contracting problems tractable, contract economics makes a critical simplifying assumption that agreements are fully customized to the particular exchange hazards affecting a proposed transaction.[75] Contracts are "bespoke." That assumption allows analysis to focus upon what is understood as the key problem of contract design: aligning parties' divergent incentives.[76]

In summary, as depicted in Figure 1 below, in conventional contract economics, providing a theory of how agreements are designed involves a simple causal model. The dependent variable is the governance responses parties use, which may include a variety of contractual mechanisms or vertical integration.[77] The explanatory variables are the exchange hazards bedeviling a given transaction.[78] Scholars have referred to the relationship between exchange hazards and governance responses as the "discriminating alignment hypothesis."[79] This hypothesis posits that the differences in governance mechanisms can be explained by the different hazards parties encounter.[80]

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[74] *See* BOLTON & DEWATRIPONT, *supra* note 1, 13–14, 237–38.

[75] *See* Choi et al., *Intelligent Design*, *supra* note 6, at 4–5, 25.

[76] *See* Hermalin et al., *supra* note 71, at 61.

[77] Much of the work in contract theory over several decades has been focused upon expanding our understanding of how these governance mechanisms respond to the threat of opportunism, and particularly asset specificity. Over time, the universe of governance mechanisms has expanded from a binary constellation of formal contract mechanisms and integration within a firm to also include informal constraints, or relational contracting. *See generally* BOLTON & DEWATRIPONT, *supra* note 1 (describing other governance mechanisms).

[78] Recent work, particularly among management scholars, legal academics, and economic sociologists, has expanded the number of exchange hazards beyond contract economics' singular focus on the hold-up problem. *See* Jennejohn, *supra* note 31, at 314–23 (summarizing research).

[79] *See* Oliver E. Williamson, *Transaction Cost Economics: How It Works; Where It Is Headed*, 146 DE ECONOMIST 23, 37–39 (1998).

[80] *See id.*

Figure 1[81]
The Conventional Causal Model of Contract Design

Because it focuses primarily upon that straightforward causal model, conventional contract economics provides, at most, an implicit theory of contract innovation. From its perspective, contract design does not present an innovation problem per se, because it is assumed that parties can readily tailor contractual governance mechanisms to address a given exchange hazard.[82] Economies of scope are assumed to be readily available, or, put another way, the benefits of scale economies are not recognized.

Recent legal scholarship on standardized contract terms makes an important contribution to contract economics by recognizing that scale economies can play a role in contract design, as in many other markets. Market complexity can lead parties to standardize contract terms, which can exhibit network effects that introduce path dependencies into the contract design process. If standard contract economics overlooks the innovation problem in contract design, the growing legal literature on the design of standardized contract terms makes that problem its central research question. Pointing to the widespread use of boilerplate language in commercial and consumer contracting, this literature highlights the incentives that make contract innovation difficult.[83]

The boilerplate literature's starting point is that innovating new contract terms is often difficult because contractual language offers increasing

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[81] This Figure is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[82] For that reason, the empirical literature that has developed to test the theoretical work outlined above focuses almost exclusively upon identifying correlations between types of exchange hazards and governance responses. *See generally* Macher & Richman, *supra* note 36 (reviewing empirical literature in transaction cost economics). These studies may control for certain party or market characteristics, but they typically do not explore the sources or effects of potential path dependencies.

[83] *See* Charles J. Goetz & Robert E. Scott, *The Limits of Expanded Choice: An Analysis of the Interactions Between Express and Implied Contract Terms*, 73 CALIF. L. REV. 261, 286–92 (1985); Choi et al., *Intelligent Design*, *supra* note 6, at 4–5. Although lock-in can be powerful, the boilerplate literature does not suggest that it is necessarily insurmountable. As research illustrates, standardized terms do change, often in response to exogenous shocks. *See generally, e.g.*, Stephen J. Choi et al., *The Dynamics of Contract Evolution*, 88 N.Y.U. L. REV. 1 (2013) (presenting evidence that contractual evolution occurs in response to discrete shocks). Taken together, those studies suggest that boilerplate evolves according to a punctuated equilibrium model of institutional change, by which concentrated and often dramatic adjustments follow long stretches of stasis. *See generally id*.

returns as it is used more frequently.[84] As markets scale, the mundane transaction costs of negotiating and drafting contracts spiral upwards, and the costs of searching for appropriate exchange partners increase. One solution is to standardize and thereby commoditize contractual language, which allows parties to recycle terms from deal to deal, thereby economizing on drafting/negotiation costs.[85] In other words, standardization allows transaction designers to achieve economies of scale. Those efficiency gains are magnified to the extent other market participants also adopt the standard.[86] Widely adopted standardized terms allow parties to reduce both front-end negotiating costs—both parties to the deal understand the common language, which can streamline costly dickering—and back-end enforcement costs—if a court has given a standard term a definitive interpretation, then enforcement uncertainty can be reduced.[87] Using a standard term can also serve as a signaling mechanism, whereby parties indicate their sophistication to one another by proposing standardized or "market" terms.[88] Taken together, these beneficial effects of standardized terms raise switching costs for market participants,[89] and those switching costs can lead to path dependence in the development of contractual governance mechanisms.[90] A number of studies have found evidence of lock-in in boilerplate language,[91] although perhaps the most dramatic example is recent scholars' analysis of the standard *pari passu* clause used in sovereign debt indentures.[92]

The boilerplate literature highlights the role of the deal attorney as an intermediary between a party and the terms of a deal. In that respect, it provides an important qualification to the contract design literature's assumption that

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[84] The discussion here draws upon a significant body of research, which includes Choi et al., *Intelligent Design*, *supra* note 6, at 4–5; Goetz & Scott, *supra* note 83, at 286–92; Henry T. Greely, *Contracts as Commodities: The Influence of Secondary Purchasers on the Form of Contracts*, 42 VAND. L. REV. 133, 159 (1989); Marcel Kahan & Michael Klausner, *Standardization and Innovation in Corporate Contracting (or "The Economics of Boilerplate")*, 83 VA. L. REV. 713, 718 (1997) [hereinafter Kahan & Klausner, *Standardization*]; Michael Klausner, *Corporations, Corporate Law, and Networks of Contracts*, 81 VA. L. REV. 757, 782–88 (1995); Mark R. Patterson, *Standardization of Standard-Form Contracts: Competition and Contract Implications*, 52 WM. & MARY L. REV. 327, 331–35 (2010).

[85] *See* Kahan & Klausner, *Standardization*, *supra* note 84, at 718.

[86] *Id.* at 726–27 (differentiating between internal learning benefits and network benefits arising from standardization).

[87] *See id.* at 719–25 (discussing the beneficial aspects of standardizing contract terms).

[88] *See id.* at 723 (highlighting the usefulness of common terms familiar to all parties involved in drafting a contract).

[89] *See id.* at 727–29 (discussing "switching costs").

[90] *See* Marcel Kahan & Michael Klausner, *Path Dependence in Corporate Contracting: Increasing Returns, Herd Behavior and Cognitive Biases*, 74 WASH. U. L.Q. 347, 347–49 (1996).

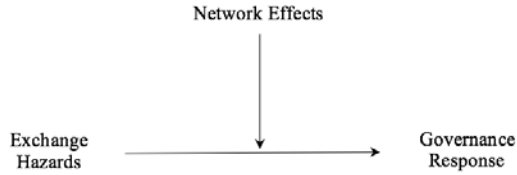
[91] *See, e.g.*, *id.*; Choi et al., *Intelligent Design*, *supra* note 6, at 20–21.

[92] Choi et al., *Intelligent Design*, *supra* note 6, 10–11.

agreements reflect the preferences of the immediate parties to the contract. Instead, as depicted in Figure 2 below, the boilerplate scholarship focuses on how the characteristics of the production system act as a moderating variable affecting contract design. In short, the boilerplate literature demonstrates that contract terms themselves are developed within an imperfect market.[93]

Figure 2[94]

Network Effects as a Moderating Variable in the Conventional Causal Model of Contract Design



Mass customization presents a problem that is different in important respects from the question explored in the boilerplate literature. The boilerplate scholarship asks how market complexity affects the design of a given agreement, with the characteristics of other deals in the market acting as the source of path dependency. Mass customization, however, asks how infra-transactional complexity affects the design of a given contract, with the characteristics of the many interlocking governance mechanisms within the agreement as the source of path dependency. Both implicate the production system but in different ways.

C. Strategies for Achieving Mass Customization

Current theory can be summarized by reference to its primary metaphors. There are now theories of how fully *customized* agreements—the contractual equivalent of Saville Row suits—are designed, and how fully *commoditized* contracts—the equivalent of common ball bearings—are designed. This divides the suppliers of transaction design services into artisans on one side and assembly lines on the other.[95] That dichotomy overlooks the possibility of a middle ground between the two extremes in which the scope economies of fully customizable agreements are combined with boilerplate's economies of scale. This sub-section fills that gap in the literature by

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[93] *See supra* notes 83–84 and accompanying text.

[94] This Figure is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[95] For insights with respect to the latter, see generally Barak Richman, *Contracts Meet Henry Ford*, 40 HOFSTRA L. REV. 77 (2011).

introducing the concept of infra-transactional complexity, and by outlining the ways in which transaction designers manage it.

Our starting point is Herbert Simon's classic concept of a "nearly decomposable" system.[96] Generalizing across a number of complex natural and social systems, Simon argues that many systems are comprised of subsystems with "weak, but not negligible" interactions.[97] Such systems have two characteristics with respect to their evolution over time. First, in the short run, the "behavior of each of the component subsystems is approximately independent of the . . . behavior of the other components."[98] Second, in the long run, the "behavior of any one of the components depends in only an aggregate way on the behavior of the other components."[99] That conception of complex systems raises the question of what exactly is the mechanism—or the *architecture*—that holds the sub-systems together as they change independently, affecting them "in only an aggregate way" over the long run.[100]

Subsequent research has identified two paradigmatic approaches for managing the complexity of such nearly decomposable systems. Those two strategies can be summarized as follows:

> 1. Redesign tasks to reduce/simplify interdependence and rely on standardized procedures to achieve coordination.
> 2. Create opportunities for extensive communication among interdependent actors so that they achieve reciprocal predictability of action.[101]

The first, which has gained significant currency in the legal academy following Henry Smith's pioneering research in the field of property, is often referred to as modular system design.[102] This Article refers to the second as "flexible specialization," which has remained largely unexploited in the literature on contract design.[103]

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[96] Herbert A. Simon, *The Architecture of Complexity*, 106 PROC. AM. PHIL. SOC'Y 467, 474 (1962).

[97] *Id.*

[98] *Id.*

[99] *Id.*

[100] *Id.*

[101] Kannan Srikanth & Phanish Puranam, *Integrating Distributed Work: Comparing Task Design, Communication, and Tacit Coordination Mechanisms*, 32 STRATEGIC MGMT. J. 849, 850 (2011).

[102] *See* Henry E. Smith, *Modularity in Contracts: Boilerplate and Information Flow*, 104 MICH. L. REV. 1175, 1175–79 (2006) [hereinafter Smith, *Modularity*].

[103] *See* MARCH & SIMON, *supra* note 22, at 197–203; PIORE & SABEL, *supra* note 22, at 17. Piore & Sabel coined the term "flexible specialization." PIORE & SABEL, *supra* note 22, at 17.

1. Modular System Design

One way to think of modular design is as a "divide and conquer" approach to managing change across a complex system. As systems scale, altering one sub-system can lead to a cascade of changes across all other subsystems to which the first is connected.[104] One solution is to "modulate" the structure of the system.[105] This strategy manages complexity by, first, subdividing the system into constituent parts; second, and somewhat counterintuitively, "hiding" information in each sub-system, or "module," from the other separate parts of the system; and finally, ensuring interoperability of the discrete modules through a standard interface.[106] So long as all of the individual modules feed into the common interface, this approach allows work to proceed on each module concurrently and, in turn, allows changes to be made to a single module without disturbing the rest of the system.[107] By so doing, modularity manages complexity that may otherwise overwhelm a system.[108] Examples of modular strategies have been identified in a variety of product types, ranging from software to electronics to flat-packed furniture.[109] Subsequent research has extended modularity to organizational design,[110] and to the structure of property law.[111]

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[104] Mid-20th century software programming provides what has become a canonical example. As software programs increased in size, the number of engineers included on the design team would grow in turn. This growth made the traditional method of ensuring interoperability between the code each engineering created—which involved, at the start of the day, each member of the team reviewing the code the other members produced the day before—unwieldy. The amount of code being produced led to the engineers spending a large amount of time every day digesting the entire team's output. Unless an organizational solution was devised, eventually the complexity of the software system would completely overwhelm the team's resources. *See* BALDWIN & CLARK, *supra* note 20, at 175–76; FREDERICK P. BROOKS, JR., THE MYTHICAL MAN-MONTH: ESSAYS ON SOFTWARE ENGINEERING 68–78 (anniversary ed. 1995).

[105] Modularity is the subject of a now vast interdisciplinary literature spanning the social and natural sciences. For overviews of the former, see BALDWIN & CLARK, *supra* note 20, at 175–76, and for the latter, see Werner Callebaut, *The Ubiquity of Modularity*, *in* MODULARITY: UNDERSTANDING THE DEVELOPMENT AND EVOLUTION OF NATURAL COMPLEX SYSTEMS 3, 3–28 (Werner Callebaut & Diego Rasskin-Gutman eds., 2005). Both Simon and Alexander struck upon the basic idea of modularity in their independent explorations of complex systems. *See* CHRISTOPHER ALEXANDER, NOTES ON THE SYNTHESIS OF FORM (1964); Simon, *supra* note 96. For some pivotal contributions since then, see BALDWIN & CLARK, *supra* note 20; Eric von Hippel, *Task Partitioning: An Innovation Process Variable*, 19 RES. POL'Y 407 (1990); Ron Sanchez & John T. Mahoney, *Modularity, Flexibility, and Knowledge Management in Product and Organization Design*, 17 STRATEGIC MGMT. J. 63 (1996).

[106] *See* BALDWIN & CLARK, *supra* note 20, at 63–64. Baldwin & Clark define an "interface" as a "pre-established way to resolve potential conflicts between interacting parts of a design. It is like a treaty between two or more sub-elements." *Id.* at 73.

[107] *Id.* at 89–91.

[108] *Id.* at 90–91.

[109] A well-known example of modular product architecture is second generation computer technology, such as IBM's System/360 family, which was developed in the 1960s. *See id.* at 169–

Early interventions by legal scholars explore the possibility that transaction designers also employ a modularity strategy when structuring merger agreements and other complex contracts. Smith's extension of modularity theory from property law to the design of boilerplate provisions is the earliest articulation of the theory.[112] Recent scholarship builds upon Smith's work, arguing that complex agreements exhibit a modular structure that is exploited by document assembly software that tailors contracts by "adding, adjusting, swapping, and removing modules" according to clients' needs.[113] That argument echoes other recent empirical analysis that finds evidence of modular design in outsourcing agreements.[114]

The fullest application to date, however, is Hwang's recent analysis of the structure of M&A deals.[115] In Hwang's account, M&A deals are organized as modular collections of "unbundled" bargains that span a number of

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94 (discussing the development of IBM's System/360 computers). The preceding computer systems IBM developed in the 1950s had precise instructions for executing desired calculations hardwired into the computers' control units, leading to a high degree of interdependence between subsystems. *Id.* at 170–71. That interdependence led to entirely different systems being designed for particular market niches. *Id.* at 170. Complaints mounted, as customers struggled with the lack of compatibility between the various computers offered. *Id.* 170–71. IBM responded with an innovation that, at the time, was unprecedented: requiring all of its next generation of computer processors to use the same set of instructions in a common control system. *See id.* at 174–75. That standard interface allowed the development of the separate processors in the System/360 family to proceed in parallel and resulted in a suite of different, yet interoperable, computers. *See id.* at 186–90. As Baldwin and Clark note, modularity was a challenge to achieve because, although IBM successfully modulated hardware design, operating system software remained highly integrated. *Id.* at 191–92. For more detail on IBM's design process for System/360, see BROOKS, *supra* note 104 (providing an insider's view of managing the System/360 development process).

[110] *See generally* Richard N. Langlois, *Modularity in Technology and Organization*, 49 J. ECON. BEHAV. & ORG. 19 (2002) (applying modularity to the theory of the firm); Sanchez & Mahoney, *supra* note 105 (same); Timothy J. Sturgeon, *Modular Production Networks: A New American Model of Industrial Organization*, 11 INDUS. & CORP. CHANGE 451 (2002) (applying modularity to a structure of production networks).

[111] *See generally* Thomas W. Merrill & Henry E. Smith, *Optimal Standardization in the Law of Property: The* Numerus Clausus *Principle*, 110 YALE L.J. 1 (2000) (examining standardization in property law); Henry E. Smith, *Exclusion Versus Governance: Two Strategies for Delineating Property Rights*, 31 J. LEGAL STUD. S453 (2002) (examining exclusion and governance strategies in property rights).

[112] *See generally* Margaret Jane Radin, *Boilerplate Today: The Rise of Modularity and the Waning of Consent*, 104 MICH. L. REV. 1223 (2006) (examining modularity in boilerplate language); Smith, *Modularity*, *supra* note 102 (extending modular theory of property rights to boilerplate language in contracts).

[113] George G. Triantis, *Improving Contract Quality: Modularity, Technology, and Innovation in Contract Design*, 18 STAN. J.L. BUS. & FIN. 177, 191 (2013).

[114] *See generally* Margaret M. Blair et al., *Outsourcing, Modularity, and the Theory of the Firm*, 2011 BYU L. REV. 263 (finding evidence of modularity in outsourcing contracts).

[115] *See* Hwang, *supra* note 19, at 1413–16 (analyzing ancillary agreements in modern M&A contracts).

related agreements.[116] Modularity allows the deal lawyers to economize on transaction costs in two respects. First, it allows specific, complicated issues to be isolated and passed along to subject-matter specialists, who can tailor that module of the bargain without relying upon or disturbing other parts of the deal team.[117] Second, it allows simple issues to be isolated and delegated to junior associates, who can address those matters at less cost to clients.[118] Hwang applies that theory to provide a compelling account of why M&A deals are structured across a number of agreements, and not just one single contract.[119]

2. Flexible Specialization

Segmenting a complex system and thereby allowing greater specialization within each module allows modularity to reap efficiencies, but it also sows the seeds of modularity's limits. Modular designs of complex systems only work where there is a stable standardized interface, and, as modularity increases, the costs of changing that interface rise. That is, although the costs of infra-modular change may be low, changing the system's architecture may be costly.[120] In essence, the standardized interface on which a modular system depends is susceptible to the lock-in problems identified in the boilerplate literature. These problems lead to the possibility of "modularity traps" in which a dysfunctional product architecture cannot be adjusted.[121] Greater modularity therefore presents a trade-off between incremental, infra-modular change and broader, architectural change within a system.[122]

The inescapability of that trade-off has led to a second strategy for managing complexity, long recognized in the business literature but overlooked in legal scholarship.[123] This second approach maintains an integrated

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[116] *Id.* at 1417.

[117] *Id.* at 1419–20.

[118] *Id.* at 1423–26.

[119] *See generally id.* (explaining that M&A contracts function more efficiently when agreements are "unbundled").

[120] *See* Charles F. Sabel & Jonathan Zeitlin, *Neither Modularity nor Relational Contracting: Inter-Firm Collaboration in the New Economy*, 5 ENTERPRISE & SOC'Y 388, 398–99 (2004). Tellingly, Baldwin and Clark's description of IBM's modular System/360 design includes a recitation of the costly multi-year undertaking that was required to design the system's architecture. *See* BALDWIN & CLARK, *supra* note 20, at 175–90.

[121] *See* Sabel & Zeitlin, *supra* note 120, at 394–96.

[122] *See* MARCH & SIMON, *supra* note 22, at 47–48.

[123] *See* Srikanth & Puranam, *supra* note 101, at 850. *See generally* MARCH & SIMON, *supra* note 22 (examining connections between organizations); J. Douglas Orton & Karl E. Weick, *Loosely Coupled Systems: A Reconceptualization*, 15 ACAD. MGMT. REV. 203 (1990) (describing loose coupling between organizations). Sabel provides perhaps the richest theory of this collaborative form of production. For the original outline of that theory, see PIORE & SABEL, *supra* note 22.

system with direct connections between the various constituent units.[124] In that situation, interoperability is straightforward, because the separate components are purpose-built to work within one another. Rather, the challenge in the integrated system is in managing change throughout the system, for, as noted above, in an integrated system the alteration to one component creates a cascade of changes throughout the other connected elements. To address that issue, integrated systems often rely upon a rich reservoir of system-specific information, usually embedded in the organizational routines of the systems engineers tasked with designing and maintaining the system, which facilitates the efficient and accurate processing of changes throughout the system. Those routines are substantively simple in that they establish processes for identifying, investigating, and addressing dysfunction within a complex system, and those processes combine into an elegant framework for continuous improvement.[125] As engineers trace errors to their root causes across the system and interact with other teams, the relentless search for improvement transforms otherwise tacit knowledge of the system's inner working into explicit information that is more easily communicated across the organization.[126] That is, "pragmatist" problem-solving routines reduce the organization's learning costs, or, put another way, flexible specialization achieves scope economies by creating institutions that leverage craftsperson expertise.[127] With the costs of customization reduced, flexible specialization—whereby designers are capable of efficiently reconfiguring assets to create more customized products—is possible.[128]

Examples of flexible specialization are found historically and in contemporary economic organization. Classic examples include 18th and 19th century industrial districts in Western Europe and the United States, which excelled at using expert craftspeople and universal machinery to produce a

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For further development of the theory, see Helper et al., *supra* note 22; Sabel, *supra* note 22; Sabel & Zeitlin, *supra* note 120; WORLD OF POSSIBILITIES: FLEXIBILITY AND MASS PRODUCTION IN WESTERN INDUSTRIALIZATION (Charles F. Sabel & Jonathan Zeitlin eds., 1997). Organizational routines have also been identified as a source of competitive advantage and have become the subject of a vast literature in corporate strategy. *See generally, e.g.*, RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE (1982) (examining how firms change over time); David J. Teece et al., *Dynamic Capabilities and Strategic Management*, 18 STRATEGIC MGMT. J. 509 (1997) (examining how dynamic capabilities allow companies to to gain competitive advantage); Sidney G. Winter, *The Satisficing Principle in Capability Learning*, 21 STRATEGIC MGMT. J. 981 (2000) (examining how organizations achieve dynamic capabilities).

[124] *See* Srikanth & Puranam, *supra* note 101, at 850.

[125] *See* Sabel & Zeitlin, *supra* note 120, at 397–99.

[126] *Id.*

[127] *Id.*

[128] *See* PIORE & SABEL, *supra* note 22, at 17. "Flexible specialization" is Piore & Sabel's original term for the phenomenon. *Id.*

wide array of customized products.[129] A paradigmatic contemporary example is automotive production, particularly as organized by major Japanese carmakers,[130] which, instead of modulating product design, have pursued a three-step process that results in continuous improvement.[131] Collaboration within Silicon Valley's various technology industries and venture capital market provides another modern example.[132]

D. Summary

Mass customization presents a puzzle for contemporary contract scholarship: how do transaction designers increase complexity, so as to allow greater consumer choice, without overwhelming the contractual system? This Part of the Article has outlined two paradigmatic approaches transaction designers might employ to solve that puzzle. In the first approach, modular design, a complex contractual system is subdivided into discrete sub-systems,

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[129] The concept of an industrial district finds its origins in Marshall's work, well over one hundred years ago. ALFRED MARSHALL, PRINCIPLES OF ECONOMICS 267–77 (8th ed. 1920). For more recent scholarship on the topic, see generally, for example, WHITFORD, *supra* note 33; Håkon With Andersen, *Producing Producers: Shippers, Shipyards and the Cooperative Infrastructure of the Norwegian Maritime Complex since 1850*, *in* WORLD OF POSSIBILITIES, *supra* note 123, at 461; Rudolf Boch, *The Rise and Decline of Flexible Production: The Cutlery Industry in Solingen Since the Eighteenth Century*, *in* WORLD OF POSSIBILITIES, *supra* note 123, at 153; Bennett Harrison, *Industrial Districts: Old Wine in New Bottles?*, 26 REGIONAL STUD. 469 (1992); Carlo Poni, *Fashion as Flexible Production: The Strategies of the Lyons Silk Merchants in the Eighteenth Century* (Patrick Leech trans.), *in* WORLD OF POSSIBILITIES, *supra* note 123, at 37; Charles F. Sabel, *Flexible Specialisation and the Re-emergence of Regional Economies*, *in* REVERSING INDUSTRIAL DECLINE?: INDUSTRIAL STRUCTURE AND POLICY IN BRITAIN AND HER COMPETITORS 17 (Paul Hirst & Jonathan Zeitlin eds., 1989); Béatrice Veyrassat, *Manufacturing Flexibility in Nineteenth-Century Switzerland: Social and Institutional Foundations of Decline and Revival in Calico-Printing and Watchmaking*, *in* WORLD OF POSSIBILITIES, *supra* note 123, at 188; Josh Whitford, *The Decline of a Model? Challenge and Response in the Italian Industrial Districts*, 30 ECON. & SOC'Y 38 (2001); Josh Whitford & Jonathan Zeitlin, *Governing Decentralized Production: Institutions, Public Policy, and the Prospects for Inter-Firm Collaboration in US Manufacturing*, 11 INDUSTRY & INNOVATION 11 (2004).

[130] *See* Paul Hirst & Jonathan Zeitlin, *Flexible Specialization: Theory and Evidence in the Analysis of Industrial Change*, *in* CONTEMPORARY CAPITALISM: THE EMBEDDEDNESS OF INSTITUTIONS 220, 232–33 (J. Rogers Hollingsworth & Robert Boyer eds., 1997).

[131] *See* Helper et al., *supra* note 22, at 466.

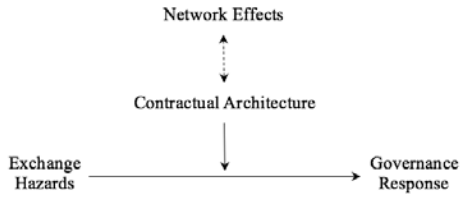
[132] *See generally* ANNALEE SAXENIAN, REGIONAL ADVANTAGE: CULTURE AND COMPETITION IN SILICON VALLEY AND ROUTE 128 (1994) (comparing the success of Silicon Valley's collaborative system with the decline of the more independent Route 128 in Massachusetts). For insights on the role of legal institutions in fostering the Silicon Valley cluster, see generally Jonathan M. Barnett & Ted Sichelman, *Revisiting Labor Mobility in Innovation Markets* (USC Ctr. for Law & Soc. Sci. Research Papers Series, Research Paper No. CLASS16-13, 2016); Ronald J. Gilson, *The Legal Infrastructure of High Technology Industrial Districts: Silicon Valley, Route 128, and Covenants Not to Compete*, 74 N.Y.U. L. REV. 575 (1999).

which are rendered interoperable through a standardized interface.[133] In the second approach, flexible specialization, thick connections between subsystems is maintained, and interoperability is achieved through organizational routines that reduce communication and learning costs.[134]

One effect of these design strategies is to moderate the role network externalities may play in contract design. The architecture of an agreement—whether modular or integrated—allows transaction designers to combine customized and standardized provisions. By reducing the costs of coordinating changes throughout the system, strategies for managing contractual complexity may also reduce reliance on standardized terms, which alleviates incentives that lead to lock-in. Figure 3 provides a simple diagram illustrating the role contractual architecture plays in the contract design causal model.

Figure 3[135]

Including Contractual Architecture as an Additional Moderating Variable in the Causal Model



It is important to note for the analysis that follows in Part II, that, as both modular design and flexible specialization strategies suggest, the structure of a product and the organization that produces it are linked. Part of the efficiency gains in the modular approach is achieved by cabining personnel and protecting them from information overloads. In the flexible specialization approach, organizational routines shaping the development of human capital provide the architecture ensuring interoperability between components. This relationship between product and organizational structure has been dubbed the "mirroring hypothesis."[136] Available evidence indicates that a modular

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[133] *See supra* notes 104–119 and accompanying text.

[134] *See supra* notes 120–132 and accompanying text.

[135] This Figure is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[136] For foundational work on the mirroring hypothesis, which has gone by other names in different fields, see generally Melvin E. Conway, *How Do Committees Invent?*14 DATAMATION 28 (1968); Rebecca M. Henderson & Kim B. Clark, *Architectural Innovation: The Reconfiguration of Existing Product Technologies and the Failure of Established Firms*, 35 ADMIN. SCI. Q. 9 (1990); Eric von Hippel, *supra* note 105. For recent empirical tests of the mirroring hypothesis, see generally Anna Cabigiosu & Arnaldo Camuffo, *Beyond the "Mirroring" Hypothesis: Product Modularity and Interorganizational Relations in the Air Conditioning Industry*, 23 ORG. SCI. 686

organizational structure will often mirror a modular product design, and an integrated organization will mirror an integrated product design.[137]

II. MAPPING THE TOPOLOGY OF PRODUCT AND ORGANIZATIONAL NETWORKS IN THE M&A MARKET

This Part of the Article analyzes the question of whether modularity or flexible specialization is typically employed in the design of a complex agreement. Answering that question requires empirical tools for, first, analyzing the structure of a contractual system to determine the extent to which the components of an agreement are modulated or integrated. Second, because flexible specialization posits that the architecture of system innovation is not built into the system itself but is rather embedded in the design teams' routines, tools are required for analyzing the organizational structure of the law firms tasked with designing the agreements in interest.

This Part introduces new methods for analyzing the structure of a contract and of the organization that produced it. Those methods treat contracts as any other type of advanced technology,[138] and apply concepts and empirical tools developed to study other product architectures to the design of complex agreements. This application makes a contract's architecture visible and susceptible to analysis by plotting governance mechanisms within a contract as nodes within a network, and then mapping the network topology of an agreement to illuminate how interdependencies between mechanisms are organized. Those methods also treat law firms as any other type of productive organization, and in so doing, illuminate how human capital within a firm is deployed to design complex agreements.[139]

Those methods are then applied to a sample of thirty public company merger agreements, and a sample of approximately three hundred deal teams at three Wall Street law firms. The results from the analyses produce evidence supporting the thesis that merger agreements and the law firms that produce them are integrated systems relying in significant part upon flexible specialization, rather than modular design. As discussed below, these findings should be considered preliminary, and further research is needed to refine the analysis.

(2012); Alan MacCormack et al., *Exploring the Duality Between Product and Organizational Architectures: A Test of the "Mirroring Hypothesis,"* 41 RES. POL'Y 1309 (2012); Lyra J. Colfer & Carliss Y. Baldwin, *The Mirroring Hypothesis: Theory, Evidence and Exceptions* (Harvard Bus. Sch., Working Paper 16-124, 2016).

[137] *See supra* note 136.

[138] *See generally* Kevin E. Davis, *Contracts as Technology*, 88 N.Y.U. L. REV. 83 (2013) (analyzing contracts as an instance of technological innovation).

[139] *See infra* notes 147–230 and accompanying text.

This Part is organized as follows. First, the specific hypotheses to be tested are introduced, after which the details of the data used to test those hypotheses are discussed.[140] Then, the new suite of methods is introduced,[141] and the results of applying those methods to the sample of agreements are presented.[142] This Part then concludes with a discussion of the results and next steps for future research focused upon analyzing the product and organizational structure of the M&A market.[143]

A. Research Design and Hypotheses

Stated generally, this study's overarching research question asks how interconnections are distributed between provisions within a merger agreement and between the attorneys who design the agreement. Those distributions reveal whether the product and organizational structure of the M&A market reflect modularity or flexible specialization design strategies, or a combination of the two. A variety of approaches might provide insightful answers to that research question. For instance, a large number of practitioners might be surveyed, or a smaller group may be interviewed.[144] This study uses a quantitative approach to draw inferences with respect to the contractual and organizational structure of the M&A market. The quantitative methods used here are attractive because they are replicable and directly analyze observable aspects of agreement and organizational structure. Nevertheless, as discussed below, some aspects of the M&A market's product and organizational structure are not readily observable, and so different, more qualitative methods will undoubtedly need to be pursued in subsequent research. The quantitative methods used here to analyze publicly available data are intended to provide guidance for that later work.

This Article answers that research question by testing a series of hypotheses relating to both product and organizational architecture in the M&A market. Each hypothesis below is formulated as a test of modularity. Nevertheless, because modularity and flexible specialization are understood as two ends of a continuum for this study, the null hypotheses of the statements below are implicitly tests of flexible specialization.

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[140] *See infra* note 144–146 and accompanying text.

[141] *See infra* notes 147–198 and accompanying text.

[142] *See infra* notes 199–230 and accompanying text.

[143] *See infra* notes 232–237 and accompanying text.

[144] Informal interviews with practitioners were used to design this study, but a series of structured interviews is deferred to later research.

1. Hypotheses Relating to Contractual Structure

H1: Contractual structure will be comprised of multiple clearly-delineated groups of related provisions, as measured with standard metrics of emergent modularity, consistent with the proposition that a modular system has discrete, bounded sub-systems.

H1 tests the modularity hypothesis by analyzing the overarching structure of an agreement. A more fragmented structure, in which discrete components are identifiable, is suggestive of a modular, rather than an integrated system. But such fragmentation is only a necessary condition to concluding that merger agreements have a modular, not a sufficient structure. Further evidence that the divisions between parts of the agreement are purposefully designed to cabin related elements into coherent sub-systems is needed to conclude that merger agreements reflect a modularity strategy. For that reason, the study also tests the following two additional hypotheses:

H2a: Emergent sub-structures will correspond to the sections of the agreement imposed by the transactional attorneys designing the agreement, consistent with the proposition that a modular system has discrete, bounded sub-systems.

H2b: Emergent sub-structures will correspond to the sections of the agreement that subject-matter specialists commonly address, consistent with the proposition that a modular system has discrete, bounded sub-systems.

Both *H2a* and *H2b* build upon *H1* by positing a logic underlying any modularity that is observed. *H2a* assumes that transaction designers pursuing a modularity strategy will explicitly organize the agreement into separate modules. *H2b* assumes that modules will correspond with specific subject matters, such as grouping all of the antitrust-, tax-, or environmental-related provisions together.

2. Hypotheses Relating to Organizational Structure

The first hypothesis relating to organizational structure tracks *H1* above by positing that discrete sub-groups within the organizational structure will be identifiable, consistent with a modular design.

H3: The structure of the entire organization will be more fragmented than integrated, consistent with a modular organizational strategy.

To refine the analysis, the study also zeroes in on the structure of the core M&A teams. In a modular organizational system, these terms would

serve as the common interface that renders the work product of the various specialist attorneys on a deal interoperable.

H4: Discrete sub-groups within the core M&A group will be identified, consistent with stable teams of attorneys serving as the standard interface in a modular system.

B. Data

Testing these hypotheses requires detailed data on how merger agreements are structured and how the staffing on deals is organized within a firm.[145] This sub-section discusses how such data was collected. It is important to note at the outset that all of the data was obtained from publicly available sources, as described in detail below.

1. Merger Agreement Sample

The sample of thirty merger agreements analyzed here were hand-collected from LexisNexis' EDGAR filings database. Only the merger agreements of the three New York law firms—Cravath, Swaine & Moore LLP ("Cravath"), Davis Polk & Wardwell LLP ("Davis Polk"), and Shearman & Sterling LLP ("Shearman")—were sampled. To reduce the possibility of variation in contract structure over time, agreements from a two-year period, 2012–2014, were sampled.

Thousands of merger agreements are publicly available via EDGAR, and so the sample size is not restricted due to the availability of the contracts. Rather, the size of the sample is relatively modest because a team of research assistants manually executes the methods—outlined below—for converting a merger agreement into a matrix identifying the interconnections between provisions are executed manually by a team of research assistants. Manual data extraction is resource intensive, which practically constrains the sample size. Successful automation of the process will allow for the analysis of much larger samples, but those tools are still under development.

A team of research assistants extracted the relevant data from each merger agreement in the sample using the methods introduced below. Two methods were used to ensure consistency across the team. First, twenty percent of the agreements were originally double-blind coded by different research assistants in order to identify any inconsistencies in approach. Second, all data extraction was subject to a quality control process by which the

[145] *See infra* note 146 and accompanying text.

author reviewed the matrix produced for each contract and compared it to the original agreement.

The dataset resulting from this sampling approach has a number of limits, which caution against drawing broad conclusions from the results reported below. First, the sample includes agreements from only three New York law firms. Second, only mergers involving at least one public company are included in the sample, because private company mergers are not often disclosed via SEC filings. Finally, only the final executed version of each contract, rather than earlier drafts, is analyzed, which may, for instance, mean that greater modularity in the contract templates used in early stages is being overlooked in the analysis. Addressing these limitations is an important task for subsequent research.

2. Law Firm Sample

Data on the attorneys working on each of the agreements sampled above was taken from publicly available press releases issued by three New York law firms: Cravath, Davis Polk, and Shearman. Those firms were chosen because they are widely recognized to handle some of the most sophisticated transactions in the M&A market, and because all three firms disclose the information required for the study in their deal press releases. Other firms could have been used, of course, and an important task for future research is to expand the sample to additional law firms.

The Cravath, Davis Polk, and Shearman press releases all disclose the name, practice group, rank, and office location of the attorneys working on the given transaction.[146] Those disclosures provide a basis for inferring relationships between the lawyers on the deal team. Of course, it would be ideal to have more information—such as each lawyer's time entries or the e-mail traffic between members of a deal team—from which to draw inferences on attorneys' interactions. Due to the demands of confidentiality, however, such detailed information is not publicly available.

C. Methods

Testing the hypotheses requires the ability to analyze the structure of complex agreements and organizations. In other words, to determine whether merger agreements and the law firms that design them are more modular or integrated, one must be able to examine the interconnections between

[146] *See, e.g.*, *Shearman & Sterling Advises ICE on Its US$11 Billion Acquisition of NYSE Euronext*, SHEARMAN & STERLING LLP (Nov. 13, 2013), http://www.shearman.com/en/newsinsights/news/2013/11/nyse-euronext [https://web.archive.org/web/20131127122418/http://www.shearman.com/en/newsinsights/news/2013/11/nyse-euronext] [hereinafter *Shearman & Sterling Advises ICE*].

components of each type of system to identify and interpret patterns. One needs a light to illuminate the black boxes of merger agreement and law firm structure.

This study leverages the tools of network analysis to analyze contractual and organizational structure in the M&A market. By taking that approach, this study departs from existing measures of contractual complexity. Over the years, researchers have developed a number of approaches to measuring contractual complexity, but none of them provide a framework for studying complexity-qua-interdependency. Efforts have included measuring complexity by the number of pages in an agreement,[147] the quantity of kilobytes in the digital version of an agreement,[148] or the number of provisions in an agreement.[149] Perhaps the most promising approach to date is the multidimensional "cognitive load" metric, which captures the complexity indirectly by measuring the extent to which an agreement taxes the faculties of the humans designing the contract.[150] Although important steps in the right direction, these measures of contractual complexity do not directly illuminate the interdependencies between governance mechanisms, and, therefore, do not provide the level of detail necessary to test the hypotheses outlined above.

Network analysis, however, provides concepts and methods capable of studying the interconnections between the governance mechanisms in complex agreements. Treating a complex agreement as a network allows one to break the contractual system down into constituent sub-units, trace links between sub-systems, and identify structures for processing change within sub-units or across the entire system. Thus, both merger agreements and the law firms that design them are treated, like many complex systems, as networks, and network analysis is used to examine how the constituent parts of the networks interact with one another.

Applying network analysis involves two steps. First, relationships between components in a complex system, such as a merger agreement or a

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[147] *See* Stuart L. Gillan et al., *Explicit Versus Implicit Contracts: Evidence from CEO Employment Agreements*, 64 J. FIN. 1629, 1637 (2009).

[148] *See* Robinson & Stuart, *supra* note 2, at 586.

[149] *See* Africa Ariño & Jeffrey J. Reuer, *Designing and Renegotiating Strategic Alliance Contracts*, 18 ACAD. MGMT. EXECUTIVE 37, 46–47 (2004); Jeffrey J. Reuer & Africa Ariño, *Strategic Alliance Contracts: Dimensions and Determinants of Contractual Complexity*, 28 STRATEGIC MGMT. J. 313, 320–22 (2007); Michael D. Ryall & Rachelle C. Sampson, *Formal Contracts in the Presence of Relational Enforcement Mechanisms: Evidence from Technology Development Projects*, 55 MGMT. SCI. 906, 913 (2009).

[150] Eggleston et al., *supra* note 2, at 99; Hagedoorn & Hesen, *supra* note 2, at 825–28 (calculating cognitive load as a combination of "mental load, mental effort, and performance").

law firm, must be plotted on an "adjacency matrix."[151] For the merger agreements studied, this is accomplished through the use of "design structure matrices" ("DSMs"). [152] DSMs developed in systems engineering research to map the interconnections between sub-systems in a complex piece of technology, and thereby render them susceptible to study.[153] For the law firms, relationships between attorneys within the law firms are plotted on a matrix according to whether the lawyers worked on the same matters. Those adjacency matrices provide the basis for the second step, which is to apply graph theory to study patterns within the contract and law firm networks.

1. Creating Adjacency Matrices

a. The Merger Agreement Matrices

This study's first step in examining the structure of a complex contract is to track the relationships between the different provisions in a given agreement. To do so, the study maps the explicit, or direct, references from one section to another, or to defined terms, that the transaction designers placed expressly within the merger agreement. This involves the use of a design structure matrix. DSMs are a tool for visualizing and analyzing system structure developed in engineering research in the 1980s and are applied to a wide range of technologies.[154] Subsequent research has refined DSM methodology and extended it to organizational research.[155]

Depicting a complex system as a square matrix allows one to tally interconnections between components. Components of the system are listed in the first column and repeated across the first row of the matrix.[156] Interac-

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[151] *See* MATTHEW O. JACKSON, SOCIAL AND ECONOMIC NETWORKS 21 (2008).

[152] *See generally* Donald V. Steward, *The Design Structure System: A Method for Managing the Design of Complex Systems*, EM-28 IEEE TRANSACTIONS ON ENGINEERING MGMT. 71 (1981) (introducing the DSM concept and basic methodology) [hereinafter Steward, *Design Structure System*].

[153] *See generally id.*

[154] *See generally* DONALD V. STEWARD, SYSTEMS ANALYSIS AND MANAGEMENT: STRUCTURE, STRATEGY AND DESIGN (1981) (describing DSMs in engineering context); Steven D. Eppinger, *Model-Based Approaches to Managing Concurrent Engineering*, 2 J. ENGINEERING DESIGN 283 (1991) (same); Steven D. Eppinger et al., *A Model-Based Method for Organizing Tasks in Product Development*, 6 RES. ENGINEERING DESIGN 1 (1994) (exploring design models in technology); Viswanathan Krishnan et al., *A Model-Based Framework to Overlap Product Development Activities*, 43 MGMT. SCI. 437 (1997) (exploring design models in technology); Steward, *Design Structure System*, *supra* note 152 (introducing the DSM concept and basic methodology). Eppinger has since produced an authoritative survey of DSM concepts and methods. *See generally* STEVEN D. EPPINGER & TYSON R. BROWNING, DESIGN STRUCTURE MATRIX METHODS AND APPLICATIONS (2012) (surveying DSM methods and concepts).

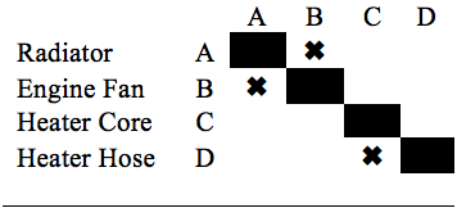
[155] *See, e.g.*, MacCormack et al., *supra* note 136, at 1310–12.

[156] *See* EPPINGER & BROWNING, *supra* note 154, at 4.

tions between components in the system are then logged in the intersecting cells of the matrix according to a pre-determined decision rule. In engineering contexts, that decision rule may be straightforward, such as logging an interdependency if there is a physical connection—such as a wire—between two components.

A simple example illustrates how interdependencies in a system are traced.[157] Imagine that four components—a radiator, an engine fan, a heater core, and a heater hose—comprise an automotive cooling system. The relationships between those four components can be represented in a DSM, such as that found in Figure 4 below. Dependencies between the four components are indicated in the DSM by an "x" if there is a physical connection running from a component listed in the left column to a component listed in the top row. If the connection is bidirectional, as in the case of the radiator and the engine fan, then note that an "x" is placed in both cell BA and cell AB. The black-filled cells falling along the diagonal of the matrix indicate that each component is assumed to interact with itself, so to speak, and therefore, such "self-loops" are uninteresting.

Figure 4[158]
DSM of a Simplified Automotive Cooling System



Similar matrices were constructed for the merger agreements sampled for this study. The first columns and rows of each matrix were populated with the separate sections of the given agreement, broken down to the sub-subsection level for a granular view of the linkages within the contract.[159] Then, dependencies between those components were logged in the matrix. Components could be dependent in two senses.[160] First, a component could explicitly

[157] This example is derived from *id.* at 21–22.

[158] This Figure is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[159] In other words, the DSM would consider, for instance, Section 1.1(a)(i) a separate component in the system.

[160] Note that a third type of dependency—implicit references from one provision to another—are not coded here. Implicit references were excluded from the study because, until automated

refer to a defined term that was defined in another sub-section in the body of the agreement or in the definitional section of the contract. For example, a specific provision in the seller's representations and warranties might refer to a definition of Material Adverse Effect, for which a definition is found in the definitional section of the agreement. In that case, the provision was coded as being dependent upon the section of the contract where the term was defined. Second, a provision could contain an explicit reference to another section of the agreement. For instance, the "bring-down" condition in a merger agreement explicitly refers, often by section number, to certain representations and warranties of sellers given earlier in the contract.

Each time a provision contained one of those two reference types, a dependency was tallied on the matrix at the intersecting cell between the provision in which the reference was made and the referenced provision. That coding method means that a single provision could have multiple dependencies, such as when a provision references more than one defined term. That coding method also means that a provision could reference the same provision more than once, leading to a weighted measure. That weighting is simply quantitative, however, and does not reflect a qualitative notion that, particularly in practitioners' eyes, some provisions are more important than others.

Once populated, the DSM for an agreement provides a foundation for studying patterns in the relationships between the interconnections between sub-systems. A DSM is useful in itself because it provides a high-level view of system structure and detailed information on the relationships between provisions in the contract.[161] For instance, a simple visual review of a DSM quickly provides an analyst with a sense of whether the system is comprised of discrete modules or has more integrated sub-systems.[162] Identifiable groups of ties between provisions suggest a more modular structure, while widely distributed ties indicate a more integrated agreement.[163]

b. The Deal Team Matrices

To capture the internal structure of the law firms designing each transaction, a matrix was created for each firm of all the attorneys working on M&A deals from 2012–2014. A link was logged between two lawyers on the matrix whenever those two lawyers worked on a transaction together,

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tools are developed to identify implicit references, their inclusion likely reduces replicability of the study to a significant extent. Because implicit references are not included in the study, the total number of dependencies identified in each agreement is likely underreported.

[161] *See generally* MacCormack et al., *supra* note 136 (finding evidence of mirror hypothesis through study utilizing DSM).

[162] *Id.* at 1310–11.

[163] *See id.* at 1310–12.

subject to certain exceptions. As noted above, detailed information on each lawyer's involvement in a matter is unavailable, and so several conservative assumptions are made to add texture to the data. First, on every deal it is presumed that the senior attorneys—i.e., partners, counsel, and of counsel—in the core M&A group who run the deal, regularly interact with all of the other senior attorneys who are subject-matter specialists.[164] That leads to two corollary assumptions: first, that senior attorneys do not interact with associates outside of their practice group;[165] and second, that senior attorneys that are subject-matter specialists do not interact with any other subject-matter specialists.[166]

2. Applying Network Analytics

Visual analysis of a contract DSM or a law firm matrix provides one with a rough sense of a system's structure, but the matrices alone do not produce metrics by which agreement structure can be assessed systematically, such as with methods of statistical inference. These more rigorous analyses are available, however, if the tools of network analysis are applied to the DSM. In short, a DSM can be used as an "adjacency matrix" listing the nodes

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[164] This presumption reflects the intuition that to provide high-level strategic advice to a client, collaboration between partners, counsel, and of counsel in the M&A group and attorneys of the same rank in specialist practice groups is necessary.

[165] It is likely that, in a non-trivial amount of deals, this assumption that associates do not interact with senior attorneys in other practice groups is too strong because senior associates (i.e., associates that have been working at the firm for six or more years) will often have regular interactions with partners, counsel, and of counsel in other practice groups on a matter. The assumption, however, is likely quite sound as to junior associates, who typically interact only with attorneys within their practice group. Fine tuning this assumption would require seniority data on each associate within the sample, which is difficult to gather because many New York law firms do not publicly provide such information in an attempt to make it a bit more difficult for headhunters to target their associates. Thus, gathering that more detailed data is deferred to later research. The effect on the analysis here is to underreport deal team integration and to bias the results towards finding evidence of modularity because the interactions between attorneys appear more fragmented than they likely are in reality.

[166] It is likely that, in a non-trivial number of deals, this assumption that senior attorneys who are subject-matter specialists do not interact is too strong. For instance, an antitrust partner, advising on the implications of a Department of Justice or Federal Trade Commission investigation for deal timing, may coordinate her advice with a litigation partner, who is providing advice on the implications of shareholder lawsuits challenging the merger. In many situations, however, specialist senior attorneys will have very little, if any, interaction—for example, that same antitrust partner will likely not interact with a finance partner providing advice on a financing arrangement ancillary to a transaction. Fine tuning this assumption would require data, perhaps gathered through surveys, on the typical interactions between specialty practice groups. Collecting that information is deferred to later research. The effect on the analysis here is to underreport deal team integration and to bias the results towards finding evidence of modularity, because the interactions between attorneys appear more fragmented than they likely are.

in a network and the links between them.[167] Then, graph theory can be applied to study the relationship between nodes, including whether they are grouped in discrete sub-systems.[168] The discussion that follows outlines the methods for undertaking such analysis.

Network analysis is now a mature field cutting across several academic disciplines, including physics, ecology, sociology, and economics.[169] Given the breadth and depth of the field, this Article summarizes only important fundamentals and relevant methods, and the reader is directed to the many useful introductory texts for more thorough discussion of the analytical tools available.[170] The discussion here is enough to orient the reader, but should not be mistaken for an exhaustive treatment of the subject.

a. Basic Measures

The analytical tools developed to illuminate network properties fall roughly into two categories. The first category provides information specific to the individual nodes in the network (node measures).[171] Those node measures are not particularly useful for testing the hypotheses introduced above, but they are critical inputs for the methods that are used. An elementary node measure on which many other metrics are based is a node's *degree*, which is the number of links a given node has to other nodes.[172] Based on the degrees of the nodes in a network, one can then calculate the *degree centrality* for each node, which is the ratio of a given node's degree to the total number of nodes in the network.[173] Additional centrality measures have been developed to provide further information on how a given node is situated in its *neighborhood*. For instance, *betweenness centrality* measures the extent to which a node is located on the shortest path, measured in geodesic distance,[174] between all other nodes in the network.[175] Relatedly,

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[167] *See* JACKSON, *supra* note 151, at 21. This study treats the matrix as an undirected, weighted network.

[168] *See id.*

[169] *See* Peter J. Carrington & John Scott, *Introduction*, *in* THE SAGE HANDBOOK OF SOCIAL NETWORK ANALYSIS 1, 1–4 (John Scott & Peter J. Carrington eds., 2011).

[170] *See generally, e.g.*, JACKSON, *supra* note 151 (discussing methods of analyzing social networks); MODELS AND METHODS IN SOCIAL NETWORK ANALYSIS (Peter J. Carrington et al. eds., 2005) (collection of chapters on methodology regarding social network analysis); THE SAGE HANDBOOK OF SOCIAL NETWORK ANALYSIS, *supra* note 169 (collection of chapters on history and methodology regarding social network analysis); JOHN SCOTT, SOCIAL NETWORK ANALYSIS (4th ed. 2017) (describing history and methodology regarding social network analysis).

[171] *See* JACKSON, *supra* note 151, at 20–43.

[172] *See id.* at 29.

[173] *See id.* at 38–39.

[174] *See id.* at 24 (defining a geodesic between two nodes as the "path with no more links than any other path between [those two] nodes").

closeness centrality measures the average geodesic distance from a given node to all other nodes in the network.[176] Finally, *eigenvector centrality* calculates a centrality measure for a given node based on the density of the connections of the nodes to which it is connected.[177] Thus, a node with few direct links to other nodes may nevertheless have a high eigenvector centrality measure if the few nodes to which it is connected have many links to other nodes.[178]

The second category of tools provides information regarding the network as a whole (network measures).[179] This class of measures, which illuminate the relationships between the sub-systems of a network, is the tool needed to test the hypotheses introduced above. Network measures often build upon node-level measures. For instance, using the degree measure for each node in a network, one can then determine the proportion of nodes within the network that are linked to one another. That measure, called the *density* of a network, is calculated as the proportion of possible links in a network that are in fact connections between nodes.[180] One can also determine the *degree distribution* of links across the nodes in the network, with node degrees in some networks being distributed normally, skewed, or "scale-free."[181] Alone, these summary measures are not sufficient to determine whether a contractual system is modulated or integrated, but they provide a simple sense of the thickness of the interdependencies within the system and inform the use of more targeted tools.

b. Analyzing Network Structure

This study relies primarily upon three types of network measures to test the hypotheses introduced above: clustering coefficients, fragmentation statistics, and, particularly, modularity metrics. The first two, *clustering coefficients* and *fragmentation statistics*, are fairly rough measures of a complex system's structure. A common way of measuring clustering within a network is to select a node and then measure the density of all of the nodes to which it

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[175] *See id.* at 39.

[176] *See id.*

[177] *See id.* at 41–43, 49–50.

[178] *See id.* For further discussion on the use of spectral methods in network analysis, see generally Andrew J. Seary & William D. Richards, *Spectral Methods for Analyzing and Visualizing Networks: An Introduction*, *in* DYNAMIC SOCIAL NETWORK MODELING AND ANALYSIS: WORKSHOP SUMMARY AND PAPERS 209 (Ronald Breiger et al. eds., 2003) (describing types of spectral methods in network analysis).

[179] *See* JACKSON, *supra* note 151, at 20–37.

[180] *Id.* at 29.

[181] *Id.* at 30–31. A network with a scale-free distribution has "fat tails," which means that there are more nodes with a very small or a very large degree than in a normal distribution. *Id.*

is connected—i.e., the nodes in its neighborhood.[182] One can then calculate a coefficient for the entire network by averaging the clustering measures for all the individual nodes.[183] That network-wide coefficient provides a better sense than the density measure mentioned above of the extent to which groups of contractual provisions are identifiable. The second measure, fragmentation, takes a different approach by focusing on where gaps between groups of nodes occur. This approach searches a network for separate *components*, which are internally connected sub-graphs that are entirely disconnected from other sub-graphs within a broader network.[184] With components identified, it is possible to calculate the overall fragmentation of a network. Similar to calculating a market concentration ratio using the Hirschman-Herfindahl Index often employed in antitrust analysis,[185] overall fragmentation of a network is calculated as the proportion of a network's total nodes that fall within discrete components. This formula results in a measure between zero and one, with greater values indicating greater fragmentation within the network.[186]

Even more targeted analyses of a contractual system's structure are required to test our hypotheses fully, however. The fragmentation measure discussed above only identifies absolute boundaries between sub-systems,

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[182] Robert A. Hanneman & Mark Riddle, *Concepts and Measures for Basic Network Analysis*, *in* THE SAGE HANDBOOK OF SOCIAL NETWORK ANALYSIS, *supra* note 169, at 340, 345–46.

[183] *Id.* at 346. The clustering coefficient, C_i, of vertex i is commonly calculated as follows: Assume i is connected to neighbors k_i, that the total number of possible links with those neighbors is at most $k_i(k_i\text{-}1)/2$, and that the actual number of links with those neighbors is represented as n_i. In that case, C_i of vertex i is calculated as the following ratio:

$$C_i = \frac{2n_i}{k_i(k_i - 1)}$$

With that ratio calculated for all of the vertices in the network, it is then possible to calculate an average clustering coefficient, C, for the entire network as follows:

$$C = \frac{1}{N}\sum_{i=1}^{N} C_i$$

Dan Braha & Yaneer Bar-Yam, *The Statistical Mechanics of Complex Product Development: Empirical and Analytical Results*, 53 MGMT. SCI. 1127, 1129 (2007).

[184] *See* JACKSON, *supra* note 151, at 26.

[185] Stephen P. Borgatti, *Identifying Sets of Key Players in a Social Network*, 12 COMPUTATIONAL & MATHEMATICAL ORG. THEORY 21, 26–27 (2006); *see* U.S. DEP'T OF JUSTICE & FED. TRADE COMM'N, HORIZONTAL MERGER GUIDELINES § 5.3 (2010), https://www.ftc.gov/sites/default/files/attachments/merger-review/100819hmg.pdf [https://perma.cc/GR8Y-4SFA] (demonstrating how the Hirschmann-Herfindahl Index is used to calculate market concentration in conventional merger analysis).

[186] More precisely, the formula for calculating network fragmentation (F) is as follows:

$$F = 1 - \frac{\sum_k s_k\,(s_k - 1)}{n(n-1)}$$

Where n = the total number of nodes within the network and s_k is the number of nodes in the k^{th} component of the network. Borgatti, *supra* note 185, at 26–27.

not instances where the ties between nodes are less dense than elsewhere in the network. The clustering coefficient captures that concept of relative density, but it does not identify the nodes populating each cluster.

Researchers have developed a number of tools, conveniently referred to as "modularity" metrics, for analyzing the internal "community structure" of a complex network in greater detail.[187] Those methods are capable of identifying subtle boundaries between sub-systems, and they provide detailed information on the nodes within each sub-system. That level of detail allows comparison of the emergent structure of an agreement with the hypotheses introduced above.

This Article focuses upon a family of divisive algorithms, developed in the field of computational physics by Newman and collaborators, that identify dissimilarities between nodes in order to define the boundaries between discrete sub-systems within a network.[188] Specifically, it applies to methods for calculating Newman's "modularity measure,"[189] which over time has become the most widely-used metric.[190] In Newman's formulation, the modularity of a network is defined as "the number of edges falling within [discrete] groups minus the expected number in an equivalent network with edges placed at random."[191] As that formulation suggests, Newman's modularity measure is based upon the premise that modular boundaries are best identified by comparing the actual structure of a network to the allocation of links in a random network with an equal number of nodes.[192] That is, the algorithm identifies a boundary between discrete node groupings, or "modules," where there is a "*fewer than expected" number* of links between nodes.[193] That conception of substructure employs probability fundamentals familiar to any statistician: sub-systems are defined by analyzing when the

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[187] *See* M.E.J. Newman, *Communities, Modules and Large-Scale Structure in Networks*, 8 NATURE PHYSICS 25, 25–28 (2012) [hereinafter Newman, *Communities*].

[188] M.E.J. Newman & M. Girvan, *Finding and Evaluating Community Structure in Networks*, E 69 PHYSICAL REV. 026113-1 to -2 (2004).

[189] *See* M.E.J. Newman, *Modularity and Community Structure in Networks*, 103 PROC. NAT'L ACAD. SCI. U.S. 8577, 8578 (2006) [hereinafter Newman, *Modularity*]; Newman & Girvan, *supra* note 188, at 026113-7. For an overview of various approaches for studying network substructure, in which Newman's modularity measure is included, see Hanneman & Riddle, *supra* note 182, at 352–56.

[190] Newman, *Communities*, *supra* note 187, at 28 ("A variety of different measures for assigning scores [of network structure] have been proposed, such as the so-called E/I ratio, likelihood-based measures and others, but the most widely used is the measure known as the modularity.") (internal citations omitted).

[191] Newman, *Modularity, supra* note 189, at 8578.

[192] *Id.*

[193] *See id.* (emphasis added).

number of links between a collection of nodes is statistically different from a random allocation of links.[194]

Newman and collaborators have developed two variations of the metric. The calculations for each measure are quite complicated; concise summaries are provided in the footnotes to the text that follows, but the interested reader is encouraged to consult the original sources, cited below. The first variation of the modularity measure will be referred to as Newman-Girvan Modularity. This measure identifies sub-groups within a network by, first, identifying the links in the network with the highest betweenness values—i.e., the links that are along the shortest paths between large numbers of nodes within the network. It then iteratively removes those links from the network, and then, chooses the iteration that optimizes the expression in order to determine the number of discrete sub-groups.[195] The second variation of the modularity measure, which will be referred to as Newman Modularity, uses a comparison of the actual network's and random network's eigenvalues, rather than link removal, to identify module boundaries.[196] Regardless of the boundary defini-

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[194] *See id.*

[195] Newman & Girvan, *supra* note 188, at 026113-3 to -5. Newman and Girvan's algorithm has four steps: "(i) Calculate betweenness scores for all [links] in the network. (ii) Find the [link] with the highest score and remove it from the network . . . . (iii) Recalculate betweenness for all remaining edges. (iv) Repeat from step (ii)." *Id.* at 026113-3. That algorithm provides the most accurate depiction of the modular structure of a network, where the number of links between nodes in a module is higher than what is expected in a random allocation of links in a network of the same size. *See id.* at 026113-3 to -7. This approach to calculating modularity (Q) is represented mathematically as:

$$Q = \sum_{i=1}^{k} (e_{ii} - a_1^2),$$

where k represents the number of communities within the network, e_{ii} represents the probability that a link is in module i, and a_i represents the probability that a random edge would fall into module i. *See id.* at 026113-7.

[196] *See* Newman, *Modularity*, *supra* note 189, at 8578–79. Newman's modularity measure is calculated in a series of steps, the most salient of which are summarized here in simplified form. This summary is derived from M.E.J. Newman's work, *Modularity and Community Structure*, and the reader is directed to the original text for a more complete recitation of the calculation. *Id.* Recall that the core of Newman's modularity measure is a calculation of the difference between actual links in a network and the links in a randomly allocated network of the same size. *Id.* at 8578. So, the first step is to assume an actual network, A, with n nodes, and with links between nodes i and j. Second, generate a randomly-determined null network, which is calculated as the product of ki and kj divided by two times the network's total number of links, m. Third, assume that, for sake of simplicity, one is interested in determining whether the nodes in the actual network, A_{ij}, fall into only two groups. In that regard, allow $s_i = 1$ if node i falls within the first group and $s_i = -1$ if i falls within the second group. *Id.* at 8578. The modularity (Q) of the actual network is then calculated as the difference between A_{ij} and $k_i k_j/2m$ over all pairs of nodes that are included in the same group. *Id.* at 8578. Because group membership of a given node is represented by the positive integer 1 if it is in group one and negative integer -1 if it is in group two, the node pairs

tion method, both approaches employ the same probabilistic method for calculating the modularity of the system. They result in a measure ranging from zero to one, with greater values indicating a more modular structure to the network.[197] These modularity measures also identify the nodes within each module, which permits testing *H2a* and *H2b*. To increase the robustness of the results, both the Newman-Girvan and Newman Modularity measures are applied here.[198]

D. Results

Applying those methodologies outlined above illuminates the structure of the contracts and law firms sampled. Neither merger agreements nor the deal teams that design them exhibit significant evidence of modularity. Instead, the preliminary results below suggest that both merger agreements and law firms are integrated systems, organized according to a logic of flexible specialization.

1. The Integrated Structure of Modern Merger Agreements

Analysis of the sample of merger agreements produces modest evidence of modularity. Contrary to *H1*, which hypothesizes that contractual structure will be comprised of multiple discrete sub-systems reflecting a modular organization, the results presented below indicate that the structure of merger agreements is more integrated than modular. Furthermore, the

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are determined to be in the same group if $½(s_i s_j + 1) = 1$ but not in the same group if $½(s_i s_j + 1) = 0$. The calculation is represented mathematically as follows:

$$Q = \frac{1}{4\mathrm{m}}\sum_{ij}\left(\mathrm{A}_{ij} - \frac{k_i k_j}{2m}\right)(s_i s_j + 1) = \frac{1}{4m}\sum_{ij}\left(A_{ij} - \frac{k_i k_j}{2m}\right)s_i s_j.$$

The leading factor in that expression is included as a convention for normalizing results.
The fourth step is to express that equation in matrix form, so an analysis of the nodes' eigenvectors can be undertaken. With the expression stated in matrix form, one can then calculate the modularity of the network as follows:

$$Q = \frac{1}{4m}\sum_{i} a_i \mathbf{u}_i^T B \sum_{j} a_j \mathbf{u}_j = \frac{1}{4m}\sum_{i-1}^{n}(\mathbf{u}_i^T \cdot \mathbf{s})^2 \beta_i,$$

where **s** is the sum of the normalized eigenvectors, $\mathbf{u}_i$, of the matrix, **B**, and β_i is the eigenvalue of **B** that corresponds to eigenvector $\mathbf{u}_i$, Recall that the question is whether nodes *i* and *j* are in the same group, or module, and so the final step is to solve the expression so as to find a value for **s** that maximizes the value of *Q*. Maximizing *Q* involves choosing a value for **s** with the largest eigenvalues, β_i. *Id.* at 8578–79. Newman's modularity measure is similar to spectral graph partitioning, although some important differences exist. *See id.* at 8578.

[197] *See* Newman, *Modularity*, *supra* note 189, at 8578–79; Newman & Girvan, *supra* note 188, at 026113-7.

[198] *See* Newman, *Modularity*, *supra* note 189, at 8578–79; Newman & Girvan, *supra* note 188, at 026113-3 to -5.

substructures that do emerge do not correspond with the overt organizational structure—i.e., the arrangement of articles, sections, and sub-sections in a given agreement—imposed by the transaction designers, as *H2a* hypothesizes. They also do not correspond with the organization of particular subject matters—i.e., the provisions of the agreement upon which certain specialist attorneys commonly focus—as *H2b* hypothesizes. Taken together, the results below provide limited evidence of modular structure within the merger agreements studied.

The results are presented in two parts. First, to demonstrate the application of the methods introduced above, the results of a case study are provided.[199] The case study is an analysis of the merger agreement executing the 2012 merger of NYSE Euronext ("NYSE") and the Intercontinental Exchange ("ICE"), which was the subject of the shareholder litigation mentioned in the Introduction above.[200] The NYSE/ICE merger agreement is a fairly typical contract, exemplary of the merger agreements sampled. The second part then presents the results of analyzing the entire sample of merger agreements.

a. Case Study: Intercontinental Exchange's Acquisition of NYSE Euronext

The recent merger of NYSE with ICE provides a useful case study illustrating the network analysis methods outlined above. NYSE has historically been one of the leading stock exchanges in the world, and ICE is a recent market entrant that operates electronic exchanges for a number markets, including over-the-counter energy markets, global futures markets, and other cleared over-the-counter products.[201] The cash/stock transaction was valued at approximately $8.2 billion, and the deal was sold to shareholders as an opportunity to "combine[] two leading exchange groups to create a premier global exchange operator diversified across markets."[202] Counsel for NYSE was Wachtell, Lipton, Rosen & Katz, and ICE was represented by Shearman, which advised on European aspects of the transaction, and Sullivan & Cromwell LLP, which advised on U.S. issues.[203]

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[199] *See infra* notes 201–211 and accompanying text.

[200] *See supra* note 7 and accompanying text.

[201] *See* Press Release, Intercontinental Exch., Intercontinental Exchange to Acquire NYSE Euronext for $33.12 Per Share in Stock and Cash, Creating Premier Global Market Operator (Dec. 20, 2012), http://ir.theice.com/press/press-releases/all-categories/2012/12-20-2012 [https://perma.cc/KK2M-8M24]; *Intercontinental Exchange: Overview,* INTERCONTINENTAL EXCHANGE (May 2017), https://www.theice.com/publicdocs/ICE_at_a_glance.pdf [https://perma.cc/LXL4-SFBD].

[202] Press Release, *supra* note 201.

[203] *See* Michael J. de la Merced, *Upstart Market Operator Clinches $8.2 Billion Deal for N.Y.S.E.*, N.Y. TIMES (Dec. 20, 2012, 8:39 AM), https://dealbook.nytimes.com/2012/12/20/

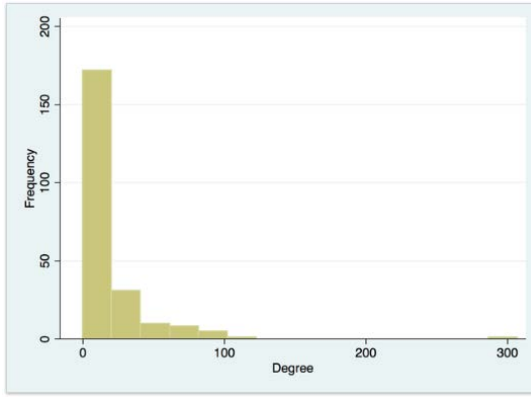
Interconnections between provisions in the NYSE/ICE agreement were first plotted in a DSM using the methods outlined above.[204] That DSM was then converted into a network graph. The summary statistics for the network graph of the NYSE/ICE agreement, reported below in Table 1, reveal a governance system that has 229 nodes and 1029 links. This data results in a network that is sparsely connected—density measures as only 0.021—although the average node degree is 23.345. As Figure 5 demonstrates, the network's degree distribution is right skewed.

Table 1[205]

NYSE/ICE Agreement Network Summary Statistics

Measure	Value
Node Count	229
Link Count	1029
Average Degree	23.345
Network Density	0.021
Diameter	25

Figure 5[206]



upstart-market-operator-clinches-8-2-billion-deal-for-n-y-s-e/ [https://perma.cc/3X6C-7XCA] (listing counsel of both parties); *Shearman & Sterling Advises ICE*, *supra* note 146.

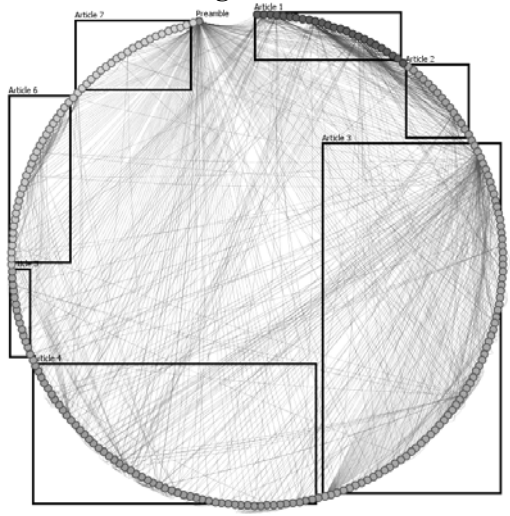
[204] The NYSE/ICE agreement's DSM is so large that, when replicated on the printed page, it is virtually impossible to analyze closely.

[205] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[206] This Figure is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

Figure 6 below presents the NYSE/ICE merger agreement network graph with nodes arranged in a circular layout. References between provisions are represented as ties from one node to another. The articles of the agreement are indicated by the boxes encompassing certain nodes in the network. A visual review of the network graph in Figure 6 gives the impression that the NYSE/ICE merger agreement is a more integrated, rather than modular, system.

Figure 6[207]



Systematic analysis of the NYSE/ICE agreement's substructures confirms the impression from Figure 2 that the contract exhibits limited modular design. As reported in Table 2 below, the clustering coefficient for the network is modest. There are only two isolated nodes in the network, and the network is otherwise composed of a single component. As a result, the fragmentation measure is also low. Finally, the modularity statistics provide modest evidence of modular structure. The Newman-Girvan value is 0.000, which provides no evidence of modularity. The Newman value is a larger, but still relatively low, 0.390.[208] The Newman modularity algorithm, which provided

[207] A full color version of this Figure is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[208] *See* Girvan & Newman, *supra* note 188, at 026113-7 (indicating that most networks across a wide range of phenomena have modularity measures between 0.3 and 0.7). By way of comparison, it is interesting to note that analyzing the structure of the American Bar Association's model merger agreement resulted in a materially greater Newman modularity measure of 0.579. Although the ABA model merger agreement is rarely used as the starting precedent in sophisticated M&A transactions, it is suggestive of the type of modularity that may be found in standard tem-

the higher modularity value, identified five primary modules of different sizes, the largest having ninety-three nodes and the smallest having six.[209]

Table 2[210]
NYSE/ICE Agreement Substructure Measures

Measure	Value
Clustering Coefficient	0.302
Isolates	2
Components (2+ nodes)	1
Fragmentation	0.017
Newman-Girvan Modularity	0.000
Newman Modularity	0.390

Taken together, the NYSE/ICE agreement's low clustering coefficient, fragmentation measure, and modularity values provide little evidence supporting *H1*.

Tests of *H2a* and *H2b* also provide little evidence of modular structure. *H2a* and *H2b* are tested in the following respects. To test *H2a*, the NYSE/ICE agreement's substructure is analyzed to determine whether the module boundaries identified with the Newman Modularity algorithm correspond with the predetermined structure of the agreement. That is, each module identified with the Newman algorithm is examined to see whether the nodes included in the module correspond with a discrete section of the agreement. For instance, if all of the nodes in a given module are provisions within the seller's representations and warranties, a major section in any merger agreement, then one would conclude that the given module's boundaries coincide with part of the express structure of the agreement.

To test *H2b*, the NYSE/ICE agreement's substructure is studied to determine whether the module boundaries correspond with the segmentation of subject matter expertise. Each module identified with the Newman algorithm is analyzed to see whether the module boundaries correspond with the provisions that a given subject-matter specialist—such as an antitrust, tax, envi-

plates that are typically used at many large firms. This would suggest that modularity may play a greater role in the early design stages of a transaction, and that the contractual system grows more integrated as customization proceeds.

[209] The algorithm also identified four 1-node modules, which are excluded from the results reported here.

[210] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

ronmental, or executive compensation attorney—typically focuses upon when advising upon the design of a merger agreement. Here, the analysis centers upon the antitrust provisions in a merger agreement: namely, representations with respect to required regulatory filings, covenants and risk-shifting provisions relating to the defense of the merger if competition authorities identify antitrust concerns, closing conditions, and termination provisions, including reverse termination fees triggered by regulatory obstacles.[211]

Table 3 below summarizes the results of those analyses. Column (a) in Table 3 provides the total number of nodes in each module. Column (b) reports results relevant to *H2a* by indicating the articles of the agreement in which the provisions included in the module are found. Modules appear to include provisions from many parts of the contract. For instance, provisions from Article 4, which sets forth the parties' covenants prior to closing, are found in every module. If module boundaries and sections of the agreement were coterminous, one would see modules with nodes from only one part of the agreement. What is observed, however, is a mix of nodes from different sections of the contract within every module. This observation indicates that the modularity algorithm is identifying substructures within the agreement that do not correspond with the predetermined structure of the contract.

Analysis of the correspondence between module boundaries and subject matter specialization provides little evidence supporting *H2b*. Column (c) of Table 3 indicates the number of nodes in a given module that are relevant to antitrust issues. The results indicate that antitrust provisions are not isolated to a single module. In the full form of the network, the antitrust provisions are split nearly evenly between the first two modules. In the reduced network that excludes outliers, the provisions are spread across four of the five modules. Furthermore, in every module in which they appear, the antitrust provisions are a fraction of the total number of nodes in the module. This result indicates that they are mixed with a large number of provisions relevant to other subject matters.

[211] Note that antitrust specialists typically also review the ordinary course covenants, but the analysis is to screen against gun-jumping and Section 1 concerns, which is different than the suite of provisions addressing the defense of the deal. *See* 1 ANTITRUST ADVISER, *supra* note 54, §§ 4.79–.80.

Table 3[212]

NYSE/ICE Agreement Direct References Network Module Measures

Module No.	Number of Nodes in Module	Articles Included in Module	Number of Antitrust-Relevant Nodes
	(a)	(b)	(c)
Module 1	93	P, 1, 2, 3, 4, 5, 6, 7	7 (7.52%)
Module 2	72	3, 4, 5, 7	5 (6.94%)
Module 3	48	1, 2, 3, 4, 5	0 (0.00%)
Module 4	8	3, 4	0 (0.00%)
Module 5	6	4	0 (0.00%)

In summary, evidence of modular design in the NYSE/ICE agreement is weak. The clustering coefficient and fragmentation values are low, the Newman-Girvan modularity measure is zero, and the Newman modularity measure is a modest 0.390. Further analysis finds no evidence that module boundaries correspond with either the formal structure of the agreement or subject-matter specialization.

b. Complete Sample

Analysis of the larger sample of thirty merger agreements confirms the results above. As Table 4 indicates, the NYSE/ICE merger agreement is typical with respect to number of nodes and links, and to network density, of the contracts included in the sample. Table 5 shows that the NYSE/ICE merger agreement is also similar to other agreements in the sample with respect to the metrics used to measure modulation of the contractual system. In that regard, the results reported in Table 5 also provide little evidence supporting *H1*.

Table 4[213]

Descriptive Statistics for Complete Merger Agreement Sample

Measure	Values				
	Min	Max	Mean	Median	Stan. Dev.
Nodes	196	730	355.767	342.500	110.577
Links	730	5007	1855.967	1782.000	904.374
Density	0.004	0.027	0.016	0.017	0.006

[212] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[213] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

Table 5[214]
Substructure Measures for Complete Sample of Merger Agreements

Measure	Value				
	Min	Max	Mean	Median	Stan. Dev.
Clustering Coeff.	0.226	0.406	0.328	0.321	0.053
Fragmentation	0.000	0.471	0.094	0.029	0.131
Newman-Girvan Modularity	0.000	0.002	0.000	0.000	0.001
Newman Modularity	0.288	0.657	0.417	0.391	0.086

Analysis of the larger sample also produced little evidence supporting *H2a* and *H2b*. Modules identified in the sample agreements using the Newman Modularity algorithm rarely coincided with either the express structure of the agreement or the subject-matter specialization, as measured by the antitrust-related provisions in the contracts.

2. The Recombinant Architecture of M&A Deal Teams

This sub-section examines the organization of the deal teams that designed the sampled agreements analyzed above.[215] The results of that analysis suggest that, like the complex agreements they design, M&A deal teams are highly integrated, rather than entirely modular, systems. Interestingly, the core attorneys in the deal teams—the M&A lawyers that run each deal, coordinating the efforts of the various subject-matter specialists—consistently recombine in different configurations from transaction to transaction. This method creates a thick network of relationships at the core of the organization. Presumably, that network promotes the diffusion of information and maintains the routines necessary for effective tacit coordination.

Although acquisitive companies may run non-idiosyncratic deals largely through their internal corporate development team and in-house counsel, merger agreements are often extraordinary transactions designed in significant part by the merging parties' external lawyers.[216] A wide range of firms advise on M&A matters, from small deals involving privately-held companies to the multi-billion dollar public company transactions that occupy the front pages of the Financial Times and Wall Street Journal. At the top of the market for M&A counsel are the large Wall Street law firms. These firms are more or less characterized by the following: (1) all-equity partnerships; (2) business models built around billable hours, with success

[214] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].
[215] *See supra* notes 145–146 and accompanying text.
[216] *See* Hwang, *supra* note 19, at 1417.

fees possibly playing a supplementary role in a number of transactions; (3) a demanding up-or-out system of promotion for associate attorneys; and (4) cross-border platforms capable of servicing transactions with multijurisdictional implications.[217]

At the large Wall Street firms, M&A transactions are typically run by deal lawyers in the firm's "Corporate" or "M&A" group. These M&A attorneys then bring in subject-matter specialists—such as antitrust, environmental, executive compensation and benefits, or tax lawyers—to work on a deal as needed.[218] The M&A lawyers may also invite M&A attorneys or subject-matter specialists from other offices in the firm to participate in the deal team, if, for example, cross-border issues arise.

a. Case Study: Shearman & Sterling LLP

To illustrate the application of network analysis to study the organizational structure of a corporate law firm's M&A lawyers, a case study of approximately 100 deal teams at Shearman from 2012–2014 is presented. Shearman is one of the oldest Wall Street law firms, founded when Thomas Shearman and John Sterling opened a law office in New York in 1873.[219] Over the subsequent years, it distinguished itself as counsel to clients such as the National City Bank of New York (now Citibank) and Ford Motor Company, as one of the earliest U.S. law firms to expand globally, and as a leading adviser in M&A matters throughout the 20th and 21st centuries.[220] As of 2016, it has approximately 850 attorneys in twenty offices around the world.[221]

The sample of Shearman deals resulted in an average team size of twelve lawyers across an average of five practice groups and three offices. Table 6 below reports the descriptive statistics for the network of Shearman attorneys. Column (a) reports basic statistics for the full network, column (b) reports basic statistics for the network when only senior attorneys (i.e., partners, counsel, and of counsel) are included, column (c) reports statistics when only lawyers in the core M&A group are included, and column (d)

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[217] *See* Victor Fleischer, *Regulatory Arbitrage*, 89 TEX. L. REV. 227, 265–69 (2010).

[218] *See* Hwang, *supra* note 19, at 1417–22.

[219] *History*, SHEARMAN & STERLING LLP, http://www.shearman.com/en/about-us/history-timeline [https://web.archive.org/web/20170625145202/http://www.shearman.com/en/about-us/history-timeline].

[220] *See id.*

[221] *Overview*, SHEARMAN & STERLING LLP, http://www.shearman.com/en/about-us/about-shearman [https://web.archive.org/web/20170617181213/http://www.shearman.com/en/about-us/about-shearman].

reports metrics when only the senior lawyers in the core M&A group are included.

Table 6[222]

Descriptive Statistics of Shearman Deal Team Network

Measure	Value			
	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only
	(a)	(b)	(c)	(d)
Node Count	417	160	166	42
Link Count	1418	569	527	90
Max Degree	117	91	38	18
Min Degree	1	1	1	1
Average Degree	9.201	10.688	7.500	5.520
Median Degree	4	4	5	3
Stan. Dev. Degree	14.85	15.546	7.356	4.691
Network Density	0.008	0.022	0.019	0.052
Diameter	21	14	10	9

Table 7 below reports the substructure measures for the Shearman network. Note that the clustering coefficient does not vary significantly across the different configurations of the network, while the fragmentation measure increases materially when only the senior M&A lawyers are included in the network. The Newman-Girvan Modularity figure is very low across every configuration of the network, but the Newman Modularity measure is significantly higher, particularly in columns (a) and (c). Some caution should be used when interpreting the Newman Modularity measures, especially with respect to columns (a) and (c) that include associates in the network. Because of the conservative assumption that associates do not interact with attorneys in other practice groups, columns (a) and (c) may over-report the modularity of the firm's internal structure. In any event, evidence of modularity in the Shearman network is modest.

[222] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

Table 7[223]
Shearman Deal Team Substructure Measures

Measure	Value			
	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only
	(a)	(b)	(c)	(d)
Clustering Coefficient	0.183	0.232	0.222	0.229
Isolates	0.000	0.000	0.000	0.000
Components (2+ nodes)	1.000	2.000	2.000	3.000
Fragmentation	0.000	0.085	0.036	0.264
Newman-Girvan (2004) Modularity	0.000	0.011	0.006	0.068
Newman (2006) Modularity	0.540	0.432	0.634	0.478

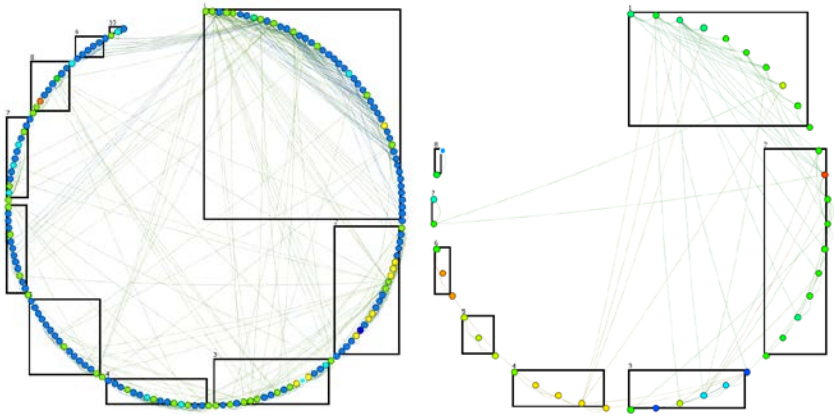
The Newman Modularity figures reported in Table 7 above provide moderate support for *H3*. The Newman Modularity statistics for the core M&A group in column (c) and the M&A senior attorneys-only found in column (d) also appear to provide support for *H4*. Some caution, however, is necessary when interpreting columns (c) and (d). If a law firm has a modular structure, then presumably the M&A group that runs the deal would serve as the interface by which the efforts of the subject-matter specialists are coordinated. For that interface to be effective, it must be stable so that specialists can slot in and out of teams easily. Therefore, one would expect to see high Newman Modularity scores for the M&A group, as captured in columns (c) and (d) in Table 7 above, reflecting stable, discrete subteams within the firm's M&A group. At first glance, the Newman Modularity measures for columns (c) and (d) appear to provide some support for the modularity thesis because the values are relatively high.

Closer analysis suggests a more equivocal picture, however. Examination of the attorneys within the groups identified by the Newman Modularity algorithm reveals that the module boundaries are capturing geographic relationships. Figure 7a below represents the M&A group-only configuration of the Shearman network, with the nodes colored by the office location of each attorney. The first module mostly includes attorneys from the New York office; the second, lawyers from the London office; the third, attorneys from the Rome and Milan offices; the fourth, attorneys from the Palo Alto and San Francisco offices, etc. Nevertheless, that clear geographic ordering,

[223] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

which likely reflects the assumption that associates only interact with the attorneys at their home office, fades when only the senior attorneys in the M&A group are included in the network. Figure 7b below represents the senior M&A attorneys, with the nodes again colored according to office location. In this configuration, the first module includes partners from the New York, London, and Paris offices, the second has partners from the New York, Toronto, Milan, and London offices, the third has partners from the Beijing, New York, Frankfurt, and Paris offices, etc. In Figure 7b, the relationships between senior attorneys appear unbounded geographically.

Figures 7a and 7b[224]



If Shearman's internal organization is modular, then one would also expect to see stable M&A teams if one drills down into the data and examine the teams for each individual relationship partner. To explore that possibility, the study analyzed the deal teams of the relationship partners in Shearman's New York office who had five or more transactions in the dataset. Table 8 below reports the results for one of the selected partners. That partner had five deals in the dataset, and most of the M&A lawyers on each team were entirely different than those on the preceding matter. Only once did an associate repeat from one deal to the next.

[224] A full color version of these Figures is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

Table 8[225]

Comparison of Five Deal Teams with the Same Relationship Partner

Deal	Date	Other M&A Partners		M&A Counsel		M&A Associates	
		No.	Percentage Repeating from Prior Deal	No.	Percentage Repeating from Prior Deal	No.	Percentage Repeating from Prior Deal
1	Jan. 2012	0	n/a	1	n/a	4	n/a
2	Nov. 2012	0	0.00%	0	0.00%	4	0.00%
3	Jun. 2013	1	0.00%	0	0.00%	4	25.00%
4	Oct. 2013	0	0.00%	0	0.00%	3	0.00%
5	Feb. 2014	1	0.00%	0	0.00%	2	0.00%

Table 9 below provides summary statistics for all three relationship partners selected according to the above criteria, five or more transactions in the dataset. The vast majority of those partners' deal teams involved only 0–10% of the M&A lawyers repeating from one transaction to the next. One partner had one deal where 11–20% of the M&A attorneys repeated, while another partner had a matter where 31–40% of the M&A team repeated. Put another way, a significant majority of those partners' core M&A teams turned over from one deal to the next. That data provides little evidence of a stable interface underpinning a modular system, and therefore, little support for *H4*.

Table 9[226]

Repeating Team Members on Matters of NY Relationship Partners with Five or More Deals

Percentage of Deal Team that are Repeating Team Members	Relationship Partners			
	No. of Partner 1 Deals	No. of Partner 2 Deals	No. of Partner 3 Deals	Total
0-10%	4	6	5	15
11-20%	1	0	0	1
21-30%	0	0	0	0
31-40%	0	0	1	1
41% or greater	0	0	0	0

b. Complete Sample

Analysis of Cravath's and Davis Polk's internal organization reveals similar patterns. Staffing on deals was similar across all three firms, as reported in Table 10 below. The lower number of average offices per deal reflects the fact that Cravath has only two offices, a large home office in New

[225] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[226] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

York and a much smaller office in London, while Davis Polk and Shearman have a large number of offices around the world.

Table 10[227]

Descriptive Statistics of the NY Law Firm Deal Team Sample

Measure	Value			
	Cravath	Davis Polk	Shearman	All Firms
	(a)	(b)	(c)	(d)
Average Attorneys Per Deal	13	8	12	12
Average Practice Groups Per Deal	6	4	5	5
Average Offices Per Deal	1	2	3	2

Table 11 then reports descriptive statistics for all three firms. Again, the firms are similar across all measures, although Cravath lawyers have relatively higher degrees (i.e., a higher number of links to other Cravath lawyers) than their counterparts at Davis Polk and Shearman.

Table 11[228]

Descriptive Statistics of Three NY Law Firms' Deal Team Networks

Measure	Value											
	Cravath				Davis Polk				Shearman			
	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Node Count	336	75	166	29	336	145	258	69	417	160	166	42
Link Count	1680	325	900	104	1086	469	921	109	1418	569	527	90
Max Degree	77	64	66	32	53	35	51	12	117	91	38	18
Min Degree	1	1	1	0	1	1	1	0	1	1	1	1
Average Degree	9.917	15.293	12.84	11.586	7.369	7.628	8.085	3.507	9.201	10.688	7.500	5.520
Median Degree	6	9	9	11	4	5	5	2	4	4	5	3
Stan. Dev. Degree	10.571	16.034	13.23	8.261	8.481	7.289	8.336	3.161	14.85	15.546	7.356	4.691
Network Density	0.015	0.058	0.033	0.124	0.01	0.022	0.014	0.023	0.008	0.022	0.019	0.052
Diameter	10	10	10	9	10	8	8	7	21	14	10	9

Table 12 below reports the clustering coefficient, fragmentation statistic, and modularity measure for all three firms. The Cravath and Davis Polk measures are moderate and typically slightly lower than the Shearman figures reported above.

[227] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[228] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

Table 12[229]

Substructure Measures of Three NY Law Firms' Deal Team Networks

Measure	Value											
	Cravath				Davis Polk				Shearman			
	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only	Full Network	Senior Attorneys Only	M&A Group Only	M&A Senior Attorneys Only
	(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)	(i)	(j)	(k)	(l)
Clustering Coefficient	0.282	0.185	0.313	0.221	0.218	0.159	0.245	0.134	0.183	0.232	0.222	0.229
Isolates	0	0	0	0	0	0	0	0	0	0	0	0
Components (2+ nodes)	1	1	1	1	2	1	2	5	1	2	2	3
Fragmentation	0.000	0.000	0.000	0.000	0.018	0.027	0.023	0.474	0.000	0.085	0.036	0.264
Newman-Girvan (2004) Modularity	0.179	0.000	0.000	0.000	0.005	0.000	0.006	0.097	0.000	0.011	0.006	0.068
Newman (2006) Modularity	0.521	0.277	0.468	0.351	0.500	0.421	0.474	0.539	0.540	0.432	0.634	0.478

To drill down further into the data, the deal teams of relationship partners with five or more transactions in the dataset were examined in order to determine the amount of stability within the core M&A teams.[230] Table 13 reports the results of this analysis. For each law firm and for the aggregate sample, Table 13 reports the percentage of core M&A team members repeating from one deal to the next. For the vast majority of teams, only zero to ten percent of the team members repeated from one deal to the next. Indeed, for Davis Polk, none of the teams had more than ten percent of the team members repeat. Cravath had the greatest percentage of repeat players from deal to deal, although the numbers are still quite modest.

Table 13[231]

Repeating Team Members on Matters of NY Relationship Partners with Five or More Deals

Percentage of Deal Team that are Repeating Team Members	Law Firms			
	Cravath	Davis Polk	Shearman	Total
0-10%	44	31	12	87
11-20%	10	0	1	11
21-30%	4	0	0	4
31-40%	5	0	1	6
41% or greater	0	0	0	0

[229] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

[230] An important caveat to this analysis is that only publicly announced matters were analyzed. It is likely that the relationship partners whose teams are analyzed here had matters during this time period that were not publicly disclosed, and those teams are, of course, not included in the analysis. Because it is difficult to predict which deals will proceed through signing, and which will expire before an agreement is reached, the publicly announced deals analyzed here approximate a random sample of each relationship partners' deals during this time period.

[231] This Table is permanently available at http://www.bc.edu/content/dam/bc1/schools/law/pdf/law-review-content/BCLR/58-6/jennejohn-graphics-A1b.pdf [https://perma.cc/QU9G-JURG].

E. Discussion

The preliminary results reported above suggest that the M&A market relies significantly upon flexible specialization to manage infra-transactional complexity. Little evidence is found to support the thesis that merger agreements and the organizations that design them are purely modular systems. Rather, the picture that emerges from the analysis is of a product with tightly coupled sub-systems designed by a thickly interwoven cluster of experts.

The merger agreements analyzed exhibit few discrete modules, and the modules that are identified using standard techniques do not reflect an obvious logic. Of course, modularity may play a greater role in the early stages of the contract design process, when deal lawyers frequently use agreement templates to construct the basic structure of a contract.[232] As the analysis of the final agreements above indicates however, at some point whatever modularity is employed gives way to a more integrated design. In that respect, even if modularity is used more extensively in the opening stages, the final product resembles an integrated system. Further analysis is needed to explore this possibility.

Interestingly, the severability provisions frequently found in the merger agreements sampled reflect the integrated nature of the contracts.[233] In a purely modular system, one might expect a simple severability clause, such as: "if any part of this [agreement/plan] is declared unenforceable or invalid, the remainder will continue to be valid and enforceable."[234] That simple formulation presumes that striking the offending provision will leave the rest of the contractual system undisturbed. That contrasts with the severability provisions in the sampled merger agreements, which often anticipate greater difficulty in eliding the invalid provision. Consider the following example:

> *Severability*. If any term, provision, covenant or restriction of this Agreement is held by a court of competent jurisdiction or other Governmental Authority to be invalid, void or unenforceable, the remainder of the terms, provisions, covenants and restrictions of this Agreement shall remain in full force and effect and shall in no way be affected, impaired or invalidated *so long as the eco-*

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[232] *See* Fleischer, *Deals*, *supra* note 13, at 483.

[233] A severability provision is a term in an agreement that essentially directs a court to strike language in the agreement that is found to be unenforceable, but to otherwise enforce the remaining, valid terms of the contract. *See* 11 SAMUEL WILLISTON & RICHARD A. LORD, A TREATISE ON THE LAW OF CONTRACTS § 45:6 (4th ed. 2012).

[234] *Severability*, CONTRACTSTANDARDS, https://www.contractstandards.com/clauses/severability [https://perma.cc/TRD2-KGM5]. This simple example is a standard clause available on the ContractStandards platform. *See id.*

> *nomic or legal substance of the transactions contemplated hereby is not affected in any manner materially adverse to any party. Upon such a determination, the parties shall negotiate in good faith to modify this Agreement so as to effect the original intent of the parties as closely as possible in an acceptable manner in order that the transactions contemplated hereby be consummated as originally contemplated to the fullest extent possible*.[235]

The italicized language in the latter half of the provision suggests that, in the view of the transaction designers, simply removing a provision in the agreement would be easier said than done. Good faith renegotiation between the parties would be required to ensure the revised contract remained faithful to the original intent of the parties. That result is consistent with the analysis above illustrating the integrated nature of the agreements in question. It is also in line with Freund's characterization of merger agreements:

> A properly drafted acquisition agreement is a rather delicate mechanism. There is a structure and symmetry among its principal articles that must be understood and constantly reviewed in order to conclude successful negotiations. [The provisions of the agreement] function together as a unit, serving different but complementary purposes. As issues arise in negotiating the transaction, one of the first steps in problem-solving is to identify all of the specific areas affected.[236]

Merger agreements' integrated structure mirrors the integrated structure of the law firms that design them.[237] The analysis above suggests that the back bone of the firms' deal teams—the core M&A lawyers that run the transactions—is not fixed. Rather, the core of the organization is fluid, with the architecture of the organization recombining from deal to deal. What then ensures that the different sub-groups within the organization can effectively work together? The answer is that the routines and know-how embedded within the network of experts are the mechanism by which the work product of each individual team member is rendered interoperable. It is the network—not a fixed standard interface as in a modular system—that holds the contractual system together while allowing incremental innovation to

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[235] Ebix, Inc., Exchange Parent Corp. & Exchange Merger Corp., Agreement and Plan of Merger, § 11.12 (May 1, 2013) (emphasis added).

[236] FREUND, *supra* note 55, at 153.

[237] In that respect, this study provides additional evidence supporting the hypothesis that product and organizational architecture mirror one another. *See supra* note 136 and accompanying text.

unfold from deal to deal. Interestingly, those findings are also consistent with the firms' business models. Many of the large New York firms use (more or less) lock-step compensation, which facilitates a "task force" approach to staffing that might be undermined by a completely "eat-what-you-kill" compensation structure, and up-or-out promotion, which leads to consistent turnover.

III. TOWARD DYNAMIC MARKET INSTITUTIONS

The analysis in Part II suggests that contractual innovation in the M&A market relies upon flexible specialization to a material extent. The evolution of mass customizable agreements is achieved through a recombinant architecture comprised of the routines and know-how embedded within the law firms designing the transactions. Wall Street law firms behave like an industrial district, such as that found in Emilia-Romagna in Italy,[238] rather than Ford's famous Highland Park assembly line.[239] In such a system, one would expect contract design to be a dynamic process where change is continual rather than episodic. In that respect, by including infra-transactional complexity in the theory of contract design, this Article builds a bridge between customized and standardized contract theory. Infra-transactional complexity acts as a vertex at which the insights of both conventional contract economics and the new learning of the boilerplate scholarship meet. That vertex provides an apparatus for a conditional theory of path dependency in contract design. In that respect, this Article follows in the footsteps of broader trends in the social science research on institutional change. These trends have moderated the initial generation of rather stark rational choice models with more textured analyses over time.[240]

The dynamism of that production process requires market institutions that are dynamic in turn. First, this part discusses how this study informs recent efforts to articulate a more dynamic approach to contract interpretation.[241] Then, this part discusses how this study cautions against overly static

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[238] *See generally* ARNALDO BAGNASCO, TRE ITALIE: LA PROBLEMATICA TERRITORIALE DELLO SVILUPPO ITALIANO (1977) (describing Emilia-Romagna industrial district).

[239] *See supra* note 42.

[240] *See generally, e.g.*, BEYOND CONTINUITY: INSTITUTIONAL CHANGE IN ADVANCED POLITICAL ECONOMIES (Wolfgang Streeck & Kathleen Thelen eds., 2005) (highlighting limitations of rational theories and exploring other models to examine institutional change); KATHLEEN THELEN, HOW INSTITUTIONS EVOLVE: THE POLITICAL ECONOMY OF SKILLS IN GERMANY, BRITAIN, THE UNITED STATES, AND JAPAN (2004) (explaining skill formation in Germany, Britain, the United States, and Japan, using institutional theory); STRUCTURING POLITICS: HISTORICAL INSTITUTIONALISM IN COMPARATIVE ANALYSIS (Sven Steinmo et al. eds., 1992) (distinguishing historical institutionalism from rational change models).

[241] *See infra* notes 244–268 and accompanying text.

models of the legal services market's transformation and provides a basis for more detailed empirical work on contractual innovation.[242] Calibrating institutions to support pragmatically coordinated private ordering is a large topic, and this part concludes by simply highlighting some of the major questions that are raised.[243] More thorough treatments are deferred to later research.

A. Contingent Contract Enforcement

The mass customization of commercial contracts challenges universal calls for formalist contract enforcement that are based upon the theory that sophisticated market participants desire stable standard terms.[244] In some markets, such standards are important and useful, and the arguments for formalism are compelling. In other situations, however, such as the M&A market analyzed above, diversity is a feature, not a bug, and attempts to standardize terms may be counterproductive. In that respect, this Article's analysis underscores recent arguments to transcend unitary approaches (i.e., either the traditional common law's formalism or the Uniform Commercial Code's contextualism) to American contract law.[245]

The task for non-unitary theories of contract law is to articulate a decision rule by which either formalism or contextualism is applied in any given situation, if they are not to be applied across the board. The most convincing arguments toward that end look to the design of the contract itself as the key to determining whether to apply formalist or contextualist interpretation in the event of an enforcement action.[246] In that respect, this Article adds an important nuance that incorporates further dimension to the analysis.

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[242] *See infra* notes 269–286 and accompanying text.

[243] *See infra* notes 287–292 and accompanying text.

[244] *See generally, e.g.*, Eric A. Posner, *A Theory of Contract Law Under Conditions of Radical Judicial Error*, 94 NW. U. L. REV. 749 (2000) (arguing that formalism creates incentives for clear standardization of terms); Eric A. Posner, *The Parol Evidence Rule, the Plain Meaning Rule, and the Principles of Contract Interpretation*, 146 U. PA. L. REV. 533 (1998) (same); Alan Schwartz & Robert E. Scott, *Contract Theory and the Limits of Contract Law*, 113 YALE L.J. 541 (2003) (same).

[245] *See generally* Adam B. Badawi, *Interpretive Preferences and the Limits of the New Formalism*, 6 BERKELEY BUS. L.J. 1 (2009) (arguing that formalism is not wanted for infrequent and uncertain transactions); Gilson et al., *Contract Interpretation*, *supra* note 30 (arguing for non-unitary theory of contract interpretation that includes both textualism and contextualism); Hwang, *supra* note 19 (explaining "unbundled bargains" in M&A deals); *see also* Rachel Arnow-Richman, *Modifying At-Will Employment Contracts*, 57 B.C. L. REV. 427 (2016) (arguing against formalist enforcement for modifications to at-will employment contracts).

[246] *See* Badawi, *supra* note 245, at 28–54; Gilson et al., *Contract Interpretation*, *supra* note 30, at 40–43. The alternative is to focus upon party characteristics—distinguishing between sophisticated and unsophisticated bargainers, for instance—which challenges courts' ability to identify marginal market participants. *See* Robert E. Scott, *Text Versus Context: The Failure of the*

Our starting point is one of the conceptual workhorses of conventional contract economics and, in turn, the economic approach to contract law: the distinction between "observable" and "verifiable" information.[247] Information related to a party's performance of its contractual obligations is said to be observable where only the parties to the contract have access to it, and verifiable where a third party tribunal also has access.[248] Using that dichotomy as a foundation, scholars have developed an increasingly sophisticated theory of how court intervention affects contract design, and vice versa.[249] This theory posits that whether performance is verifiable by a court is relevant to parties' economization strategy. Where performance-related information is readily verifiable—i.e., when uncertainty is relatively low—then parties may specify a state contingent contract ex ante and rely upon formal enforcement in the event of breach.[250] At the opposite extreme, if performance-related information is only observable and not verifiable, such as in situations of high uncertainty, parties may choose to govern their exchange with a relational contract—i.e., via the threat of social sanctions—and forego formal enforcement.[251] In the middle are situations of moderate uncertainty that challenge but do not totally overwhelm parties' ability to specify a state contingent agreement and a court's ability to verify breach.[252] In that situation, parties carefully shift certain transaction costs to the front-end drafting process and others to the back-end enforcement process, according to whether the risks are more efficiently addressed ex ante or ex post.[253] That shifting between front-end drafting costs and back-end enforcement costs is accomplished by using either bright line rules in the former case or vague standards, such as "best efforts" obligations, in the latter.[254] The combination of both rules and standards undermines unitary approaches to contract interpretation and calls for the application of both formalist and contextualist enforcement, depending

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Unitary Law of Contract Interpretation, *in* THE AMERICAN ILLNESS: ESSAYS ON THE RULE OF LAW 312, 321–29 (F.H. Buckley ed., 2013).

[247] *See* Hermalin et al., *supra* note 72, at 11–12, 68–69.

[248] *Id.* at 69.

[249] *See* Gilson et al., *Contract Interpretation*, *supra* note 30, 56–58. *See generally* Robert E. Scott & George G. Triantis, *Anticipating Litigation in Contract Design*, 115 YALE L.J. 814 (2006) (arguing that parties can shape a court's interpretive framework by designing contract provisions as rules or standards).

[250] *See* Gilson et al., *Contract Interpretation*, *supra* note 30, at 55–60.

[251] *See* Ronald J. Gilson, et al., *Braiding: The Interaction of Formal and Informal Contracting in Theory, Practice, and Doctrine*, 110 COLUM. L. REV. 1377, 1389–94 (2010). Note that Gilson and colleagues envision a role for formal court enforcement in such high uncertainty situations, but it is a minimalistic one. *See id.*; Gilson et al., *Contract Interpretation*, *supra* note 30, at 65.

[252] Gilson et al., *Contract Interpretation*, *supra* note 30, at 60–63.

[253] *See* Scott, *supra* note 246, at 316; Scott & Triantis, *supra* note 249, at 817–20.

[254] *See* Scott & Triantis, *supra* note 249, at 839–54.

upon the specifics of a transaction's design.[255] That is, the transacting parties' choice between bright line rules and vague standards—a design choice that is ultimately driven by the level of uncertainty affecting the exchange—is the pivot point between formalist and contextualist enforcement.

The analysis in Part II above complicates that theory. Evidence suggesting that complex agreements are integrated systems qualifies the distinction between contractual rules and standards. Bright line rules and vague standards surely exist, but they are not necessarily separable. It is not unusual, for example, for a vague standard such as a best efforts obligation to be embedded within a collection of related provisions, including bright line rules.[256]

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[255] *See* Gilson et al., *Contract Interpretation*, *supra* note 30, at 56–57; Scott & Triantis, *supra* note 249, at 851–54.

[256] For example, consider the regulatory risk shifting provision in the NYSE/ICE Merger Agreement, which couches a reasonable best efforts obligation in a number of additional bright line rules and general standards:

> *Reasonable Best Efforts; Regulatory Filings*. Yankees and Braves shall cooperate with each other and use (and shall cause their respective Subsidiaries to use) their respective *reasonable best efforts* to take or cause to be taken all actions, and do or cause to be done all things, necessary, proper or advisable on their respective parts under this Agreement and applicable Laws to consummate and make effective the Merger and the other transactions contemplated by this Agreement as soon as reasonably practicable, including preparing and filing as promptly as practicable all documentation to effect all necessary notices, reports and other filings and to obtain as promptly as practicable all consents, registrations, approvals, non-disapprovals, authorizations, licenses and other Permits (including all approvals, non-disapprovals, non-objections and consents to be obtained under the Competition Approvals, and from the SEC and other Governmental Entities) necessary or advisable to be obtained from any third party and/or any Governmental Entity (if any) in order to consummate the transactions contemplated by this Agreement; it being understood that, to the extent permissible by applicable Law, neither the Yankees Board nor Braves Board shall take any action that could prevent the consummation of the Merger, except as otherwise permitted under this Agreement. Subject to applicable Law, contractual requirements and the instructions of any Governmental Entity, Yankees and Braves shall keep each other apprised of the status of matters relating to the completion of the transactions contemplated by this Agreement, including promptly furnishing the other with copies of notices or other communications received or provided by Yankees or Braves, as the case may be, or any of their respective Subsidiaries, from or to any Governmental Entity with respect to such transactions. Each of Braves and Yankees will, and will cause its respective Affiliates to, cooperate with the other Party and provide such assistance as the other Party may reasonably request to promote the Merger and the other transactions contemplated by this Agreement and facilitate the Closing. Nothing in this Section 4.4 shall require, or be construed to require, Yankees or Braves to agree to any condition to any consents, registrations, approvals, non-disapprovals, authorizations, licenses or other permits that are not conditioned on the consummation of the Merger and the other transactions contemplated by this Agreement.

NYSE Euronext, Intercontinental Exchange, Inc. & Baseball Merger Sub, LLC Agreement and Plan of Merger § 4.4(a) (Dec. 20, 2012) (emphasis added).

The inseparability of rules and standards matters because their interaction affects the scope of a court's interpretive approach in an unforeseen way. Recall the long-standing maxim of contract law that the terms of an agreement should be interpreted consistently so as not to render any provision meaningless.[257] One effect of that consistency maxim may be to skew the scope of court intervention. For instance, because interdependent provisions restrict the universe of reasonable interpretations, the consistency maxim may reduce the scope of court intervention beyond what might otherwise be expected. If a vague standard such as a best efforts provision is coupled with, say, a bright line rule, the clear intent underlying the rule will restrict the plausible constructions of the standard.

The Court of Chancery of Delaware decision in *Hexion Specialty Chemicals, Inc. v. Huntsman Corp*. in 2008 provides a concrete example of this dynamic at work.[258] A central issue in that case was how to interpret the Material Adverse Effect ("MAE") provision in the merger agreement,[259] a term that was drafted as a vague standard and that was, as the court recognized, subject to a contextual review.[260] The court noted, however, that Hexion's

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[257] *See* WILLISTON & LORD, *supra* note 233, § 32:5 ("An interpretation which gives effect to all provisions of the contract is preferred to one which renders part of the writing superfluous, useless or inexplicable. A court will interpret a contract in a manner that gives reasonable meaning to all of its provisions, if possible.").

[258] Hexion Specialty Chems., Inc. v. Huntsman Corp., 965 A.2d 715 (Del. Ch. 2008).

[259] The merger agreement defined a Material Adverse Effect, in relevant part, as:

> any occurrence, condition, change, event or effect that is materially adverse to the financial condition, business, or results of operations of the Company and its Subsidiaries, taken as a whole; *provided, however*, that in no event shall any of the following constitute a Company Material Adverse Effect: (A) any occurrence, conditions, change, event or effect resulting from or relating to changes in general economic or financial market conditions, except in the event, and only to the extent, that such occurrence, condition, change, event or effect has had a disproportionate effect on the Company and its Subsidiaries, taken as a whole, as compared to other Persons engaged in the chemical industry; (B) any occurrence, condition, change, event or effect that affects the chemical industry generally (including changes in commodity prices, general market prices and regulatory changes affecting the chemical industry generally) except in the event, and only to the extent, that such occurrence, condition, change, event or effect has had a disproportionate effect on the Company and its Subsidiaries, taken as a whole, as compared to other Persons engaged in the chemical industry . . . .

Hexion, 965 A.2d at 736–37. For commentary on MAE/MAC clauses and their purposes, see generally Ronald J. Gilson & Alan Schwartz, *Understanding MACs: Moral Hazard in Acquisitions*, 21 J.L. ECON. & ORG. 330 (2005); Eric L. Talley, *On Uncertainty, Ambiguity, and Contractual Conditions*, 34 DEL. J. CORP. L. 755 (2009).

[260] *Hexion*, 965 A.2d at 738 ("For the purpose of determining whether an MAE has occurred, change in corporate fortune must be examined in the context in which the parties were transacting.").

preferred interpretation of the MAE provision—that Huntsman's failure to achieve its forecasted targets after signing resulted in an MAE—conflicted with an express disclaimer in the merger agreement that Huntsman made no representations or warranties with respect to "any projections, forecasts or other estimates, plans or budgets . . . ."[261] The court therefore rejected Hexion's interpretation, reasoning that to adopt it would "eviscerate, if not render altogether void, the meaning of [the representation]."[262] In that respect, a formalistic interpretation of a rule restricted what might have been a more searching contextual analysis of the related standard.

Interestingly, the consistency maxim may also amplify the scope of court intervention in certain situations. If it is impossible to reconcile a conflict between two or more related contractual provisions, then, even in ostensibly formalist jurisdictions such as New York and Delaware, a court will resort to reviewing the broader context of the transaction to ascertain the parties' underlying intent.[263] Imagine, for instance, that two bright line rules conflict with one another. Considered individually, they would appear to be invitations for formalist enforcement. Interpreting them together, however, leads to a contextualist approach, and one that may expand beyond any single provision. For an actual example, consider the Delaware Court of Chancery's decision in *CA Inc. v. Ingres Corp.* in 2009 that involved conflicting provisions in a collection of agreements resulting from Ingres' spin-off from CA.[264] In that case, the parties were disputing CA's right to receive new releases of Ingres' database software free of charge as provided under the terms of the original divestiture agreements.[265] One of the interpretation issues was whether the scope of a later contract, which required CA to pay for new releases, was sufficiently broad that it effectively renegotiated the terms of the original divestiture agreements.[266] Finding that the terms of the

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[261] *Id.* at 741 n.67.

[262] *Id.* at 741.

[263] *See, e.g.*, Klein v. Empire Blue Cross & Blue Shield, 569 N.Y.S.2d 838, 842 (App. Div. 1991) ("If [contract language] is found to be ambiguous, then extrinsic evidence is admissible to resolve the ambiguity.") (internal citation omitted); W.W.W. Assocs. v. Giancontieri, 565 N.Y.S.2d 440, 442–43 (App. Div. 1990) (holding that the court will not look at extrinsic evidence because the provision in the contract is unambiguous, making extrinsic evidence not material); Hartford Accident & Indemnification Co. v. Wesolowski, 305 N.E.2d 907, 909 (N.Y. 1973) (stating if there is ambiguity the court will look to extrinsic evidence).

[264] C.A. No. 4300-VCS, 2009 WL 4575009, at *29–34 (Del. Ch. 2009). Notably, one of the contract interpretation issues—whether Ingres was obligated to provide a recently released version of its database software as an "update" under the original divestiture agreements—provides another example of the consistency maxim constraining the scope of judicial intervention because the court referenced the definition of "update" in one contract and the definition of "enhancement" in a contemporaneous agreement. *Id.* at *26–29.

[265] *Id.* at *1–4.

[266] *See id.* at *29–33.

related agreements were ambiguous, the court analyzed the contracts' context, eventually concluding that extrinsic evidence suggested the later agreement controlled.[267] The effect was a broad refashioning of the exchange relationship. Interestingly, the court sought to cabin the implications of that reworking by reasoning that the underlying intent of the contract limited Ingres' ability to issue new releases under the later agreement.[268]

The upshot is that understanding how parties might trigger either formalist or contextualist intervention requires more than the conventional framework of observable/verifiable information and the rules/standards dichotomy. The structure of the contractual system matters in that it moderates parties' efforts to shift transaction costs from the front end to the back end, and vice versa. Notably, greater modularity may be useful for clarifying those efforts to shift costs. Analyzing with precision the role contractual structure plays in a contingent approach to contract enforcement is an important project for future research.

B. Disrupting a Flexible Production System

The integrated structure of merger agreements and the recombinant teams of corporate lawyers that design them also has implications for what might be called United States "industrial policy" directed toward markets for transaction design services. To be sure, there is no coherent, state-driven industrial policy directed toward the market for the design of merger agreements (or any other type of commercial contract) in the United States. Indeed, *dirigiste*-style industrial policy has never gained much traction in the decentralized U.S. political economy outside of wartime conditions.[269] What policy that has been directed toward the market for contract design is largely privatized, with bar associations and for-profit content providers, such as the Prac-

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[267] *Id.* at *33. The court noted that, under California contract law, which controlled the subsequent contract, a contextual analysis was required, but that the outcome would have been the same under New York law, which controlled the earlier divestiture agreements, because of the ambiguity arising from the conflict between the plain language of the contracts in question. *Id.* at *29–30.

[268] *See id.* at *33. In the end, Ingres was unable to recover from CA, because the court found that Ingres had engaged in bad faith behavior in contravention of a different provision in one of the original divestiture agreements. *Id.* at *34–36.

[269] *See* Frank Dobbin, Book Review, 22 CONTEMP. SOC. 250, 251 (1993) (reviewing OTIS L. GRAHAM, JR., LOSING TIME: THE INDUSTRIAL POLICY DEBATE (1992)) ("Political sociology's conventional wisdom suggests that American state structure is better suited to inchoate, misguided bailouts characterized by political graft than to coherent, disinterested, industrial planning on the Japanese model."). Schrank and Whitford, however, outline an intriguing argument for industrial policy directed at addressing failures within the innovation networks that characterize the twenty-first century American economy. *See generally* Andrew Schrank & Josh Whitford, *Industrial Policy in the United States: A Neo-Polanyian Interpretation*, 37 POL. & SOC'Y 521 (2009) (arguing for industrial policies in the United States).

ticing Law Institute, the primary actors in coordinating efforts to steer industry development.[270]

This Article's first contribution to that ersatz industrial policy is to illuminate trade-offs that are often overlooked in current efforts to transform the American legal industry. Those efforts include policy proposals to introduce greater competition within the market for legal services,[271] and new market entrants that are disrupting the market by leveraging advances in information technology.[272] The former includes research analyzing the barriers to innovation in the legal industry.[273] The latter comprises "LegalTech" companies that target markets ranging from legal research (LexMachina and RavelLaw) to entity formation (LegalZoom) to contract drafting (Shake and ContractStandards) to matter management (SimpleLegal), and that, according to Angel List, currently number approximately 1700 start-ups.[274]

There is no question that greater efficiencies can be realized in the legal industry, or that access to justice is a major public policy concern in the United States. Many of the benefits of greater competition and lower barriers to market entry are obvious. The costs of disruption, however, which are inevitable in the legal industry as in any other sector that has felt the effects of market liberalization and the information revolution, are not often clearly in focus.[275] This Article illuminates one of those costs—not simply that dis-

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[270] The New York City Bar Association, which currently has 160 committees, including a Mergers, Acquisitions & Corporate Control Contests Committee and Corporation Law Committee, provides an example. *See Committee Listing*, N.Y.C. BAR ASS'N, http://www.nycbar.org/member-and-career-services/committees/committee-listing/committees [https://perma.cc/2PEG-ABTK] (providing a full list of the Association's committees). Such associations consolidate industry best practices and inform legislative and regulatory processes. *See, e.g.*, *Committee Reports*, N.Y.C. BAR ASS'N, http://www.nycbar.org/member-and-career-services/committees/reports-listing/reports////573403baa6a763482d868175///1/10 [https://perma.cc/BXE9-GB4C]. The Business Law Section of the American Bar Association, which covers the entire country, provides another example. *See Business Law Section*, AM. BAR ASS'N http://www.americanbar.org/groups/business_law.html [https://perma.cc/H88N-3GZ7].

[271] *See generally* GILLIAN K. HADFIELD, RULES FOR A FLAT WORLD: WHY HUMANS INVENTED LAW AND HOW TO REINVENT IT FOR A COMPLEX GLOBAL ECONOMY (2017) (proposing greater competition among providers of "legal infrastructure").

[272] *See* RICHARD SUSSKIND, THE END OF LAWYERS?: RETHINKING THE NATURE OF LEGAL SERVICES 99–145 (2008).

[273] *See generally* HADFIELD, *supra* note 271 (analyzing the barriers to innovation in the legal industry); Triantis, *supra* note 113 (analyzing the barriers to innovation in transaction design services).

[274] *See Legal Startups*, ANGELLIST, https://angel.co/legal [https://perma.cc/KP79-4DZL].

[275] Research has shown that it is not unusual for the logic of standardization and mass production to be promoted without regard to the costs of disrupting innovation networks. *See generally* PIORE & SABEL, *supra* note 22 (arguing that flexible specialization is an overlooked alternative to mass production); WORLD OF POSSIBILITIES, *supra* note 123 (discussing development of industrialization and economic history).

ruption might render a large number of lawyers redundant, but that it might upend a collaborative production system with rich stores of human capital at its core. In other words, this study suggests that there may be a baby in the bathwater. Disrupting legal services may not simply introduce long-overdue productivity gains, but also eliminate the institutional supports for product innovation. And, once eliminated, those institutions may be beyond reach—research analyzing U.S. manufacturing has found that industry clusters are difficult to resurrect.[276]

The argument here should not be overplayed. The point is not that disruption is necessarily negative, but rather that further analysis is needed to fully apprehend the consequences of change in the market for legal services. An important part of that analysis is accurately assessing the costs of disrupting the industry's innovation networks. For instance, additional research is necessary to determine the extent to which such networks exist beyond the rarified New York M&A cluster that works on top shelf public company transactions. It is possible that such research will identify both vibrant innovation networks that endure in certain regional or niche markets and defunct networks that have collapsed under the demand for greater efficiency.[277] These findings will inform policy by revealing either successful or ineffective practices.[278]

Recognizing that trade-off leads to this Article's second contribution to industrial policy for the contract design market, which is to question deterministic accounts of industrial change. There is no question that information technology is refashioning many aspects of legal services, transaction design included.[279] For attorneys operating in one of those areas, learning how to adapt to that disruptive technology is imperative. This study and the literature upon which it draws suggest, however, that it would be a mistake to conclude that market transformation ineluctably follows a single path. Some scholars argue, for example, that information technology disrupts markets for legal services according to a predictable pattern whereby bespoke products become

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[276] *See generally* GARY P. PISANO & WILLY C. SHIH, PRODUCING PROSPERITY: WHY AMERICA NEEDS A MANUFACTURING RENAISSANCE (2012) (arguing against deindustrialization in the United States).

[277] It is not unusual for industries to straddle or oscillate between modularity and flexible specialization. *See generally* WORLD OF POSSIBILITIES, *supra* note 123 (discussing development of industrialization and economic history).

[278] *See generally* Andrew Schrank & Josh Whitford, *The Anatomy of Network Failure*, 29 SOC. THEORY 151 (2011) (describing theory network failures and how they are related to each other and network governance). Fully informed policy depends upon understanding not only why collaboration networks succeed, but also why they fail. *See id.*

[279] *See generally* SUSSKIND, *supra* note 272 (describing how changes in technology are affecting legal services).

commoditized.[280] Evidence of flexible specialization operating in legal services suggests that commoditization is not inevitable but is rather a *choice*.[281] In some situations, the costs and benefits may well weigh towards pursuing a commoditization strategy. But in other situations, the benefits of maintaining an innovation cluster might outweigh the costs. There is abundant evidence of such in other fields, such as automotive manufacturing, where high-value added engineering continues to produce innovative components for original equipment manufacturers and healthy margins for suppliers.[282]

Relatedly, careful reflection indicates that the organizational routines that underpin flexible specialization will be necessary regardless of the path taken. That is because, in situations where commoditization is pursued or where a modular design is employed, a high level of expertise, which must often extend across teams of attorneys, is necessary to establish the standard product or interface. Standardization itself presents something of a paradox, in that standardized products depend upon non-standardized equipment or expertise.[283] For instance, the multi-year process that developed the IBM's modular System/360 architecture—a classic example in the modularity literature—was a highly collaborative endeavor.[284] Recent scholarship that identifies the ability to manipulate technologies as a comparative advantage for the 21st century lawyer recognizes this.[285] This Article's contribution is to provide a theoretical framework and a methodology for studying how that expertise is organized.

If anything appears certain at this stage, it is that the trajectory of change in the market for contract design services, and legal services more broadly, is indeterminate. Additional research is needed to more fully understand the extent to which flexible specialization is used throughout the legal industry and how moving to a modularity strategy affects law firms' current business models, the structure of the products that are produced, the internal organization and the accrual of expertise within the law firms, and the creation and maintenance of relationships between attorneys across firm boundaries. The goal of such further research is not to definitively substantiate flexible specialization as the only path to success, but is rather to fine tune our policy

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[280] *See id.* at 60.

[281] For a discussion of the choice between mass production and flexible specialization, see PIORE & SABEL, *supra* note 22, at 17.

[282] *See generally* WHITFORD, *supra* note 33 (analyzing collaborative production models among equipment suppliers of heavy equipment).

[283] *See generally* PIORE & SABEL, *supra* note 22 (describing flexible specialization).

[284] *See supra* notes 109 & 120 and accompanying text.

[285] *See generally* RICHARD SUSSKIND, TOMORROW'S LAWYERS: AN INTRODUCTION TO YOUR FUTURE (2d ed. 2017) (describing how changes in technology are affecting legal services and how lawyers can embrace it); SUSSKIND, *supra* note 272 (same).

proposals to account for a full spectrum of costs and benefits. A likely outcome of that research is a heterogeneous picture of the industrial landscape, implying that policy initiatives will play asymmetrically across the sector. The complexity of the problem—and the inescapably heterodox character of the policies needed to address the issues—unmasks over-simplified proposals as misguided.[286]

C. Exploring the Complexity Frontier Further

Efficiently recalibrating enforcement institutions and industrial policy will depend upon more rigorous and detailed analyses of how complex agreements are designed. This Article takes a first step in that regard, but much work remains to be done. In particular, an important next step for subsequent research is to analyze how contractual architecture affects the evolution of given governance mechanisms, or collections of governance mechanisms, that are of interest.

Introducing an additional dimension of complexity presents challenges for both theoretical modeling and empirical research because it raises the possibility that interdependencies between provisions may either reinforce path dependencies or augment incentives for change. In other words, the effect of interdependencies may be asymmetric depending upon the contractual provisions in question and the linkages between them. Fully understanding those dynamics requires a much more comprehensive, robust, and data-intensive approach with respect to both theoretical and empirical analysis.

Interdependent governance mechanisms present a difficult modeling problem for theoretical analysis because the outcome of a bargaining strategy with respect to one mechanism may affect the strategy with respect to another mechanism. The primary families of models in contract economics may allow a game to repeat,[287] or they may involve more than two parties,[288] but they typically do not frame bargaining as two or more related games played between the same parties at the same time.[289] A basis for constructing such models, however, may perhaps be found in recent work in

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[286] For this reason, Anderson & Manns' call for greater standardization in merger agreement design, based on an empirical study that presents evidence of diversity in the design of agreements throughout the M&A market and even within the same law firm, should be considered with caution. *See generally* Anderson & Manns, *supra* note 12 (calling for greater standardization in agreements); Coates, *Why Have M&A Contracts Grown?*, *supra* note 4, at 3–4 (discussing the limits of Anderson & Manns' empirical methods).

[287] *See* BOLTON & DEWATRIPONT, *supra* note 1, at 31.

[288] *See id.* at 237–38.

[289] *See* JOHN H. MILLER & SCOTT E. PAGE, COMPLEX ADAPTIVE SYSTEMS: AN INTRODUCTION TO COMPUTATIONAL MODELS OF SOCIAL LIFE 190–92 (2007).

political science, which explores how playing an ensemble of simultaneous games shapes parties' strategies.[290] A potential task for future research is extending this early scholarship to the contracting context and, in particular, exploring asymmetric effects within ensembles of games.

Developing such formal models will also require more detailed information on the interactions between governance mechanisms in complex contracts. As noted in a recent survey of empirical research on contract design, few studies examine interaction effects between provisions.[291] One of the primary challenges of examining interaction effects between provisions is the sheer scale of interdependencies in a modern commercial contract, such as a merger agreement. This challenge makes it difficult to find a rigorous basis for selecting which interactions between explanatory variables to test when specifying a multivariate regression model.[292] Of course, practitioner experience and intuition can inform both the selection of variables to examine for interactions and the use of data reduction techniques. That knowledge, however, is typically tacit, and, therefore, not readily accessible to the research community. In any event, few practitioners have a universal

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[290] This research draws upon Putnam's classic 1988 article on two-level games, which argues that many international negotiations can be understood as including not only a game between governments at the international level, but also a game between each government and domestic interest groups at the national level. Robert D. Putnam, *Diplomacy and Domestic Politics: The Logic of Two-Level Games*, 42 INT'L ORG. 427, 434 (1988). The research also draws on Tsebelis' argument that political actors' choices may appear sub-optimal to an observer who fails to appreciate that the actors are operating within a network of "nested" games. *See* GEORGE TSEBELIS, NESTED GAMES: RATIONAL CHOICE IN COMPARATIVE POLITICS 7 (1990) ("[T]he argument of this book is that if, with adequate information, an actor's choices appear to be suboptimal, it is because the observer's perspective is incomplete. The observer focuses attention on only one game, but the actor is involved in a whole network of games—what I call *nested games*."); *see also* Norton E. Long, *The Local Community as an Ecology of Games*, 64 AM. J. SOC. 251, 253 (1958) ("Individuals may play in a number of games . . . . Transfer from one game to another is, of course, possible, and the simultaneous playing of roles in two or more games is an important manner of linking separate games."). More recently, Bednar and Page have used computational methods to explore, among other things, how playing an ensemble of games leads actors to develop cross-cutting strategies that apply to more than one game. *See generally, e.g.*, Jenna Bednar et al., *Behavioral Spillovers and Cognitive Load in Multiple Games: An Experimental Study*, 74 GAMES & ECON. BEHAV. 12 (2012) (finding strategic spillovers between games played simultaneously); Jenna Bednar & Scott Page, *Can Game(s) Theory Explain Culture? The Emergence of Cultural Behavior Within Multiple Games*, 19 RATIONALITY & SOC'Y 65 (2007) (examining cultural behaviors and games); Jenna Bednar & Scott E. Page, *When Order Affects Performance: Institutional Sequencing, Cultural Sway, and Behavioral Path Dependence*, AM. POL. SCI. REV. (forthcoming 2018) (on file with author Jenna Bednar through her University of Michigan webpage) (describing study on behavioral spillovers' effect on games).

[291] *See generally* Macher & Richman, *supra* note 36 (reviewing empirical literature in transactional cost economics).

[292] For background on interaction effects in regression modeling, see generally JAMES JACCARD & ROBERT TURRISI, INTERACTION EFFECTS IN MULTIPLE REGRESSION (2d ed. 2003).

familiarity with multiple agreement types. The empirical methods developed here provide a systematic way of assessing interactions across a large sample of agreements, and therefore, provide a key ingredient for more rigorous analysis of contracting behavior.

CONCLUSION

This Article has addressed the often-overlooked problem of infra-transactional complexity and, in particular, how such complexity is managed in mass customized agreements. It has done so by providing a new theoretical framework and methodological toolkit for studying the structure of complex contracts and the organizations that produce them. Using that framework and toolkit, it has found evidence that merger agreements and the law firms that design them are, to a significant extent, integrated rather than fully modular systems. Modular design may well play an important role in certain respects, as future research will undoubtedly explore, but this study suggests that it should no longer be considered the only game in town.

This Article might be summarized in a number of ways, such as an extension of Gilson's original concept of transaction cost engineering, of Scott's contributions to the theory of contract design, or of Sabel's approach to industrial organization. By investigating the role of complexity in economic organization, this study also partakes in a longer tradition, stretching back to Herbert Simon's pioneering work. Whereas much of contract economics has focused upon Simon's concept of bounded rationality, this Article has emphasized the role his equally important idea of nearly decomposable systems plays in contract design. The synthesis of those two ideas promises future insights that are exciting, important, and, one might hope, near.