INSTRUMENTS, INSTITUTIONS AND THE MODERN PROCESS OF FINANCIAL INNOVATION

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Abstract

What is "financial innovation" and why should we care about it? This question has become increasingly important in the wake of the recent financial crisis, yet the nature of financial innovation remains poorly understood. Drawing on the "New Institutional Economics" literature, this Article contends that financial innovation should be understood first and foremost as a process of change, a change in the type and variety of available financial products to be sure, but also a change in financial intermediaries (such as banks) and in markets themselves. It argues that this reframing has important policy implications for the economics of regulating the financial innovation process and for understanding the dynamics of modern financial markets in general. As an illustration of these ideas, the Article undertakes a critical analysis of a current policy proposal: the requirement that banks that deal in over-the-counter derivatives transfer the management of certain risks associated with these instruments to a highly regulated third-party called a centralized clearing party. The Article argues that this proposal is properly viewed as an attempt to regulate the process of financial innovation itself and that, when viewed in this light, the proposal is neither as modest nor as obviously superior to the status quo as its proponents claim. Finally, the Article sketches two alternatives to the proposed rule that seek to navigate the trade-offs of what the Article refers to as the "new" economics of financial regulation.

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INTRODUCTION

In sifting through the economic rubble caused by the global financial crisis of 2007 and 2008, one cannot help but be struck by the volume of obscure financial products left in its wake: credit default swaps, residential mortgage-backed securities, collateralized debt obligations. The role that these products played in the financial crisis has generated a vigorous debate about the value of financial innovation and the proper regulatory response to the development of novel financial products. The battle lines in this debate are already forming. There are those, for example, who believe that financial innovation is largely useless.[1] Others, by comparison, take a more moderate position, arguing that some financial innovation is good, some bad.[2]

Lost in this debate, however, is a more fundamental question about the nature of financial innovation itself and its effect on modern financial markets. This question is both timely and important. Lawmakers have been urged to draft new laws in the wake of the financial crisis that take into account "the special nature of the modern process of financial innovation,"[3] and the Securities and Exchange Commission ("SEC") recently announced the creation of a new division devoted in part to overseeing financial innovation in general.[4] Yet the financial innovation process itself remains poorly understood. The economics literature on financial innovation tends to concentrate on "the diffusion of these innovations, the characteristics of adopters, and the consequences of innovation for firm profitability and social welfare."[5] The few accounts of the financial innovation process in legal scholarship focus exclusively on financial products and how market actors might misunderstand the risks created by these products.[6] This

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[1] Paul Volcker, the former Federal Reserve Board Chairman and current Chairman of President Obama's Economic Recovery Board, has implied as much. *See Paul Volcker: Think More Broadly*, The Wall Street Journal, December 14, 2009, at R7 (quoting Volcker's rhetorical question, "How many other [recent] innovations can you tell me that have been as important to the individual as the automatic teller machine, which in fact is more of a mechanical than a financial one?"). And New York Times columnist and Nobel Prize winning economist Paul Krugman, has asserted that it is "hard to think of any major recent financial innovations that actually aided society, as opposed to being new, improved ways to blow bubbles, evade regulations and implement de facto Ponzi schemes." *See* www.nytimes.com/2009/04/27/opinion/27krugman.html.

[2] *See, e.g.*, Robert E. Litan, *In Defense of Much, But Not All, Financial Innovation* (Brookings working paper, 2010), *available at* http://www.brookings.edu/~/media/Files/rc/opinions/2010/0217_financial_innovation_litan/0217_financial_innovation_litan.pdf.

[3] OTC Derivatives: Modernizing Oversight to Increase Transparency and Reduce Risks: Hearing Before the Subcomm. on Securities, Insurance, and Investment of the S. Comm. On Banking, Housing & Urban Affairs, 111th Cong. 14 (2009).

[4] Press Release, U.S. Securities and Exchange Commission, SEC Announces New Division of Risk, Strategy, and Financial Innovation

[5] Josh Lerner & Peter Tufano, *The Consequences of Financial Innovation: A Research Agenda* (Dec. 30, 2009), available at www.aeaweb.org/aea/conference/program/retrieve.php?pdfid=351.

[6] *See* Henry T.C. Hu, *Swaps, The Modern Process of Financial Innovation and the Vulnerability of a Regulatory Paradigm*, 138 U. Penn. L. Rev. 333, 338-39 (1989); Henry T.C. Hu, *New Financial Products, the Modern Process of Financial Innovation, and the Puzzle of Shareholder Welfare*, 69 Tex. L. Rev. 1273 (1991); Henry T.C. Hu, *Misunderstood Derivatives: The Causes of Informational Failure and the Promise of Regulatory Incrementalism*, 102 Yale L.J. 1457 (1993).

Article builds on these important contributions but takes an overall different tack in maintaining that financial innovation must be understood first and foremost as a *process* of change, a change in the type and variety of available financial products to be sure, but also a change in financial intermediaries and markets themselves. It argues that this reframing has important policy implications for the economics[7] of regulating the financial innovation process and for understanding the dynamics of modern financial markets in general.

This Article develops a theoretical framework (the "financial innovation framework") for understanding this financial innovation process that relies on an important insight from the "New Institutional Economics" literature,[8] specifically, that organizations and markets act as both substitutes and complements for organizing and governing economic transactions.[9] Banks provide financial products to firms and individuals and manage the risk inherent in these products, but markets do as well. Because markets act as substitutes for banks, banks may be able to transfer assets, and their accompanying risks, from their balance sheets to trade in markets, thus freeing up room for banks to assume new, more profitable (and often more complex) risks. It was precisely this desire to remove assets from banks' balance sheets by packaging them in a way so that they can be freely traded on markets that was the primary motivation behind the creation of the now infamous "collateralized debt obligation," which played a significant role in the financial crisis.[10] Not only do markets act as substitutes for banks, but banks also act as complements to markets. When banks successfully transfer assets from their books to markets, these "new" markets create opportunities for banks to develop novel financial products that seek to solve firms' business objectives (such as the hedging of risk) with respect to these new markets.

The Article explores the determinants of the market's substitutability for banks and banks' complementarity with respect to markets. This relationship between financial intermediaries and markets, in turn, has complicating effects on instruments, institutions and markets. First, it leads to increasing product complexity because before banks can

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[7] What I refer to as "the economics of financial regulation" should not be confused with "the economic theory of regulation." *See, e.g.*, Richard A. Posner, *Theories of Economic Regulation*, 5 Bell J. Econ. & Man. Sci. 335, 343 (1974); George J. Stigler, *The Theory of Economic Regulation*, 2 Bell J. of Econ. & Man. Sci. 3 (1971). While both concepts have certain superficial affinities – for example, they both examine the benefits and costs of regulation – they seek to explain different phenomena. Whereas the economic theory of regulation seeks to explain the distribution of regulation in the economy (i.e., why certain industries are heavily regulated and some are not) and treats legislation as the product and legislators and interest groups as the producers and consumers, respectively, of this product, the economics of financial regulation is concerned with the trade-offs involved in addressing a particular issue of public policy in the financial markets. Thus, I am concerned in this Article not with predicting how new financial regulation will look, given the composition of the various interests involved, but rather with understanding how to analyze any proposals for financial regulation reform in light of recent tectonic shifts in the financial markets.

[7] *See, e.g.*, Richard A. Posner, *The President's Blueprint for Reforming Financial Regulation: A Critique: Part I*, available at http://www.finreg21.com/lombard-street/the-president's-blueprint-reforming-financial-regulation-a-critique-part-i.

[8] For an excellent overview of this literature, see New Institutional Economics: A Guidebook (Eric Brousseau & Mean-Michel Glachant, eds., 2008).

[9] Eric Brousseau & Jean-Michel Glachant, *A Road Map for the Guidebook*, *in* New Institutional Economics: A Guidebook xlii (Eric Brousseau & Jean-Michel Glachant, eds., 2008).

[10] *See infra* Part I.A.

transfer products to markets, they must fine-tune the products so that they are capable of being traded in relatively high volume at arm's length, and this fine-tuning process can introduce considerable complexity in the products themselves. Second, the relationship between banks and markets increases the complexity of financial intermediaries because when banks remove assets from their balance sheets and transfer them to markets to be traded in arm's length transactions, banks replace the transferred risk with more profitable risk, which also tends to be risk that is more complex and more difficult to manage.[11] Further, in their role as a complement to markets, banks become interconnected with new markets, which can further increase the risks assumed by these institutions. Third, the financial innovation process affects markets by giving rise to new markets that are relatively inefficient and therefore subject to severe realignments in the wake of exogenous shocks and untested in dealing with the stress that results from such shocks.

What are the policy implications of this account of the financial innovation process? This Article suggests that this process, and in particular its effect on instruments, institutions and markets, complicates the economics of financial regulation by increasing the information asymmetries that exist between regulators and market participants, particularly with respect to the management of risk. This "new" economics of financial regulation defies simplistic New-Deal era dichotomies between bottom-up solutions and top-down prescriptions and augurs in favor of a middle road that emphasizes increased coordination and collaboration between market actors and regulators.

As a real-world illustration of these implications, the Article adopts a "case study" approach by analyzing a current proposal for regulating the financial innovation process: a mandatory requirement that the management of a certain type of risk inherent in over-the-counter ("OTC") derivatives called "counterparty risk," which is currently carried out by banks, be transferred to a heavily regulated third-party known as a centralized clearing party ("CCP"). Many view the mismanagement of counterparty risk in the OTC derivatives market as having played an important contributing role in the financial crisis. Yet the financial innovation framework developed in this Article suggests that important dimensions of the debate over mandatory CCP clearing have gone almost entirely unnoticed. In particular, the financial innovation framework implies that the management of counterparty risk in the OTC derivatives market should be transferred to markets (or in this case, a regulated market institution like a CCP) only if markets are an efficient substitute for banks. This is a highly contestable proposition given that the financial innovation process has a tendency to increase informational asymmetries between banks and market institutions. The Article sketches two alternative reform possibilities that, unlike the traditional top-down nature of the mandatory CCP-clearing rule, seek to mediate between the trade-offs of the new economics of financial regulation created by the financial innovation process.

The discussion is organized as follows: Part I develops an account of the modern process of financial innovation, characterizing it as involving a dynamic interplay between financial intermediaries and markets. Equipped with this account, it then explains how the financial innovation process may lead to increased complexity with

[11] Raghuram G. Rajan, *Has Financial Development Made the World Riskier?*, Proceedings, Federal Reserve Bank of Kansas City, Aug. 2005, at 326-27.

respect to new products and the institutions that develop these products while at the same time creating certain fragilities in new markets. Part II applies this framework to a current policy proposal: the mandatory CCP clearing of OTC derivatives through a CCP. The account developed in Part I suggests that there are possibly significant information asymmetries that exist between market participants and a CCP in this market, particularly with respect to the pricing of counterparty risk through the use of collateral. Part III explores policy implications. In particular, this Part proposes two alternatives to a mandatory CCP-clearing rule, each of which highlight increased coordination and collaboration between regulators and market participants. Part IV briefly concludes.

I. TOWARD A FRAMEWORK FOR UNDERSTANDING MODERN FINANCIAL MARKETS

A. Financial Innovation as a Process of Change

This Part maintains that financial innovation must be understood first and foremost as a *process* of change, a change in the type and variety of available financial products to be sure, but also a change in financial intermediaries and markets themselves. The next sub-section describes the nature of these changes and how they explain some of the key features of modern financial markets. This sub-section, by contrast, focuses on the process itself. Central to the process-based view of financial innovation is the nature of the relationship between financial intermediaries and markets. In particular, financial intermediaries and markets are at once substitutes and complements for performing a particular function: the origination and management of risk.

1. Banks and Markets as Substitutes

When a financial intermediary, such as Wells Fargo or J.P Morgan, extends a loan to a corporate client who needs financing to make an investment, that loan contains a number of risks that the bank will make money managing. There is, for example, the risk that changes in the market landscape will lead to a decrease in the value of the loan. Perhaps interest rates increase, which makes the loan decrease in value since following the rate increase the bank will be receiving smaller interest rate payments relative to the market rate than it was entitled to receive before the rate hike. In addition to this market risk, the loan also contains firm-specific risks. For example, there is the risk that the borrower will decide to incur additional debt by borrowing from some other bank on the sly, which clearly reduces its ability to pay off the bank's loan. Banks make money by managing these risks. [12]

Of course, banks are not the only providers of financial products and managers of risk. Markets can also serve these functions. There are important differences, however, between intermediaries, such as banks, and markets. First, there is a difference in the

[12] Moreover, banks manage not only risks that they originate themselves, but risks that are originated by others. For example, the now-infamous credit default swap, which is discussed in more detail below, had its genesis with a transaction between the European Bank for Reconstruction and Development ("EBRD") and JP Morgan, under which the EBRD agreed to warehouse and manage the credit risk associated with a credit line that JP Morgan had extended to Exxon. *See* Gillian Tett, Fool's Gold 55 (2009).

types of products that the two institutions can provide. In order to be eligible for trading on financial markets, financial products must be traded in high volumes and have standardized terms. By contrast, banks are better suited for low-volume products with highly customized terms. Second, there is a difference in the way in which markets and intermediaries price risk. In markets, of course, risk is priced through the mechanisms of market efficiency.[13] Publicly available information becomes compounded into prices through the "bids" and "asks" of a large number of investors, each of whom places a particular value on the asset in question as a result of a set of publicly available information. Banks, by contrast, price and manage risk principally through models and non-public information that they acquire through relationships with customers. These relationships are typically long-term and are guided in part by the bank's use of non-public financial information concerning the customer that helps the bank monitor the borrower's financial stability.[14] This monitoring function is further served by a relational contract containing various covenants that allow the bank to assert certain rights in the event of a covenant violation.[15] Thus, in contrast to the market, which manages risk through risk-spreading and diversification and the reliance on publicly available information, banks manage risk largely through models and monitoring[16], which is facilitated by the bank's use of costly, borrower-specific information that the bank gathers over the course of repeated client interactions.[17]

Capital adequacy requirements place constraints on the amount of risk that banks can carry on their balance sheets. These requirements, embodied in two different international accords known as Basel I and Basel II require banks to maintain a certain

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[13] *See* Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 Va. L. Rev. 549 (1984)

[14] One challenge faced by banks is how to prevent the disclosure of this information to its rivals in order to appropriate the returns from information gathering. The answer may lie in the cooperative nature of banking markets themselves. *See* Bharat N. Anand & Alexander Galetovic, *Information, Nonexcludability, and Financial Market Structure*, 73 J. Business 357 (2000).

[15] For example, in a private loan agreement, there are typically covenants restricting the borrower's ability to incur additional debt (since additional indebtedness will adversely affect the borrower's ability to repay the bank) and requiring the lender to maintain cash flow above a certain threshold (since cash flow enhances the borrower's ability to repay the loan). A covenant violation gives the lender influence over the borrowing firm's financial or investment policy. For example, a violation of a covenant against additional debt incurrence might result in a blanket prohibition on the borrower's ability to take out additional loans. Lenders can influence borrowers in other ways as well. For example, there is some evidence that lenders have an important role in ousting CEOs of poorly performing companies. *See* Frederick Tung, *Leverage in the Board Room: The Unsung Influence of Private Lenders in Corporate Governance*, 57 UCLA L. Rev. 115, 156-57 (2009).

[16] It is worth noting that it is also by virtue of this monitoring role that banks are viewed as one of the levers of corporate governance. *See, e.g.*, Michael C. Jensen, *The Agency Costs of Free Cash Flow: Corporate Finance and Takeovers*, 76 Am. Econ. Rev. 323 (1986); George G. Triantis & Ronald J. Daniels, *The Role of Debt in Interactive Corporate Governance*, 83 Cal. L. Rev. 1073 (1995); Douglas G. Baird & Robert K. Rasmussen, *Private Debt and the Missing Lever of Corporate Governance*, 154 University of Pennsylvania Law Review 1209 (2006); and Frederick Tung, *Leverage in the Board Room: The Unsung Influence of Private Lenders in Corporate Governance*, 57 UCLA L. Rev. 115 (2009).

[17] *See* Arnoud W.A. Boot, *Relationship Banking: What Do We Know?*, 9 J. Fin. Intermediation 7, 10 (2000) (identifying two "critical dimensions" of relationship banking: "proprietary information and multiple interactions").

ratio of risk to capital.[18] Thus, if a bank wishes to increase the risk that it manages, it must also increase its capital cushion, which imposes a real cost on the bank. Banks also have internal credit limits that place further constraints on the amount of risk that banks can assume. In the face of these constraints on the amount of risk that banks can carry on their balance sheets, banks have a strong incentive to focus on managing only those risks for which they have a comparative advantage over markets. As the market becomes a more perfect substitute for a bank in the managing of risk related to a given product, the bank removes that product from its balance sheet, and the relationship in which it is embedded, and transfers it to an arm's length transaction in the financial markets, thereby creating a "new market." Of course, not all products are eligible to be transferred to markets. In particular, the product must have sufficient demand to be traded in relatively high volume, which requires it to have contractual terms that are standardized.[19] Perhaps even more importantly, there cannot be any information asymmetries between the bank and the market.[20]

Thus, everything else equal, products with more standardized terms and lower information asymmetries will migrate from banks to markets.[21] A useful analogy might be made to venture capital.[22] Venture capital funds serve as incubators of new companies. They invest in start-ups with the goal of testing and preparing them for a debut on markets, which venture capital funds accomplish through an initial public offering in the capital markets.[23] Banks do the same with respect to new financial products.

Up to this point, the discussion has been extremely conceptual. Let me illustrate the market migration process described above with a concrete example taken from the recent financial crisis. While commentators who have studied the financial crisis might disagree on the ultimate causes of the crisis, they tend to agree that a particular type of financial instrument played a crucial role in the events that roiled global markets in 2007 and 2008 and the aftershocks of which are still being felt as I write this in early 2010. This security is called a collateralized debt obligation ("CDO"). The CDO is a bond[24]

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[18] For a capsule summary of the Basel accords, see Eric Y. Wu., *Basel II: A Revised Framework*, 24 Ann. Rev. Banking & Fin. L. 150 (2005); Robert Hugi et al., *U.S. Adoption of Basel II and the Basel II Securitization Framework*, 12 N.C. Banking Inst. 45 (2008).

[19] *See* Robert C. Merton, *A Functional Perspective of Financial Intermediation*, 24 Fin. Management 23, 26 (1995)

[20] *Id*.

[21] Of course, this does not mean that substitute products will not be provided by both banks and markets. This equilibrium might occur if there exists a set of end-users of a given product that would benefit more from interacting with a bank than with a market. Consider, for example, public debt markets. These markets provide corporations with debt financing through arm's length transactions in the same way that banks provide corporations with debt financing through heavily-negotiated, private bank loans. One explanation for the co-existence of these two substitute products is that corporations that are particularly difficult to value, and that are therefore undervalued by markets, may find that banks, by virtue of their access to borrower-specific non-public information, will develop more accurate valuations than markets. Thus, for these difficult-to-value firms, private bank loans would be less expensive than going to the public debt markets. *See, e.g.*, Charles J. Hadlock & Christopher M. James, *Do Banks Provide Financial Slack?*, 57 J. Fin. 1383, 1383 (2002).

[22] Robert Merton was the first to draw this analogy. *See* Merton, *supra* note 19, at 26.

[23] *See* D. Gordon Smith, *The Exit Structure of Venture Capital*, 53 U.C.L.A. L. Rev. 315 (2005).

[24] The relevant "security" therefore in the securitization process is the security that is backed by the cash flow of the underlying debt instruments, not the underlying debt instruments themselves. In fact, in some

that is backed by the cash flows on an underlying pool of debt or debt-like instruments, such as corporate loans, other asset-backed securities[25] or credit default swap contracts.[26] Historically, banks held these debt or debt-like instruments that underlie the CDO on their own balance sheets. Banks would then do what they do best: they would manage the market and credit risk inherent in these assets, relying on models, borrower-specific, non-public information and relational contracting. Yet because of the risk constraints created by capital adequacy rules and internal credit limits, holding these assets on its own balance sheet prevented a bank from managing other, potentially more profitable risks.

Thus, there was an incentive on the part of banks to move these assets, and their associated risks, to markets, which, as discussed above, can act as a substitute for these risk-managing functions. The principal challenge, however, was in overcoming the information asymmetries and lack of standardization in these debt instruments. These loans had been extended to a variety of different parties with different credit histories and business prospects. Furthermore, by virtue of relationships with the borrowers of these loans, banks had superior information regarding these credit histories and business prospects than markets. In order to overcome these information asymmetries, banks needed a way to assuage investors' fears regarding the risks underlying the loans being sold. The banks sought to accomplish this goal through "pooling" and "tranching," two core features of CDO design.[27] By pooling a number of different loans together, the banks were able to minimize risk by exploiting the principles of diversification, assuming, as they did, that the loans in the pool were not highly correlated.[28] Further, by dividing the CDOs into distinct tranches, each representing a different level of risk and return, the banks provided the investor with a measure of flexibility regarding the level of risk it was obligated to assume.[29] Finally, banks prevailed upon credit rating agencies to

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cases (e.g., mortgage-backed securities), the underlying debt instruments (e.g., the mortgage contract) are not technically "securities" for purposes of the federal securities laws, although some argue that they should be so construed. *See* Jonathan R. Macey et al., *Helping Law Catch up to Markets: Applying Broker-Dealer Law to Subprime Mortgages*, 33 J. Corp. L. XX (2010) (forthcoming).

[25] The literature draws a distinction between CDOs on the one-hand, which are typically viewed as securities backed by bonds or loans but in any case non-mortgages, and other asset-backed securities, such as mortgage-backed securities ("MBS"), on the other hand. Yet at the level of generality required for our purposes here, there is very little difference between a CDO and an MBS – both are bonds that are backed by the cash flows on a pool of underlying assets, mortgages in the case of the MBS and other types of bonds and loans in the case of the CDO.

[26] A credit default swap is a contract that operates like insurance that covers the risk that a borrower will default on a loan. For a general description of credit default swaps, see Frank Partnoy & David A. Skeel Jr., *The Promise and Perils of Credit Derivatives*, 75 U. Cin. L. Rev. 1019 (2007).

[27] For an excellent description of the structure of CDOs, see Gary Gorton, *The Panic of 2007+* (August 4, 2008), *available at* http://www.kc.frb.org/publicat/sympos/2008/Gorton.08.04.08.pdf.

[28] Of course, the financial crisis called into question this assumption, at least as it applied to CDOs backed by sub-prime mortgages.

[29] For example, a financial sponsor might purchase one hundred mortgages, each of which generates cash flows from the homeowner's mortgage payments but also is accompanied by the risk that the homeowner defaults on his payment obligations. The financial sponsor pools these mortgages together and then sells securities backed by the mortgage pool in three different tranches, each of which represents a different level of risk and return with respect to the cash flows from the pool. If an investor purchases the "junior" tranche, which is the tranche with the highest risk and return, then losses arising from defaults on any of the mortgages in the pool would be charged against those junior-level securities first. If losses were so high

stamp a large portion of the total value of the deal with the much-coveted triple "A" rating.[30] These security design features allowed banks to move these assets to markets. Consistent with the market migration account, as these transactions migrated to markets, they were removed from bank relationships and placed in arm's-length transactions in markets. Investors could now buy and sell these loans with the same ease with which they traded stocks.

2. Banks and Markets as Complements

Markets serve not only as substitutes, but also as complements for banks in the provision of financial products and the management of risk. When a product migrates from financial intermediaries such as banks to markets, a new market is created, for example the CDO market described in the previous sub-section. The emergence of a new market creates new innovation opportunities, as banks can then create new products tied to the new markets in what Robert Merton has referred to as a "financial innovation spiral."[31]

As an illustration of banks and markets as complements, consider the "credit default swap," a security that formed one of the fault lines underlying the financial crisis. A credit default swap is a contract that operates like insurance that covers the risk that a borrower will default on a loan.[32] A purchaser of credit protection under a credit default swap, a bank, for example, might be concerned about the credit risk posed by one of its borrowers. Or, more realistically, perhaps the bank is comfortable, by virtue of its diversification practices, managing the risk that market interest rates will increase (referred to as "market risk") and that, consequently, the value of its loan will decrease.[33] While the bank might wish to retain its exposure to market risk, it may not be comfortable managing the risk that its borrower will default on the loan (referred to as "credit risk"). To protect itself against the credit risk posed by its relationship with the borrower, the bank might purchase protection from a third-party, an insurance company, for example, under a credit default swap contract. Like the purchaser of auto or homeowner's insurance, the bank must make periodic payments to the third-party insurance company, and the insurance company in return promises to make the bank whole in the event that the bank's borrower defaults on its obligation to repay the bank.[34]

The emergence of new markets in CDOs was accompanied by the emergence of new types of credit default swaps that insured against default risk in the new CDO markets. These credit default swaps were highly customized products, embedded in relationships

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that they were not covered by the junior securities, then the CDO investor who purchased the middle, or "mezzanine" level, tranche would be forced to suffer the additional losses.

[30] *See* Tett, *supra* note 12, at 55.

[31] *See* Merton, *supra* note 19, at 26.

[32] Although for convenience and ease of explication it might be sensible to analogize credit default swaps to insurance contracts, this does not necessarily imply that they should be regulated like insurance contracts. *See, e.g.*, M. Todd Henderson, *Credit Derivatives Are Not "Insurance,"* XX Conn. Ins. L. J. XX (2010) (forthcoming). For a general description of credit default swaps, see Frank Partnoy & David A. Skeel Jr., *The Promise and Perils of Credit Derivatives*, 75 U. Cin. L. Rev. 1019 (2007).

[33] Bond prices move in the opposite direction as that of interest rates.

[34] *See* Steven L. Schwarcz, STRUCTURED FINANCE: A GUIDE TO THE PRINCIPLES OF ASSET SECURITIZATION (2007).

with banks and insurance companies, firmly implanted on the "bank" side of the market migration spectrum. There were a number of reasons for buying these new derivatives that protected against the risks inherent in the new CDO markets. Banks that packaged asset-backed securities such as CDOs had to hold these securities before they were ready to market to the public in a process known as "warehousing." Even if the banks ultimately had no intention of retaining any of these asset-backed securities themselves, they were exposed to risks during this warehousing process and would accordingly purchase credit default swaps to hedge these risks.[35] In addition to hedging risks in the new CDO markets, CDSs were also used to exploit price differences between CDSs and the CDO tranches they were insuring against. In a so-called "negative basis trade," investors would purchase a CDO tranche while simultaneously purchasing a credit default swap that protected against the default risk on that particular tranche. If the cost of protection through was less than the expected payout on the CDO tranche, this trade was akin to purchasing the CDO and then immediately selling it for a profit.[36] These new credit derivatives products, which protected against the default risk attributable to CDOs would never have existed but for the creation of these new CDO markets as a result of the market migration process.

The preceding thumbnail sketch of the financial innovation process owes a significant amount to Ronald Coase's important insight in *The Nature of the Firm* that firms and markets are substitutes for coordinating economic production. In that seminal article, Coase was interested in explaining what drives an entrepreneur's decision to purchase the tangible and intangible inputs necessary to transform raw materials into goods and services. Does the entrepreneur purchase these inputs through arm's length contracts in markets or does she source them internally in a firm? Coase's hypothesis, of course, was that in the absence of transaction costs, economic production would be coordinated entirely through markets, as firms entail higher production costs by virtue of the fact that transactions carried out within the firm are shielded from the market's price mechanism. Similarly, the provision of financial products and the management of the attendant risks could be provided either through flexible relationships with financial intermediaries or through arm's length transactions in markets. As is generally recognized, Coase's distinction between firms (hierarchies) and markets is best understood as two end-points on a spectrum, with considerable space in between.[37] The same is true of the distinction between financial intermediaries and markets drawn here. Importantly, there are different categories of institutions within the term "markets." In a broad sense, "markets" as used here is simply used to draw a broad distinction between

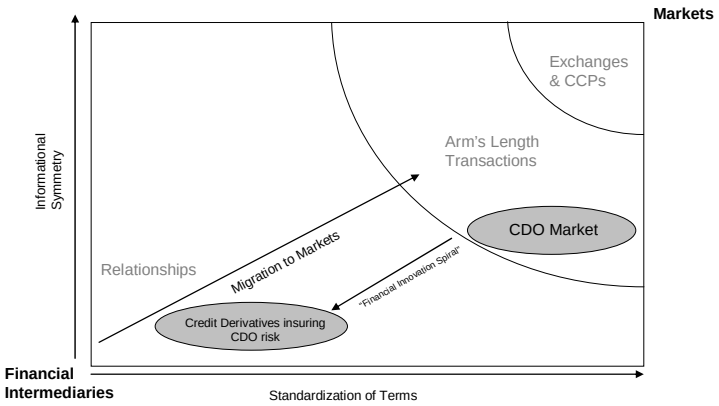
[35] *See* Tett, *supra* note 12, at 124 ("[J.P. Morgan] turned to the derivatives market to reduce its risk, by purchasing credit default swaps from other parties, which promised to redeem any default losses on the mortgage bonds it would begin selling. Such mortgage derivatives had barely existed a few years earlier, but they were among the products that had become so hot in the last years. Increasingly, banks were using them as insurance against losses from their mortgage-repackaging business.")

[36] *See* Gorton, *supra* note 8, at 38 (discussing this type of trade).

[37] *See, e.g.*, Joanne E. Oxley & Brian S. Silverman, *Inter-Firm Alliances: A New Institutional Economics Approach*, *in* New Institutional Economics: A Guidebook 209 (Eric Brousseau & Mean-Michel Glachant, eds., 2008) ("Thus, rather than a market or hierarchy dichotomy, it is more useful to think of transaction governance along a continuum, with market and hierarchy as the end points, and hybrid arrangements such as partnership and alliances making up the 'swollen middle'."); George S. Geis, *The Space Between Markets and Hierarchies*, 94 Va. L. Rev. 99 (2009).

two types of financial products. When products are provided by a financial intermediary, they tend to be relatively customized to the needs of the client and embedded in a relationship with the intermediary. When products are provided by "markets," by contrast, they are more like commodities – they are subject to less flexible, more uniform contracts, which enables the product to be traded in large volumes in the same way that investors trade stock. But the term "markets" can also refer to specific types of market institutions, such as exchanges[38] and centralized clearing parties ("CCP")[39]. As discussed in greater detail in Part II, it is not necessarily the case that products that migrate to "markets," broadly defined, will inevitably trade on exchanges or through CCPs. The figure below captures the concepts developed in this sub-part.

Figure 1: The Modern Financial Innovation Process



The figure above indicates that financial products migrate away from financial intermediaries (located in the lower left-hand corner of the grid) and toward markets (located in the upper right-hand corner of the grid) when they exhibit increasing informational symmetry between intermediaries and investors (as reflected by the arrow on the Y axis) and increasing standardization of terms (as reflected by the arrow on the X axis). The migration of CDOs away from banks is represented by its location closer to

[38] An exchange is an organized marketplace where buyers and sellers of a good gather to transact. Perhaps the most well-known example of an exchange is a stock exchange, which supports this organizing function with other functions as well. *See generally* Andreas M. Fleckner, *Stock Exchanges at the Crossroads*, 74 Fordham L. Rev. 2541 (2006).

[39] CCPs are discussed in greater detail in Part II. A CCP is an institution that is relied on by contractual parties to manage the "counterparty risk," or the risk of non-performance, involved in a contract with a time lag between execution and performance. The CCP becomes in effect both the buyer and seller to a given contract. While the CCP takes over management of counterparty risk, the parties themselves still bear other risks, such as market risk. *See, e.g.*, Robert R. Bliss & Robert S. Steigerwald, *Derivatives Clearing and Settlement: A Comparison of Central Counterparties and Alternative Structures*, 30 Econ. Persp. 22 (2006).

the "market" corner of the grid. But note that CDOs are not located all the way at the upper-right hand corner of the grid, where the terms "exchanges" and "CCPs" are found, because CDOs have not yet migrated to these market institutions. Finally, note that credit default swaps, particularly those that are tied to CDOs and discussed above, are still located at the lower-left hand corner of the figure, indicating that they are still in a nascent, testing stage, embedded in relationships with financial intermediaries. This diagram thus captures in broad strokes the intuitions regarding the financial innovation process as developed in this sub-part. The next sub-part discusses how the financial innovation process affects products, institutions and markets. In short, the process itself may lead to increased complexity in products and institutions and create certain fragilities within the new markets created by the market migration process.

B. The Effect of the Modern Financial Innovation Process on Instruments, Institutions and Markets

1. Increasing Product Complexity

Central to the account of modern financial markets developed in the previous sub-section is the notion that banks have an incentive to move financial products to markets. However, in the process of standardizing these products and resolving the information asymmetries that prevent these products from being traded at arm's length on markets, banks can introduce considerable complexity in the products themselves. For example, consider the structure of one of the simpler and more common types of CDOs, the rather clumsily named asset-backed security CDO ("ABS CDO"). This instrument is a CDO that is backed by the cash flows from a so-called residential mortgage-backed security ("RMBS"), which itself is a bond that is backed by the cash flows on a pool of residential mortgages. Thus, the institution structuring the ABS CDO would start with a pool of tranches of RMBS, perhaps "triple-A," "AA" and "A" tranches, for each RMBS, multiplied by 40 or 50 different RMBSs. Then, the structuring institution would pool those tranches together to create a new security, the ABS CDO, which would consist of different tranches representing the right to receive cash payments from the underlying mortgage assets.[40] In this manner, structuring institutions created these market-ready securities by creating complicated chains of risk that ultimately lead back to the original assets. Yet these complicated chains were extraordinarily difficult to navigate. In fact, one prominent commentator has suggested that these chains were constructed in such a way that the information necessary to value the underlying assets, for example the mortgages at the very start of the chain, simply became "lost."[41] That same commentator has explained that this complexity does not only defy market participants, but economists as well, as there are no economic models to explain the combination and diffusion of information resulting from such a structured financial product.

Another way of illustrating the complexity inherent in a product like the ABS CDO would be to simply consider the due diligence challenge presented by these instruments. As a starting point, an investor truly interested in scrutinizing the underlying risks of the ABS CDO would need to read the prospectus on file with the

[40] *See* Gorton, *supra* note 27, at 32.
[41] *See id*. (referring the "loss of information" as a result of the complexity of ABS CDO design).

Securities and Exchange Commission ("SEC") not only for the ABS CDO but also for each of the RMBSs underlying the ABS CDO. But this would be no small task since the typical ABS CDO contains a pool of on average 150 RMBSs, which implies a reading requirement of over 30,000 pages.[42] And this is actually one of the simpler types of CDOs. When one takes into account the existence of more complex variations of the CDO, such as the CDO "squared," which is essentially a CDO created from pools of ABS CDOs and which would literally require due diligence in excess of one million pages, one begins to sense how quickly complexity in product design can multiply as a result of the market migration process.

2. Increasing Institutional Complexity

The modern financial innovation process not only leads to increasing complexities in the products created by institutions but in the institutions themselves. Because they rely on non-public, borrower-specific information to manage the risks inherent in assets located on their books, banks are thought to be particularly difficult institutions for outsiders to value.[43] The financial innovation process does not improve this opacity. To the contrary, the financial innovation process tends to increase outsiders' difficulty in measuring and modeling institutional risks by increasing the complexity of these risks.[44] This increasing institutional complexity arises by virtue of the bank's role as both a substitute for and complement to markets.

Let's consider the "banks as complements" case first. As described in the preceding sub-part, banks act as complements to markets when they develop new products aimed at hedging risk in new markets created by the market migration process. These new products expose banks to the risks in these new markets, which as discussed in the next sub-part, can exhibit fragilities when placed under economic stress.

The "markets as substitutes" case can similarly expose banks to increasing risks. Because capital adequacy requirements and internal credit limits constrain the amount of risk that banks can hold on their balance sheets, banks have an incentive to only manage those risks over which they have a comparative advantage. As products work their way

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[42] *See* Andrew G. Haldane, Executive Director, Financial Stability, Bank of England: "Rethinking the Financial Network," Speech delivered at the Financial Student Association, Amsterdam (April 2009), available at http://www.bankofengland.co.uk/publications/speeches/2009/speech386.pdf. As another measure of complexity, Haldane calculates that the number of mortgages underlying an ABS CDO and a CDO "squared" is on average 750,000 and 93,750,000, respectively. *See id.*

[43] *See, e.g.*, Steven Sharpe, *Asymmetric Information, Bank Lending, and Implicit Contracts: A Stylized Model of Customer Relationships*, 45 J. Fin. 1069 (1990); Raghuram Rajan, *Insiders and Outsiders: The Choice between Informed and Arm's-Length Debt*, 47 J. Fin. 1367 (1992); *See* Donald P. Morgan, *Risk and Uncertainty in an Opaque Industry*, 92 Am. Econ. Rev. 874 (2002).

[44] While there is no direct evidence that financial institutions have grown increasingly complex, there is indirect evidence. For example, one study found that the incidence of disagreement among credit rating agencies regarding a bank's debt has increased markedly since the mid-1980s. *See* Morgan, *supra* note 43, at 884. For additional evidence that banks are more opaque than non-bank firms, see K. Stephen Haggard & John S. How, *Are Banks Opaque?* (working paper 2007) (demonstrating that banks have less firm-specific information in their equity returns and that these institutions are more likely to experience significant declines in stock price). *But see* M.J. Flannery et al., *Market Evidence on the Opaqueness of Banking Firms' Assets*, 71 J. Fin. Econ. 419 (2004) (presenting evidence that analyst forecasts of bank earnings are actually more accurate than the earnings of non-bank firms).

through the financial innovation process, becoming more standardized and less affected by information asymmetries, the risks associated with those products become correspondingly less profitable for banks to manage relative to the next best alternative.[45] These rising opportunity costs compel banks to offload these risks to the market and replace them with more complex, customized risks that are not as easily handled by the market.[46] Additionally, while market migration results in the transfer of financial assets from the balance sheets of banks to markets, it does not always remove all risk from banks. There is often a slice of risk that banks retain.[47] Sometimes this slice will be the riskiest portion of the product, which the bank will retain as a signal to market participants that they should not be concerned about information asymmetries that favor the bank.[48] Other times, the bank will retain what it believes to be a less risky portion (perhaps even the least risky) but, because of the product complexity concerns discussed in the preceding sub-part, will turn out to be unexpectedly, and possibly devastatingly, risky. A prominent example of this latter scenario is the so-called "super senior" risk associated with CDO tranches. This curious phenomenon, consisting of a tranche of a CDO that was even senior to the "triple A" rated tranche, was created as a way of increasing the interest rate, and therefore the demand, on the triple A-rated tranche by subordinating it to another tranche. Banks retained the super senior risk on their own balance sheets, assuming that it was completely risk-free, and investors in triple-A tranches received higher yield as a result of the structure. Of course, as it turned out, the super senior tranches were riskier than the banks thought, and when the default rate on the underlying mortgage assets began skyrocketing, banks were exposed to the ensuing risk.

3. Increasing Market Fragility

The financial innovation process affects the structure not only of financial products and financial intermediaries but of markets as well. The migration of products from banks to markets results in the creation of new markets that are beneficial as they serve the needs of a broader group of investors. These new markets, however, are typically less robust than more traditional markets for three main reasons. First, they replace flexible, relational agreements with rigid, standardized contracts without establishing a clear blueprint for workouts in the event of unexpected economic shocks. Second, they may exhibit less informational diversity than more traditional markets, particularly where the costs of obtaining less-public sources of information are high relative to the likely benefits.[49] Finally, these new markets may be particularly susceptible to herd behavior, leading to less diversity not only in investment strategies but also in the risk assessment processes underlying those investment strategies. Taken together, these market features may cause the new markets created by the financial innovation process to fracture in times of stress. The risk that these stress fractures result in the market buckling altogether, as it did in the financial crisis of 2008, is heightened by

[45] Rajan, *supra* note 11, at 326.
[46] *Id*.
[47] *Id*. at 326-27.
[48] *See id*.
[49] *Id*.

the interconnectedness of financial intermediaries and these markets. Each of these three factors is discussed at greater length below.

Replacing Flexible Relationships with Rigid Contracts. As discussed in Part I.B.2, relationship banking is defined in large part by a flexible, relational contract[50] between the bank and the client. The inherent incompleteness of these contracts provides the parties with the flexibility to modify their bargain in light of new information regarding the economy in general or the borrower in particular.[51] This flexibility is not just theoretical. A large percentage of these agreements are in fact modified, and one of the key triggers for modification is the macroeconomic condition of credit and equity markets.[52]

When, as part of the financial innovation process, transactions go from being embedded in a long-term relationship between a client and a bank to being conducted at arm's length in a market, the flexible agreements that are the hallmark of relationship-banking[53] are effectively replaced with more rigid, standardized contracts that are more resistant to modification in light of market fluctuations. One example of a rigid contract that underlies one of these new markets is the "Pooling and Servicing Agreement" ("PSA") at the heart of the residential mortgage-backed securities ("RMBS") market. In contrast to the contracts involved in relationship banking, the structure of the PSA creates substantial barriers to modification. For example, PSAs typically require the consent of a super-majority of each affected "tranche" of holders in order to effect a modification, and the holders of any particular tranche are likely to number in the hundreds if not thousands and spread throughout the world.[54] At first blush, this consent requirement may not seem unusually burdensome. After all, super-majority vote provisions are not uncommon in other contexts where vote holders are numerous and widely dispersed.[55] In fact, under the Trust Indenture Act, public bond issues require unanimity among their holders in order to modify key terms.[56] However, the PSA's super-majority vote provision must be understood within the structural context of securitization. Unlike in the case of corporate bonds, where the credible threat of bankruptcy helps overcome the coordination problems of a unanimous vote requirement, securitizations are shielded from bankruptcy. The mortgage assets that underlie the RMBS are held in a special purpose vehicle that cannot file for bankruptcy and that is shielded from the bankruptcy of the financial institution

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[50] For a classic treatment of relational contracts, see, for example, Robert Scott, *Conflict and Cooperation in Long-Term Contracts*, 75 Cal. L. Rev. 2005 (1987).

[51] One way of thinking about relational contracts as applied to financial intermediaries is that relational contracting provides financial intermediaries with the flexibility to decide whether to honor or repudiate a claim (for example, a loan commitment) and therefore trade off its reputation against its financial capital. *See* Arnoud W. A. Boot et al., *Reputation and Discretion in Financial Contracting*, 83 Am. Econ. Rev. 1165 (1993) (developing a model of the trade-off between reputational capital and financial capital).

[52] *See* Michael R. Roberts & Amir Sufi, *Renegotiation of Financial Contracts: Evidence from Private Credit Agreements*, XX J. Fin. Econ. XX, 25-28 (2010) (forthcoming).

[53] *See supra* Part I.B.2.

[54] For a useful classification of the rigidities inherent in the PSA, see Anna Gelpern & Adam J. Levitin, *Rewriting Frankenstein Contracts: Workout Prohibitions in Residential Mortgage-Backed Securities*, 82 S. Cal. L. Rev. 1075, 1087-1112 (2009)

[55] For example, under Delaware corporate law, corporations can elect to have certain issues to be voted on by shareholders decided by a super-majority vote.

[56] *See* Gelpern & Levitin, *supra* note 54, at 1091. Whether RMBS themselves are subject to the Trust Indenture Act is the subject of some controversy. *See id.* at 1092-93.

that packaged the securities in the first place. Without the threat of bankruptcy to act as an incentive to modify the terms of a PSA, the contract's super-majority consent requirement becomes a nearly insurmountable hurdle.

Of course, the new markets are not the only ones to exhibit these types of contractual rigidities. More settled markets, such as the corporate bond market, do as well.[57] However, these settled markets have usually had the time to develop fairly clear blueprints for conducting workouts. The public debt market in particular has a long, established history of restructurings outside of bankruptcy. The new markets that result from the financial innovation process, by contrast, lack this track record. In the absence of a blueprint for conducting workouts, let alone an established track record, contractual rigidities can amplify the effects of exogenous shocks to the economy.

Lack of Informational Diversity. Markets are information exchanges.[58] They match buyers and sellers for whom there are positive gains from trade, and through the prices negotiated in these transactions, the buyers and sellers convey important information regarding the value of the asset being traded. This asset-value information is aggregated across all transactions in the market and is broadcasted to other potential market participants through the price mechanism. The more effectively the market absorbs and reflects all publicly available information, the more accurately it will predict future prices.[59] However, markets are not dispassionate automatons – they are inherently human institutions that are subject to human incentives. For this reason, the effectiveness of a market in absorbing all publicly available information depends on the incentives of the market participants in incurring the costs necessary to gather the information and rely on it in their trading activities. Accordingly, market efficiency is a function at least in part of the costs of processing and evaluating information in the market.[60] As we saw in Part I.B.1, however, information costs in the new markets can be extremely high as a result of financial product complexity. The publicly available information on a single ABS CDO is measured in the tens of thousands of pages, whereas more exotic CDO spinoffs number in the millions. One commentator has described the task of sifting through this informational morass as "to some extent akin to the difficulty that would be posed by searching the Internet without a search engine."[61] Thus, while this information

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[57] These contractual rigidities may occur not only in bond indentures but also in the Trust Indenture Act, which is the background legislation that governs public debt issues. *See, e.g.*, Mark J. Roe, *The Voting Prohibition in Bond Workouts*, 97 Yale L.J. 232 (1987) (arguing that the Trust Indenture Act's prohibition on a binding vote by bondholders to change any core term of a bond issue could cause unnecessary bankruptcies during recessionary periods).

[58] *See, e.g.*, Saul Levmore, *Efficient Markets and Puzzling Intermediaries*, 70 Va. L. Rev. 645, 645 (1984).

[59] The definition used here assumes that efficient markets absorb only "publicly available information" and therefore it is a version of the "semi-strong" form of market efficiency. This can be contrasted with the "strong" form of market efficiency, which assumes that in order to be efficient, a market must absorb all information, including non-public information held by insiders, and the "weak" form of market efficiency, which assumes that in order to be efficient, a market must only absorb historical information. I adopt the weak-form of market efficiency here because it is the most common in the literature and has the most empirical support.

[60] Although overly simplified, this was one of the central points of the most famous and influential article (at least in the legal literature) on market efficiency, *The Mechanisms of Market Efficiency* by Professors Gilson and Kraakman. *See* Ronald J. Gilson & Reinier H. Kraakman, *The Mechanisms of Market Efficiency*, 70 Va. L. Rev. 549 (1984).

[61] *Id.*

is publicly available as a technical matter,[62] the costs of processing and evaluating it are substantial, if not prohibitive, and therefore even professional traders are unlikely to undertake the Herculean task necessary to ensure that this information is incorporated into market prices. In the absence of such professionally-informed trading, the new markets therefore must rely for their efficiency primarily upon what Professors Gilson and Kraakman refer to as "universally-informed trading,"[63] or trading on information that all market actors know, which in the new markets largely consists of informational heuristics, such as credit ratings. To be sure, it is now widely known that credit ratings themselves can exhibit fundamental flaws as a result of conflicts of interest in the credit ratings market[64] or by virtue of the structure of the market itself,[65] and various reforms for correcting these problems have been proposed.[66] Yet the important point here is that even with reliable informational heuristics, such as conflict-free credit ratings, the new markets may exhibit limited informational diversity and consequently low relative efficiency.

The limited informational diversity of the new markets may in and of itself lead to a relatively inefficient market as important bits of publicly available information fail to be incorporated into market prices. But in the new markets, limited informational diversity can cause deviations from fundamental value through another channel as well: by exacerbating the tendency of professional traders to travel in herds. While herd models are not particularly new,[67] they are becoming increasingly accepted among financial economists and legal academics.[68]

The idea behind herd models is deceivingly simple: "brains and resources are separated by an agency relationship."[69] Most professional traders, such as hedge fund

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[62] Steven L. Schwarcz, *Regulating Complexity in Financial Markets*, 87 Wash. U. L. Rev. 211, 222 (2009) ("Prior to the subprime crisis, for example, except for anticipating quite how profoundly home prices would drop, virtually all of the risks giving rise to the collapse of the market for securities backed by subprime mortgages appear to have been disclosed.").

[63] *See* Gilson & Kraakman, *supra* note 60, at 569-72.

[64] Claire A. Hill, *Regulating the Rating Agencies*, 82 Wash. U.L.Q. 43 (2004)

[65] Frank Partnoy, *The Siskel & Ebert of Financial Markets?: Two Thumbs Down for the Credit Rating Agencies*, 77 Wash. U.L.Q. 619 (1997).

[66] *See, e.g.*, Press Release, U.S. Securities and Exchange Commission, SEC Votes on Measures to Further Strengthen Oversight of Credit Rating Agencies (September 17, 2009), *available at* http://www.sec.gov/news/press/2009/2009-200.htm.

[67] For example, Keynes's famous quote about how "[w]orldly wisdom teaches that it is better for reputation to fail conventionally than to succeed unconventionally." John Maynard Keynes, The General Theory 158 (1936). More recent examples of herd models include David S. Scharfstein & Jeremy C. Stein, *Herd Behavior and Investment*, 80 Am. Econ. Rev. 465 (1990); Andrei Shleifer & Robert W. Vishny, 52 J. Fin. 35 (1997).

[68] *See* Rajan, *supra* note 11, at 338 (acknowledging this increased acceptance); Ronald J. Gilson & Reinier Kraakman, *The Mechanisms of Market Efficiency Twenty Years Later*, 28 J. Corp. L. 718, 734 (2003) (expressing sympathy for models of herd behavior). While some might have the inclination to group herd models with behavioral finance in general, this would be a mistake. While behavioral finance tends to consider the cognitive biases that undermine the rationality of market actors, herd models instead focus on the agency and incentive problems that result from the separation of capital from control among professional traders. For this reason, many who are left unpersuaded by behavioral finance's focus on cognitive biases nevertheless are sympathetic to herd models. *See, e.g.*, *id*. (discounting the value of behavioral finance but expressing sympathy for agency-cost and incentive analyses of the structure of professional trading markets).

[69] Andrei Shleifer, Inefficient Markets 89 (2000).

managers, must rely on outside capital to fund their arbitrage activities. While the investor must select a fund to invest with ex ante, the same investor can re-assess ex post in light of the arbitrageur's performance, which is typically measured against some benchmark, such as the S&P 500 or the performance of other funds. The problem is that poor performance can be the result of either bad judgment or bad luck, and the investor cannot distinguish very well between the two. Regardless of the explanation behind the outcome, if the fund underperforms with respect to the relevant benchmark – be it an index like the S&P 500 or peer funds – the investor withdraws his investment and re-deploys it with another fund.[70] Consequently, the arbitrageur tends to adopt strategies that do not deviate much from the relevant benchmark, which, when multiplied across all funds, leads to increasingly imitative and homogeneous arbitrage strategies. Perhaps most importantly for an analysis of the new markets, the greater the deviation of the asset's market price from the asset's fundamental value, the greater the risk that the arbitrageur's trade will underperform as a result of bad luck.[71] Consequently, herd behavior tends to be particularly acute in markets, like the new markets, that are prone to deviations from fundamental value.

To summarize, when markets are inefficient, exogenous shocks, like a marked increase in foreclosures, that affect these markets cause the markets to experience dramatic fluctuations in value. The new markets are susceptible to these sorts of fluctuations, which can cause stress fractures in these markets as they undergo dramatic realignment. Combined with the brittleness of the new markets – they are propped up by rigid, standardized contracts that resist modification and lack a plan for workouts, like more settled markets – these stress fractures can cause a market to buckle. In short, liquidity freezes up. These effects are amplified by the financial innovation process, which increases the interconnectedness between these new markets, more settled markets and financial intermediaries.

C. The Framework Under Stress: Application to the Global Financial Crisis of 2007-2008

This Article has thus far developed a framework for understanding modern financial markets through an account of the effect that the "financial innovation process" has on products, institutions and markets. New financial products revolutionize the ability to transfer risk and promote increasing efficiency through market completeness, but in addition to transferring risk, they also transfer uncertainty that many end-users have difficulty in managing. Further, they create new information problems as a result of the complexity of product design and opaque market structures. For their part, financial institutions that develop new financial products are increasingly innovative but also increasingly complex in the face of growing competition with markets over risk

[70] This discussion tends to follow the model presented in Shleifer & Vishny, *supra* note 67, at 35.

[71] To be sure, there will be some intrepid souls who are willing to run this risk. Or, alternatively, their fund's structure allows them to wait out a trade for a substantial amount of time before an investor has the right to withdraw funds. However, a few investors will not necessarily be enough to correct substantial fundamental inefficiencies. For examples of the activities of such contrarian traders in the most recent financial crisis, see Gregory Zuckerman, The Greatest Trade Ever: The Behind-the-Scenes Story of How John Paulson Defied Wall Street and Made Financial History (2009); Michael Lewis, The Big Short: Inside the Doomsday Machine (2010).

management. And markets themselves exhibit increased breadth with the emergence of new markets but potentially also increased fragility as the new markets are both (i) relatively inefficient and therefore subject to severe realignments in the wake of exogenous shocks and (ii) untested in dealing with the stress that results from such shocks.

Before exploring the regulatory implications of this framework, we first need to informally test its explanatory power by evaluating how well it explains the global financial crisis of 2007-2008. The crisis is an extraordinarily complicated phenomenon that is destined to keep economists and legal scholars occupied for years, and any diagnostic attempts at this early date are certain to be preliminary and incomplete.[72] What follows therefore cannot hope to be (and in fact is nothing) more than an informal sketch of the crisis. Its limited purpose is to highlight how the framework developed in Part I can be used to understand how a relatively modest shock[73] in one corner of the financial world mushroomed into a full-blown systemic event.

The financial crisis began in August 2007[74] with the bursting of the housing bubble. After years of continuous gains, home prices first leveled and then began to fall. Waves of cascading defaults on subprime mortgages, whose very existence depended on rising home prices, then followed, which began to affect the actual and perceived value of subprime-mortgage-backed securities, such as CDOs and RMBs. These new markets, plagued by inefficiencies resulting from a lack of informational diversity exacerbated by herd behavior, plummeted in value.[75]

The new markets were interconnected with financial institutions and other more settled markets. First, they were interconnected with financial institutions because, although as part of the financial innovation process, these institutions had transferred the assets underlying CDOs and RMBs from their balance sheets to the market, they had retained exposure to these assets through new, customized products such as credit derivatives and the residual risk of the asset-backed securities themselves. As the value of the subprime-mortgage-backed securities plummeted in value, banks and other financial institutions were required to make substantial write-downs of assets on their balance sheets. These actions had feedback effects at certain firms, such as Bear Stearns, where the firm's counterparties in OTC derivatives contracts withdrew the cash collateral they had posted pursuant to the agreement, reducing the firm's liquidity and accelerating

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[72] Of course, this has not stopped commentators from opining. For example, one catalogue of proposed causes of the crisis includes everything from regulatory failure, monetary policy, budget deficits and banking deregulation to "collective madness". *See* Richard A. Posner, *The President's Blueprint for Reforming Financial Regulation: A Critique: Part I*, 1 Lombard Street ¶9 (July 20, 2009), http://www.finreg21.com/lombard-street/the-president%E2%80%99s-blueprint-reforming-financial-regulation-a-critique-part-i.

[73] Subprime mortgage originations in 2005 and 2006 totaled about $1.2 trillion, which, although certainly a large number, is not alone large enough to cause a systemic crisis. *See* Gary B. Gorton, *Slapped in the Face by the Invisible Hand: Banking and the Panic of 2007,* at 32 (working paper, May 9, 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1401882.

[74] Of course, some might argue that the true origins of the financial crisis reach further back to the beginning of the era of easy credit for homeowners.

[75] A striking piece of evidence of the fall in value of these securities is a line graph developed by Gary Gorton depicting the decrease in the amount that lenders were willing to lend in the repo market on collateral consisting of subprime-mortgage backed securities. *See* Gorton, *supra* note 73, at 29.

its failure.[76] At firms that were dealers in credit derivatives, such as American International Group Financial Products ("AIGFP"), the unexpected increase in the likelihood of having to make its counterparties whole triggered obligations on the part of AIGFP's parent and guarantor, American International Group ("AIG"), to post billions of dollars in collateral that it did not have.[77]

Perhaps even more significantly, the new markets were interconnected with other more settled markets because banks relied on asset-backed securities in the "sale and repossession" ("repo") market as collateral for short-term loans that were necessary for the banks' solvency. In the repo market, large institutional investors deposit significant amounts of cash with banks which insure the cash with collateral. This collateral often took the form of senior tranches of subprime-mortgage-backed securities. Although obscure, the repo market couldn't be more significant. At roughly $8 trillion to $10 trillion in value, its size alone demands attention. And for banks, it provides a crucial source of short-term financing.

Yet as the value of mortgage-backed securities declined, the lenders in the repo market decreased the amount of cash they were willing to lend the banks for a given amount of collateral. Because the banks were not able to borrow as much off the same pool of collateral, they were required to finance their balance sheets in some other way. But as demonstrated in Part 1.B.2, the financial innovation process increases the institutional complexity of banks, and in the financial crisis, this increased institutional complexity made it nearly impossible for potential bank investors to determine which banks were more exposed to subprime risk than others, which created a lemons market[78] with virtually no investors willing to lend to the banks. With no short-term financing alternative to the repo market, the banks faced potential (or actual) insolvency. The failure or threat of failure of these large institutions prompted unprecedented federal intervention.

Although brief and overly simplified, this informal sketch of the financial crisis illustrates how the framework developed in Part I, which focuses on the effect of the financial innovation process on products, institutions and markets, played a significant role in the dénouement of the global financial crisis.

While these elements of modern financial markets give rise to problems that will certainly have to be addressed through regulation, they also complicate the economics of financial regulation by creating significant informational barriers for regulators. In this way, the financial innovation process has effectively "re-wired" the regulatory switch. The next Part explores this claim through the lens of one current policy proposal: the regulation of the financial innovation process through the mandatory CCP clearing of "over-the-counter" ("OTC") derivatives. The following analysis demonstrates how the framework developed in Part I calls into question certain fundamental assumptions regarding the benefits of subjecting OTC derivatives to a mandatory CCP clearing structure. Part III then explores policy implications that emerge from this analysis.

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[76] *See infra* Part II.
[77] *See infra* Part II.
[78] *See* George A. Akerlof, *The Market for "Lemons": Quality, Uncertainty and the Market Mechanism*, 84 Q. J. Econ. 488 (1970).

II. REGULATING THE FINANCIAL INNOVATION PROCESS: THE CASE OF MANDATORY CCP CLEARING FOR OTC DERIVATIVES

Part I developed an account of the financial innovation process and the effect that this process has on instruments, institutions and markets. It traced a market migration pattern that begins with the creation of a new financial product by a financial intermediary and ends when banks find it more profitable for the product to be provided for by markets, commoditizes the product and then removes it from both the relationships in which it is embedded as well as its balance sheet, and lets the markets take over. This Part analyzes how the framework developed in Part I sheds light on the regulation of the OTC derivatives market.

A derivative is a type of financial contract that *derives* its value from some other asset, financial indicator, event or condition. This so-called "underlying" includes plain-vanilla equity and debt, exchange rates and commodities but also more exotic things like hurricanes and other natural disasters.[79] While some derivatives trade on exchanges, where investors can buy and sell them without worrying about who is on the other side of the transaction, many derivatives are traded without the use of exchanges in what is known as the over-the-counter ("OTC") market. Unlike their exchange-traded cousins, OTC derivatives are individually negotiated among financial institutions and between financial institutions and their sophisticated clients. These financial institutions are referred to as "dealers" in such derivatives and the major derivatives dealers tend to be banks located in large financial centers.[80] The size of the OTC derivatives market is significant and growing. Notional amounts[81] of all categories of OTC contracts at the end of December 2007 reached almost $600 trillion.[82]

Derivatives are used for a number of different functions, not least of which is to hedge the risk of a particular asset. However, derivatives contain risks themselves largely because there is typically a significant time lag between the execution of a derivatives contract and the ultimate performance of the contract, which typically entails a cash payment by one of the parties. During this time, the value of the derivative will fluctuate with the value of the underlying, which is referred to as "market risk."

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[79] John C. Hull, Options, Futures and Other Derivatives 1 (2009).

[80] The major derivatives dealers include Bank of America, Barclays Capital, BNP Paribas, Citigroup, Credit Suisse, Deutsche Bank, Dresdner Kleinwort, Goldman, Sachs & Co., HSBC Group, JPMorgan Chase, The Royal Bank of Scotland Group, Société Générale, UBS AG and Wachovia Bank N.A. (Wells Fargo). *See* Darrell Duffie, *How Should We Regulate Derivatives Markets?* 2 (Pew Financial Reform Project Briefing Paper # 5, 2009), *available at* http://faculty.chicagobooth.edu/john.cochrane/teaching/35150_advanced_investments/Pew_Duffie_Derivatives.pdf.

[81] "The 'notional amount' of a derivatives contract is the market value (or, in the case of fixed-income markets, the principal amount) of the asset whose risk is transferred by the derivative. For example, an option to buy 1 million shares of an equity whose price is $50 per share represents a notional derivatives position of $50 million." *See* Darrell Duffie, *How Should We Regulate Derivatives Markets?*, at 3 (Pew Financial Reform Project Briefing Paper #5, 2009), *available at* http://www.pewfr.org/project_reports_detail?id=0017.

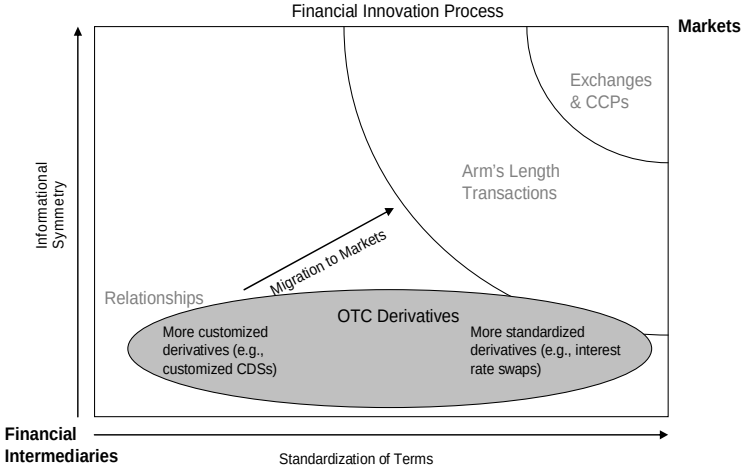
[82] Miguel A. Segoviano & Manmohan Singh, *Counterparty Risk in the Over-the-Counter Derivatives Market* (IMF Working Paper, November 2008).

Additionally, because a derivatives contract is "executory" and because at the outset of the contract, the parties do not know which of them will have a payment obligation at the time of performance or in what amount, derivatives contracts also contain "counterparty risk," or the risk that the party will not perform under the contract. Many consider that poor management of the counterparty risk associated with OTC derivatives contracts was a substantial contributing factor to the financial crisis.[83] Accordingly, one of the regulatory reform proposals currently under consideration in the U.S., the European Union and the U.K. is a rule (the "mandatory CCP-clearing rule") that would require the counterparty risk of OTC derivatives to be managed by a heavily regulated third-party called a centralized clearing party ("CCP").[84] The effect of this type of rule on the OTC derivatives market can be understood by reference to the following Figure 2:

[83] *See, e.g.*, Darrell Duffie et al., *Policy Perspectives on OTC Derivatives Market Infrastructure*, Federal Reserve Bank of New York Staff Report No. 424 (January 2010); Viral Acharya & Alberto Bisin, *Centralized Versus Over the Counter Markets* (working paper, May 5, 2009); Brian J.M. Quinn, *The Failure of Private Ordering and the Financial Crisis of 2008*, 5 N.Y.U. J.L. & Bus. 549 (2009) (concluding that "[o]n balance, a mandatory CCP clearinghouse for derivatives trades . . . would be socially desirable and would reduce many of the negative social costs associated with market participants' previous failure to engage in private ordering with respect to these contracts").

[84] In the United States, the mandatory CCP-clearing rule has been proposed by the Treasury Department and the influential Committee on Capital Markets Regulation. *See* Department of the Treasury, Financial Regulatory Reform – A New Foundation: Rebuilding Financial Supervision and Regulation 2 (June 30, 2009), *available at* http://www.financialstability.gov/docs/regs/FinalReport_web.pdf.; Letter from the Committee on Capital Markets Regulation to the U.S. Senate Committee on Banking, Housing and Urban Affairs (March 4, 2010), *available at* http://www.capmktsreg.org/pdfs/10-Mar-4_Committee_Derivatives_Letter.pdf. In the United Kingdom, the mandatory rule is a part of the British Treasury's financial reform proposals. *See* Financial Services Authority & HM Treasury, Reforming OTC Derivative Markets: A UK Perspective 11 (December 2009), *available at* http://www.fsa.gov.uk/pubs/other/reform_otc_derivatives.pdf. The mandatory CCP-clearing rule has also been proposed in an official European Commission Communication. *See* Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Central Bank, Ensuring Efficient, Safe and Sound Derivatives Markets: Future Policy Actions 5 (October 20, 2009), *available at* http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2009:0563:FIN:EN:PDF.

Figure 2: Situating the OTC Derivatives Market Within the Financial Innovation Process



As indicated in Figure 2, some OTC derivatives are highly customized and therefore embedded in banking relationships (and therefore spatially located closer to financial intermediaries in the figure) while others are more standardized. Within the context of Figure 2, the proposed "mandatory CCP-clearing rule" would effectively force a right-upward shift of the OTC derivatives market, moving a large portion of these contracts to a CCP. Viewed in this light, mandatory CCP clearing is not simply an instance of modest tinkering with the financial plumbing but a dramatic intervention in the financial innovation process itself. Drawing on the framework developed in Part I, this Part contends that the debate over a mandatory CCP-clearing rule has largely overlooked[85] the importance of the elimination of information asymmetries in the market migration process. This Part begins with a brief account of the role played by OTC derivatives in the financial crisis of 2008. It then proceeds with a critical assessment of the proposal to require mandatory CCP clearing of OTC derivatives.

A. The Role of OTC Derivatives in the Financial Crisis

[85] One exception is Craig Pirrong, *Rocket Science, Default Risk and the Organization of Derivatives Markets* (August 14, 2006), *available at* http://www.isnie.org/ISNIE06/Papers06/07.1%20(no%20discussant)/pirrong02.pdf

While OTC derivatives were not the "proximate cause" of the financial crisis,[86] they are thought to have exacerbated the crisis in two principal ways: by laying the foundation for faulty risk modeling and by contributing to bank-like runs.[87] First, credit default swaps ("CDSs"), one type of OTC derivative, allowed dealers in such instruments to assume considerable exposure to ABS CDOs by selling insurance on the risk of default of super senior (high investment grade) tranches of these securities. One of the most significant dealers in CDSs was American International Group Financial Products ("AIGFP"), which in 2003, underwrote close to eighty billion dollars in notional amount of these securities.[88] This extraordinary success, however, was in some sense a house of cards, as it was built at least in part on faulty risk modeling that led AIGFP to sell more insurance than it would have had had the risks of CDSs been properly accounted for.[89] When these overlooked risks finally materialized and it became increasingly likely that AIGFP would have to make substantial payments on its CDS positions, AIGFP's parent company and guarantor, American International Group ("AIG"), became obligated to post billions of dollars in collateral that it didn't have, and AIG teetered on the brink of bankruptcy. The potentially devastating implications that an AIG bankruptcy would have had on the hundreds of domestic and foreign financial firms that were counterparties to AIGFP's CDS contracts.[90]

Whereas in the case of AIG, OTC derivatives exacerbated the effects of the financial crisis by proving to be devilishly tricky instruments for risk modeling, OTC derivatives also contributed to the financial crisis by giving rise to bank-like runs. The paradigmatic example here is Bear Stearns. As discussed in Part I, firms like Bear Stearns were exposed to ABS of CDOs in a variety of ways, yet Bear's institutional complexity prevented outside investors from accurately assessing the magnitude of the risks to which the firm was exposed. Consequently, Bear Stearns's OTC derivatives counterparties reduced their exposures to the firm as news of its weakness spread. As these counterparties unwound their derivatives positions with Bear Stearns, they withdrew the cash collateral they had posted with the firm as part of their derivatives agreement, reducing Bear Stearns's liquidity and accelerating its failure. Fearing that a

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[86] *See* René M. Stulz, *Credit Default Swaps and the Credit Crisis*, 24 J. Econ. Perspectives 73, 83 (2010) (arguing that a combination of panic combined with institutional opaqueness and bad bets, not credit default swaps or other OTC derivatives, were the ultimate cause of the failure of AIG, Bear Stearns and Lehman Brothers).

[87] *See* Duffie, *supra* note 81, at 5-6.

[88] *See* Carol J. Loomis, *AIG: The Company That Came to Dinner*, Fortune, Jan. 19, 2009, at 70, 73.

[89] AIGFP estimated that it basically would never be obligated to make a CDS payment, *See* Brady Dennis & Robert O'Harrow, Jr., *A Crack in the System*, Wash. Post, Dec. 30, 2008, at A1, A8 (noting that AIGFP's estimate of having to make such a payment was less than 1%). More problematic, however, was the fact that AIGFP failed to assess the impact of a downgrade in the credit rating of AIGFP's parent, American International Group ("AIG"), which was a guarantor of AIGFP's obligations. *See* Robert O'Harrow, Jr. & Brady Dennis, *Downgrades and Downfall*, Wash. Post, Dec. 31, 2008, at A1, A8.

[90] *See* Gretchen Morgenson, *Behind Insurer's Crisis, Blind Eye to a Web of Risk*, N.Y. Times, Sept. 28, 2008, at A1, A28; O'Harrow & Dennis, *supra* note 89, at A9; Joe Nocera, *Propping Up a House of Cards*, N.Y. Times, Feb. 28, 2009, at B1; Press Release, U.S. Dep't of Treasury, U.S. Treasury and Federal Reserve Board Announce Participation in AIG Restructuring Plan (March 2, 2009).

Bear Stearns bankruptcy would pose a "systemic risk"[91] to the system, the federal government orchestrated a buyout of the investment bank by JP Morgan.

In the case of both AIG and Bear Stearns, the risk that these firms would fail to fulfill their obligations under their relevant OTC derivatives contracts was substantial enough to require dramatic federal intervention – a government bailout in the case of AIG and in the case of Bear Stearns, a government orchestrated buyout by JP Morgan. Indeed, although estimates vary, some have claimed that when such systemic risks are taken into account, the total loss of the failure of a financial institution to perform under an OTC derivatives contract could exceed $1 trillion.[92] In light of these sorts of calculations, and given the sobering quality of recent financial history, reducing "counterparty risk" has become a significant concern for policymakers and is indeed the motivation behind the mandatory CCP-clearing rule, a topic to which we now turn.

B. The Argument for Mandatory CCP clearing

The current structure of the OTC derivatives market consists of "bilateral" contracts between dealers, and contracting parties accordingly bear all of the risks inherent in their transaction, including both market risk and counterparty risk. The mandatory CCP-clearing rule would alter this market structure by effectively transferring the management of counterparty risk to a CCP, subject to substantial regulatory oversight. An example might help illustrate how a CCP functions. Let's say that Seller sells a credit default swap to Buyer, providing Buyer with protection from the risk that a reference entity (let's call it XYZ Inc.) will default on a particular security (let's call it XYZ Bond). Where trades must be "cleared" through a CCP, Seller and Buyer novate their side of the transaction to the CCP, creating two new contracts, one between the CCP and Seller and another between the CCP and Buyer. Once the trade is cleared through the CCP, Seller and Buyer no longer have a contractual relationship with one another. In effect, the CCP becomes the buyer to every seller and the seller to every buyer. Under this arrangement, if due to price fluctuations on the CDS instrument, the transaction were to become more profitable to Buyer, Seller would still owe the relevant amount upon settlement, but it would now owe it to the CCP, not to Buyer. Thus, the original counterparties still bear the market risk of the transaction. However, they no longer bear the counterparty risk. If, for example, Seller defaults on its payment obligation, the CCP is obligated to make Buyer whole. Thus the CCP, not the original counterparties, bears the default risk. Why should a CCP be expected to manage default risk better than

[91] There is no consensus definition of "systemic risk." It is often defined in terms of risk that causes a "chain reaction of failures of major financial institutions." *See, e.g.*, Darrell Duffie et al., *Policy Perspectives on OTC Derivatives Market Infrastructure*, Federal Reserve Bank of New York Staff Report No. 424 (January 2010). For more detailed variation on this definition, see Steven L. Schwarcz, *Systemic Risk*, 97 Geo. L. Rev. 193 (2008) (defining "systemic risk" as "the risk that (i) an economic shock such as market or institutional failure triggers (through a panic or otherwise) either (X) the failure of a chain of markets or institutions or (Y) a chain of significant losses to financial institutions, (ii) resulting in increases in the cost of capital or decreases in its availability, often evidenced by substantial financial-market price volatility.").

[92] *See* Miguel A. Segoviano & Manmohan Singh, *Counterparty Risk in the Over-the-Counter Derivatives Market*, at 15 (IMF Working Paper, November 2008).

market participants? The academic and policy literature provides two answers, and they track the two principal methods for managing default risk: netting and collateral.[93]

1. Multilateral Netting

The argument for mandatory CCP clearing of OTC derivatives relies in part on the availability of "multilateral netting" when trades are cleared through a CCP. The intuition behind netting should be familiar to anyone who has ever gone through the simple arithmetic of figuring out how much to reimburse a friend for an expense incurred on your behalf (say $10 for a movie ticket) where the friend herself owes you a certain amount for a different expense that you incurred on the friend's behalf (say $8 for a soda at the concession stand). Paying $2 to the friend in a single transaction is much simpler than engaging in two transactions, a transfer of $10 from you to the friend and a transfer of $8 from the friend to you. But besides mere simplicity, a netting rule also avoids the breakdown in the payment process that arises if you only have $5 in your wallet and your friend is broke. Netting in the OTC derivatives market works roughly the same way as in the movie theater example. Derivatives are a zero-sum game: one side wins while the other side loses. Thus, where two parties have multiple derivatives contracts outstanding between them, each party will have some losing contracts (where they owe the other side money) and some winning contracts (where the other side owes them money). Under a netting rule, each party subtracts all of her losing contracts from all of her winning contracts to determine how much she owes (or is owed by) the other party, thereby reducing the number of times money changes hands at settlement. The principal benefits of netting in the OTC derivatives market are also similar to those illustrated in the movie theater example: by reducing the number of cash transfers that must be made, netting also reduces the amount of cash that must trade hands. In the presence of liquidity constraints (where, like the two friends at the movies, OTC derivatives dealers have empty or near-empty wallets), reducing the amount of cash that must trade hands can mean the difference between performance and default.

While netting occurs in bilateral markets, CCPs provide for *multilateral* netting, which can result in even greater cash reductions between parties, since a CCP becomes a counterparty to all contracts being cleared by clearing members, and therefore there is potentially a greater number of contracts that can be netted against. The following figure[94] illustrates the benefits of multilateral netting:

[93] *See* Stephen G. Cecchetti et al., *Central Counterparties for Over-the-Counter Derivatives*, BIS Quarterly Rev., September 2009, at 49-50 (identifying these two elements as the core benefits of a CCP for OTC derivatives markets).

[94] This figure is based on one set forth in Raymond Knott & Alastair Mills, *Modelling Risk in Central Counterparty Clearinghouses: A Review*, Fin. Stability Rev. 162, 163 (2002).

Figure 3(a): Bilateral Clearing

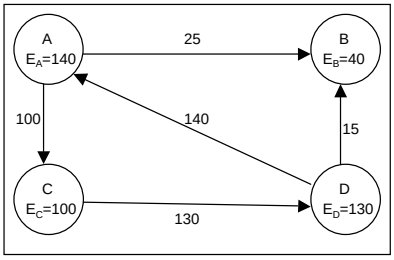


Figure 3(b): Gross positions with CCP

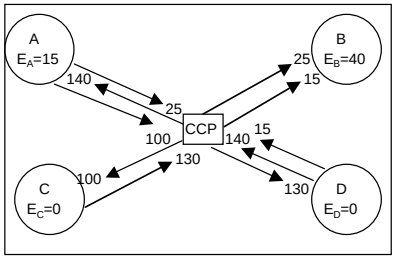
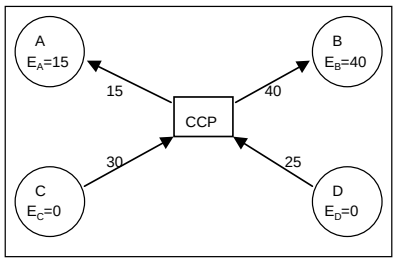


Figure 3(c): Multilateral net positions with CCP



In the above figures, there are four OTC derivatives dealers, "A," "B," "C," and "D." The "E" indicates the maximum counterparty exposure for a given dealer. The three figures illustrate the difference between bilateral clearing, in Figure 3(a), and multilateral clearing in Figure 3(c). Figure 3(b) is included simply to show the gross positions in a multilaterally cleared market to illustrate the step between Figure 3(a) and Figure 3(c). As illustrated, counterparty risk exposure ("E") decreases significantly for all parties.

2. Resolving the "Counterparty Risk Externality"

In addition to multilateral netting, the other principal argument that is made in favor of mandatory CCP clearing for OTC derivatives is that CCPs will be able to overcome what some refer to as the "counterparty risk externality"[95] of bilateral markets, which in turn will lead to more accurate pricing of collateral. Typically, parties will be required to post collateral[96], called "initial margin," at the inception of a derivatives transaction and will be subject to adjustments to this initial margin, called "variation

[95] Viral Acharya & Alberto Bisin, *Centralized Versus Over the Counter Markets* (working paper, May 5, 2009).

[96] In the U.S., collateral used in OTC derivatives transactions tends to be either cash or cash substitutes, such as treasury bills. ISDA Margin Survey 2009 (2009), available at http://www.isda.org/c_and_a/pdf/ISDA-Margin-Survey-2009.pdf.

margin," throughout the course of the trade. The parties' objective in using collateral is to force the counterparty to internalize the risk of default and therefore to price the collateral so as to reflect the risk that the counterparty will default on its obligation. The so-called "counterparty risk externality" arises by virtue of the fact that counterparty risk is a function, at least in part, of the number of outstanding derivatives positions of a given party. When Seller sells a credit default swap to Buyer A that requires Seller to pay Buyer A up to a certain notional amount, call it $100 million, upon the occurrence of a credit event at the reference entity (XYZ Inc. in the above example), the counterparty risk is the risk that Seller will not be able to perform on the contract if the credit event occurs. If Seller sells another credit default swap to Buyer B, the risk that Seller will default on either contract or both increases. Yet in bilateral markets, Buyer A is not necessarily aware of the contract that Seller has with Buyer B. In the absence of information regarding counterparties' outstanding derivatives positions, the argument goes, risk will be underpriced, which will lead to inefficient levels of default risk-taking in bilateral markets. A CCP, by contrast, will have information regarding the outstanding positions of all dealers who are clearing members because the dealers' positions are the CCP's positions, as the CCP is a party to all cleared contracts.

While the counterparty risk externality may identify a serious informational advantage that a CCP has over bilateral markets, two observations are in order. First, participants in the OTC derivatives market are certainly not ignorant of the fact that counterparty risk increases with the number of outstanding positions held by the counterparty. Because it is in the interest of a trading party to reduce counterparty risk, it is also in the trading party's interest to incur costs to discover the information necessary to minimize the counterparty risk externality. To be sure, the signals that a party obtains will not be as free of "noise" as the information that a CCP will acquire by simply observing all of its outstanding positions. But the important point is that a CCP is an improvement not over the absence of information but over "noisy" information. Thus, the counterparty risk externality might overstate somewhat the benefits gained from a CCP.

Second, and perhaps more importantly, the counterparty risk externality isn't really an externality at all, or at least, it is not an externality that is resolved by a CCP. An externality occurs "whenever the activities of one economic agent affect the activities of another agent in ways that are not reflected in market transactions."[97] Yet as already discussed, transactions in the OTC derivatives market can be expected to reflect a trading party's best estimates regarding its counterparty's outstanding positions. These estimates will be noisy and subject to error, but the market will capture them nonetheless. To be sure, market transactions will not reflect the social costs of a failure to account accurately for outstanding positions. For example, some have calculated that the social costs of the failure of a financial institution to perform under an OTC derivatives contract could exceed $1 trillion when taking into account the costs on other industries, lost jobs, etc.,[98] and trading parties in the OTC derivatives markets certainly do not take into account these costs in calculating and pricing counterparty risk. If this is what is meant by "counterparty risk externality," then there is no doubt that that is a true externality.

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[97] Walter Nicholson, Microeconomic Theory 730 (1998).

[98] *See* Miguel A. Segoviano & Manmohan Singh, *Counterparty Risk in the Over-the-Counter Derivatives Market*, at 15 (IMF Working Paper, November 2008).

However, a CCP does not resolve that externality. Like dealers in a bilateral market, a CCP does not take into account the societal effect of a dealer's non-performance in calculating the magnitude of loss from default.

There is little doubt that multilateral netting and the informational advantages of a CCP with respect to calculating the risk of default attributable to a counterparty's outstanding positions, even if somewhat overstated, are improvements over the current bilateral structure. In light of these considerations, a rule requiring clearing of OTC derivatives by a CCP might be a Pareto improving move, everything else equal. The problem, of course, is that everything else is not at all equal, as the next sub-section demonstrates.

C. Complicating the Argument for Mandatory CCP clearing

The standard argument for mandatory CCP clearing in the OTC derivatives market overlooks the importance of the elimination of information asymmetries in the financial innovation process, as explained in Part I and reflected in Figure 2. In the case of the OTC derivatives market, information asymmetries arise from the complicating effect that the modern financial innovation process has on products and institutions. In particular, the financial innovation process leads to increased complexity in financial instruments and the institutions that deal in those instruments. This increased complexity in turn increases the costs of developing counterparty risk models, which must take into account factors that are specific to both products and institutions. These costs are likely to be greater for a CCP than for participants in the bilateral market because of the comparative advantage of dealers in obtaining non-public (or at least publicly available, yet costly) information pertaining to product and institutional complexities. These informational advantages are reinforced by economies of scale in the development of counterparty risk models and incentives to invest in such models that simply do not exist (or at least do not exist to the same degree) in the case of a CCP. If these increased costs outweigh the benefits of centralized clearing, then a mandatory CCP-clearing rule could actually result in an institutional structure that does a worse job pricing counterparty risk than the current bilateral market. This could lead to two potential outcomes. It could increase the probability of default among systemically important entities and therefore multiply the number of bailouts that would occur in the absence of a CCP. Additionally, CCPs could act as a conduit for transmitting shocks from OTC derivatives markets to other markets, such as the new markets, which react particularly severely to such shocks, as discussed in Part I. To set the stage for this discussion, let's consider briefly the building blocks of counterparty risk models.

In the financial economics literature, it is assumed that a counterparty will default on a derivatives trade only if it is both insolvent and at the same time owes a payment under the derivatives contract.[99] Counterparty risk is therefore principally a function of

[99] *See, e.g.*, Edward I. Altman, *Analyzing and Explaining Default Recovery Rates: A Report Submitted to the International Swaps & Derivatives Association* (December 2001) (providing a survey of the four general types of extant credit risk models). While all of the available models focus on expected exposure ("EE") and the probability of default ("PD"), they may differ with respect to the assumptions they make regarding the relationship between EE and PD.

two variables: the expected exposure ("EE")[100] at the time of default and the probability of default ("PD").[101] The value of a derivative, and therefore the exposure that a party bears with respect to the instrument, fluctuates over time and depends principally on the behavior of the price of the reference security. Thus, the price of an interest rate swap is a function of the price of interest rates. The price of an exchange rate swap is a function of exchange rates. And the price of a CDS is a function of the risk that the CDS is insuring against: the risk of default on the underlying debt security. For example, the price the Buyer pays for a CDS is typically a percentage (let's say 1%) of the instrument's notional amount (let's say $100 million), and the Buyer must pay this amount, like an insurance premium, on a periodic basis (perhaps quarterly). But recall that the Seller of a CDS promises to make the Buyer whole in the event that the reference entity defaults on the reference security. If the reference entity experiences an adverse shock that affects its credit, then the CDS will become more profitable to Buyer because it becomes more likely that Seller will have to make a payment. The risk of such price fluctuations is called "market risk" and models of such market risk been a staple of risk management for years. Indeed, the famed Black-Scholes model, which ushered in the modern era of financial engineering by setting forth a method for pricing options, is precisely such a model. And one of the challenges of financial innovation is developing models that will predict the market risk of new instruments.

However, understanding the market risk, and therefore the expected exposure, of a derivative instrument is only one of the building blocks for modeling counterparty risk. After all, counterparties are not all created equal. Whereas a $30 million obligation might bankrupt a local community bank, the same obligation would be a drop in the bucket for a Wall Street firm. Thus, the risk that a counterparty will default on a payment obligation under a derivatives contract depends not only on the size of that payment obligation at a given time (i.e., the EE) but also on the probability of default at that time. Measurement of the PD must take into account past and current information regarding the counterparty's fiscal health, as measured both by balance sheet and off-balance sheet activities.

1. The Superiority of Bilateral Markets in Navigating Increasing Product and Institutional Complexity

Part I explained how the financial innovation process leads to products and institutions that exhibit increasing complexity. These increased complexities raise the costs of modeling the expected exposure ("EE") and probability of default ("PD") components of counterparty risk. Parties in bilateral markets, however, are likely to model EE and PD at less cost than a CCP because of (i) dealers' closer proximity to financial innovation; (ii) dealers' greater access to (noisy) signals regarding a counterparty's institutional risk; (iii) economies of scale in the development of

[100] The expected exposure is the cost to Buyer of replacing the defaulted-on trade minus the expected recovery from the counterparty. So, let's say that Seller defaults in the fourth year of the trade when the price of the CDS on XYZ bond has increased from 1% of notional to 5% of notional and that the expected recovery from the Buyer is zero. The expected exposure of the trade would be 5% of notional, or $5 million.

[101] *See, e.g.*, Ludger Hentschel & Clifford W. Smith, Jr., *Risks in Derivatives Markets: Implications for the Insurance Industry*, 64 J. Risk & Insurance 323, 330 (1997).

counterparty risk models that simply do not exist for a CCP and (iv) dealers' greater resources to hire highly paid specialists with quantitative mathematical backgrounds. These informational cost savings are reinforced by incentives, in particular, the arguably weaker moral hazard effect and greater reputational constraints in bilateral markets as compared to CCPs.

(i) Informational Advantages

(a) Informational Advantages in Calculating "Expected Exposure" (or the Superiority of Bilateral Markets in Navigating Product Complexity)

While the risks inherent in newer financial products are likely to be misunderstood as compared to more time-tested products, dealers will understand these risks better than a CCP because of their closer proximity to the source of innovation. This is certainly true for the dealer who created the product in the first place. For example, J.P. Morgan, the creator of one of the first CDOs,[102] arguably understood the risks inherent in that security better than its competitors, as evidenced by its refusal to enter the market for the mortgage-backed variation of Morgan's original CDO, which it determined was simply not profitable in light of the substantial risks the security posed.[103] Moreover, new financial products are rarely created *ex nihilo*, "out of nothing," but instead build off of previous products. The "synthetic CDO" that J.P. Morgan introduced in the late 1990's was composed of bits and pieces of prior innovations. This sort of innovation by precedent results in knowledge spillovers such that a dealer that invents a new product will obtain knowledge regarding the risks of products that were precedential in the development of that product but that the dealer itself did not invent. Finally, knowledge of product complexities may be diffused among dealer firms through the labor market. There is a high turnover rate at dealer firms among "quants,"

[102] To be clear, a CDO is not a derivative. This example is used here simply to illustrate the general claim that the closer one is to innovation, the better one understands the nature, including the risks, of the innovative product.

[103] In the mid-1990's, J.P. Morgan pioneered a particular type of CDO, which was a precursor to the subprime mortgage-backed securities at the epicenter of the financial crisis. Instead of bundling together subprime assets, however, the original J.P. Morgan CDO, which eventually was referred to as a "synthetic" CDO, actually bundled together credit default swaps ("CDSs"). As CDSs act like insurance on the risk of default of some credit instrument, the investors in these synthetic CDOs were essentially purchasing a claim to a pool of insurance premiums. At the time, the same J.P. Morgan team that created these synthetic CDOs also considered constructing them out of a pool of mortgages but ultimately decided against it, concluding that the risks didn't make the security profitable. *See* Tett, *supra* note 12, at 125. When other banks began offering such products, copying J.P. Morgan's original invention but replacing the pool of CDSs with a pool of subprime mortgages, J.P. Morgan twice re-considered entering the market, motivated by the apparently booming business being conducted by its competitors. *Id.* at 125, 140. But each time, the team reached the same conclusion that it had originally – the business was not profitable in light of the risks. *Id.* In retrospect, one explanation for why the other banks were willing to shoulder these risks whereas J.P. Morgan was not is that only J.P. Morgan truly understood the nature of the risks inherent in such securities because it successfully developed and marketed the original version. A competing explanation might be that the other banks were aware of and understood the risks involved in mortgage-backed CDOs but that they were seduced by the allure of short-term profits and figured that they would ride out the bubble until it burst. But this explanation almost raises more questions than it answers, not least of which is how to account for such dramatic differences in culture and intra-firm incentives among Wall Street banks.

specialists who are typically trained in some branch of the "hard" sciences and who are largely responsible for doing the heavy lifting required to bring a new financial innovation to light.[104] In moving from one dealer firm to another, these human repositories of product-specific knowledge help diffuse this knowledge among dealers.[105] Because CCPs do not themselves invent financial products, they are never in a position to benefit from this pattern of knowledge accrual concerning product complexities.

(b) Informational Advantages in Calculating the "Probability of Default" (or the Superiority of Bilateral Markets in Navigating Institutional Complexity)

As discussed above, the "counterparty risk externality" identifies an informational advantage that a CCP has over bilateral markets since the CCP is able to view the outstanding positions of all dealer trades that are being cleared with the CCP whereas such information is concealed in bilateral markets. This informational advantage is somewhat overstated, however, as dealers in bilateral markets also obtain information about the outstanding positions of trading parties, although this information is likely going to be obscured by "noise." Regardless, information pertaining to a dealer's outstanding derivatives positions is only one of the many factors that affect a dealer's probability of default, and dealers, not CCPs, have the informational advantage with respect to these other factors – what some refer to as "balance sheet risk."

As explained in Part I, the financial innovation process increases the complexity of financial institutions, as such institutions replace less profitable, plain vanilla risk with more complicated risk. These risks do not derive solely from OTC derivatives but from the myriad services performed by a typical dealer, including trading and commercial lending. In the bilateral market, dealers in OTC derivatives adjust collateral levels to reflect estimates of counterparty balance sheet risks.[106] Clearinghouses, by contrast, typically do not.[107] The information that dealers rely on to estimate such balance sheet risk can come through a variety of different channels. First and foremost, dealers in bilateral markets look to their own balance sheet risk to make informed guesses regarding the balance sheet risk of trading parties. Dealer firms operate in an industry that is characterized by herd behavior[108] and where the principle of minimum differentiation surely applies. Thus, the balance sheet risk of one dealer firm is to a certain extent predictive of the balance sheet risk of other dealer firms. Second, dealer firms obtain information regarding a trading party's balance sheet through industry consultants. Moreover, the work product created by these consultants fall on deaf ears but instead is taken seriously by market participants. For example, it was apparently an industry report by the consulting firm Oliver Wyman that spurred JP Morgan, which had pioneered one of the early versions of CDOs, to reconsider its earlier resistance to CDOs backed by

[104] *See* Henry T. C. Hu, *Review: Misunderstood Derivatives: The Causes of Informational Failure and the Promise of Regulatory Incrementalism*, 102 Yale L. Rev. 1457, 1484 (1993).
[105] *See* id.
[106] *See* Craig Pirrong, *The Economics of Clearing in Derivatives Markets: Netting, Asymmetric Information, and the Sharing of Default Risks Through a Central Counterparty*, at 32 (working paper, January 8, 2009).
[107] *See id.*
[108] *See* Part I.B.3.

residential mortgages.[109] Finally, the sociology literature emphasizes the informal information flows in the financial services industry in general and the OTC derivatives market in particular.[110] Networks that give rise to interactions ranging from telephone conversations to after-work drinks at local bars facilitate information sharing that allows dealer firms to understand, interpret and assess what other market participants are thinking and to form a "consensus view" regarding particular market trends.[111] These various channels provide dealer firms with important information regarding the balance sheet risk of rival dealer firms, information that CCPs do not typically seek out for purposes of calculating a dealer's probability of default.

(c) Economies of Scale in Building Risk Models

Another source of dealers' comparative advantage over CCPs is that dealers in bilateral markets must manage not only market risk but default risk as well.[112] As discussed above, CCPs, by contrast, only manage default risk. Yet default risk models themselves must piggyback on models of market risk since default risk is a function in part of the expected exposure of the derivatives over the life of the contract. For dealers, who can use their development of market risk models to inform their default risk models, there are economies of scale. Thus, if there are two different default risk models, one of which is both of higher quality and costlier than the other, it is more likely that the dealer, not the CCP, will choose to produce the higher quality model despite the higher cost because of its ability to spread these costs across market risk models as well.

(d) Talent

Not only are dealers more likely than CCPs to benefit from the knowledge accrual resulting from the proximity to new products, but dealers also have greater resources than CCPs to hire specialized talent for developing risk models for such products. It is well understood that financial institutions are increasingly populated with so-called "quants" and "rocket scientists," specialists who often have Ph.D.'s in a field requiring a quantitative mathematical background and who are charged with drawing on that background to develop new trading strategies, models and instruments.[113] These individuals often forego promising careers in academia for highly lucrative jobs on Wall Street, and their influence on modern financial markets cannot be underestimated. Indeed, it was quants from J.P Morgan, not from the Ivory Tower, who developed the

[109] Upon re-consideration, J.P. Morgan confirmed its previous conclusion that the risks outweighed the benefits. *See* Tett, *supra* note 12, at 140.
[110] *See, e.g.*, Pierre Agnes, *The "End of Geography" in Financial Services? Local Embeddedness and Territorialization in the Interest Rate Swaps Industry*, 76 Econ. Geography 347 (2000).
[111] *Id*. at 356-58.
[112] *See* Craig Pirrong, *supra* note 106, at 32.
[113] *See, e.g.*, Henry T.C. Hu, *Swaps, The Modern Process of Financial Innovation and the Vulnerability of a Regulatory Paradigm*, 138 U. Penn. L. Rev. 333, 338-39 (1989) (discussing how "quants" or "rocket scientists" rely on "the nuances of such matters as 'option pricing theory' . . . to take advantage of subtle differences among and inefficiencies in today's volatile capital markets").

"value-at-risk" model, [114] which is one of the most widely used market risk measures and incidentally one of the models that has drawn the ire of commentators for having failed to predict the losses resulting from the financial crisis.[115] CCPs simply do not have the resources to compete with dealers for this talent pool. While this competitive disadvantage may not be particularly significant where, as in futures markets, product risks are relatively well tested and well understood, this disadvantage is of grave concern when such risks are poorly understood, as they are with many (if not most) of the products in the OTC derivatives market.

(ii) Incentives -- Moral Hazard and Reputational Constraints

Finally, CCPs face a moral hazard problem that is arguably more severe than that faced by dealers. Moral hazard arises when insurance coverage causes a party to engage in behavior that actually increases the likelihood of incurring losses. A considerable amount of ink has been spilled about the moral hazard effect that the bailout of Bear Stearns and AIG has had on large financial institutions. Now that these firms know that the federal government will come to their aid in the event that any one of them faces the threat of insolvency, the argument goes, these institutions will actually engage in riskier behavior than before. While this moral hazard problem is significant, it could be worse. Importantly, the federal government did not bail out Lehman Brothers, and there is an ongoing debate regarding the wisdom of that decision. Thus, there exists some residual uncertainty regarding the likelihood of a bailout of even large Wall Street banks, which of course are dealers in OTC derivatives, within the zone of insolvency. There is a general consensus, by contrast, that if OTC derivatives are subject to mandatory CCP clearing by CCPs, the CCPs themselves will become systemic institutions, and that they therefore will benefit from an implicit government guarantee.[116] Thus, CCPs know with virtual certainty that if they cause a systemic event among their members by virtue of under-investing in models, they will be bailed out.

To be sure, there might be reputational costs that constrain CCPs from producing lower quality models. There is a rich theoretical literature that maintains that reputations can help buttress the production of quality in markets where information problems prevent regulators or consumers from verifying the quality of the product.[117] However, these reputational constraints are not particularly significant, where, as is likely to be the case with CCPs, producing a higher quality product (here, a higher quality model) adds little to a firm's revenues and the time horizon for verifying a firm's reputation is

[114] *See, e.g.*, Olivier Scaillet, *The Origin and Development of Value-at-Risk*, *in* Modern Risk Management: A History 154 (2003) (explaining the role of JP Morgan in developing the VaR measure); Tett, *supra* note 12, at 33-34 (same).
[115] *See, e.g.*, Nocera, *supra* note 90 at B2.
[116] *See, e.g.*, Hal S. Scott, The Global Financial Crisis (2009).
[117] One of the pioneering works in this literature is Benjamin Klein & Keith B. Leffler, *The Role of Market Forces in Assuring Contractual Performance*, 89 J. Pol. Econ. 615 (1981). *See also* Carl Shapiro, *Premiums for High Quality Products as Returns to Reputations*, 98 Q. J. Econ. 659 (1983); Russell Cooper & Thomas W. Ross, *Prices, Product Qualities and Asymmetric Information: The Competitive Case*, 51 Rev. Econ. Stud., 197 (1984); Douglas W. Diamond, *Reputation Acquisition in Debt Markets*, 97 J. Pol. Econ. 828 (1989); George J. Mailath & Larry Samuelson, *Who Wants a Good Reputation?*, 68 Rev. Econ. Stud. 415 (2001).

particularly long. In this respect, the reputational constraints of a CCP for OTC derivatives markets might bear some resemblance to those placed on credit rating agencies.

Credit rating agencies rate the creditworthiness of institutions and securities. These firms, which include familiar names such as Moody's, Standard & Poor's and Fitch, have attracted a rash of criticism for what with the benefit of hindsight appears to have been exceedingly positive credit ratings that they ascribed to the mortgage-backed securities that fueled the financial crisis. Among the evidence that has emerged regarding the role of credit rating agencies in the financial crisis, there is some indication that reputational constraints failed to induce credit rating agencies to invest in more accurate models, at least in part, because such investments would not substantially increase the credit rating agency's revenues[118] and because investors who relied on credit ratings for their investment decisions were not able to assess the reputation of a credit rating agency until after a meltdown, if then. These same factors are likely to be present in a CCP structure for OTC derivatives.

2. Bilaterally Cleared Markets v. CCP-Cleared Markets: The Cost-Benefit Problem

Table 1 below sets forth a tabular representation of the analysis of mandatory CCP clearing developed in this Part.

Table 1: Charting the Argument for Mandatory CCP clearing

	Pricing Collateral			**Netting**
	Market Risk ("Expected Exposure")	Balance Sheet Risk ("Probability of Default")	Minimizing the "Counterparty Risk Externality" ("Probability of Default")	
CCP	-	N/A	+	M
Bilateral Market	+	+	-	B

With respect to the cost of information necessary to accurately price collateral, the "plus" sign in Table 1 indicates a cost advantage whereas the "minus" sign indicates a cost disadvantage. Thus, a bilateral market has a cost advantage over a CCP with respect to information pertaining to market risk and balance sheet risk whereas a CCP has a cost advantage with respect to information regarding outstanding derivatives positions, which reduces the "counterparty risk externality." The less costly the information, the less

[118] Frank Raiter, former Managing Director and Head of Residential Mortgage Backed Securities Ratings at Standard & Poor's ("S&P"), testified before Congress that S&P did not adopt a model that would more accurately reflect the risk in structured products because "improving the model would not add to S&P's revenues." Credit Rating Agencies and the Financial Crisis Before the H. Comm. On Oversight and Gov. Ref., 111th Cong. 6 (2008) (statement of Frank Raiter).

noisy that information and the more accurate the counterparty risk modeling. In the netting column, the "M" refers to multilateral netting and the "B" refers to bilateral netting. The non-shaded area represents the standard argument for mandatory CCP clearing while the shaded area indicates how this Part has complicated that argument. The "not applicable" in the cell representing the CCP's cost of balance sheet risk information indicates that CCPs typically do not attempt to incorporate balance sheet risk information into estimates of the probability of default because of the prohibitive cost of obtaining that information.[119] As a summation of the analysis in this Part, Table 1 implies the following cost-benefit problem: whether noiseless information regarding outstanding derivatives positions (i.e., elimination of the "counterparty risk externality") will improve the accuracy of counterparty risk modeling by an amount that is greater than the loss in accuracy of such models by virtue of a CCP's inferior ability to model market risk and its apparent unwillingness to include as model inputs estimates of dealer firms' balance sheet risk. The next Part explores the implications of this cost-benefit problem.

III. IMPLICATIONS

The cost-benefit problem set forth in Part II, although resistant to simple answers, holds a number of implications for the debate over the regulation of OTC derivatives.

A. Clearing as "Shock Absorber" or "Shock Accelerator"?

First, and foremost, the cost-benefit problem suggests that a mandatory CCP-clearing rule for OTC derivatives, without regard for issues of information asymmetry, is not as obviously Pareto-improving as its proponents have made it out to be. In particular, this cost-benefit problem suggests that far from acting as a "shock absorber,"[120] a CCP for OTC derivatives could realistically act as a "shock accelerator" depending on how the calculus works out in practice. To see this, it might help to think about a CCP as an insurance provider.[121] When an individual purchases insurance for, let's say, the risk of getting into a car accident, the insurance company must confront the challenge of how to price that risk through insurance premiums so as to minimize the likelihood that the individual will take on more or less risk than she would in the absence of insurance. To this end, the insurance company gathers various bits of information on the insured that helps it to model the driver's risk of accident. If the insurance company misses an important piece of information, for example, the driver's proclivity for rush-hour drag racing, premiums may be lower than they would if that piece of information had been included in the actuarial calculation. In the face of lower premiums, the driver is paying less than it should on an actuarial basis for the risk of reckless driving and will likely engage in more of it.

The same general logic applies to CCPs, who after all act as insurers of counterparty risk. If the counterparty risk models used by a CCP to price collateral

[119] *See* Pirrong, *supra* note 106, at 45.
[120] Aline Vanduyn & Jeremy Grant, *OTC Clearers Pose Fresh Dilemma*, Fin. Times, Jan. 14, 2010, at C1.
[121] I'm not the first to analogize collateral to insurance. *See* Pirrong, *supra* note 106, at 32.

(which can be thought of as a sort of insurance premium) are less accurate than those used by counterparties in the bilateral markets, a distinct possibility in light of the information asymmetries highlighted in Part II, then a mandatory CCP-clearing rule would lead to less optimal risk-taking than that provided for by bilateral markets. This increased "model risk" could lead to one of two outcomes, depending on the output of the CCP's model, and therefore requires consideration of two cases.

The obvious case is where the CCP model underprices counterparty risk relative to bilateral markets. Dealer firms will look for these opportunities and exploit them, and as illustrated by our experience with credit rating agencies prior to and during the financial crisis, dealer firms are extraordinarily agile at gaming models created by third-parties.[122] In that case, a mandatory CCP-clearing rule could actually lead to an increase in counterparty risk among OTC derivatives dealers, which in turn could increase systemic risk. The ultimate result would be an increase in the frequency and possibly magnitude of government bailouts of systemic institutions, which of course would include the CCPs. While CCPs have proven to be remarkably stable in futures and equity markets, they are not foolproof, and CCPs have been known to fail in the past.[123] If such an outcome were to materialize, it would be hard to think of another law that more epitomized the rule of unintended consequences than the mandatory CCP-clearing rule.

But what if information asymmetries affect CCP models in a different way and in fact produce the opposite effect, leading CCPs to overprice risk relative to bilateral markets? At first blush, one might be inclined to think that such an outcome wouldn't be particularly objectionable. After all, if the financial crisis stands for any principle in particular, it might be that market actors at large Wall Street banks, including OTC derivatives dealer firms, are inclined to assume an inefficiently high degree of risk, which can lead to disastrous results.[124] Thus, less risk-taking might come as a breath of fresh air. Indeed, numerous commentators have essentially taken this position with respect to the financial sector in general.[125]

However, even this case may lead to an increase in systemic risk if dealers are required to post additional collateral that is unexpected because of inaccuracies in the way the CCP's counterparty risk model estimates market risk. In other words, the CCP might overprice risk on a static basis but underprice risk on a dynamic basis. For example, the CCP might overprice risk because it over-estimates the dealer's "probability of default," perhaps because it over-compensates for the lack of information available to it on balance sheet risk. Thus, the dealer might have to initially post $5 million cash collateral whereas in the bilateral markets, it would only have to post $2 million. By contrast, as a general matter, the CCP might underestimate the "expected exposure"

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[122] *See* Tett, *supra* note 12, at 100 (recounting how Moody's decision to make its CDO model publicly available allowed bankers to exploit loopholes in the model).

[123] For example, Paris in 1973, Kuala Lumpur in 1983 and Hong Kong in 1987. *See* Raymond Knott & Alastair Mills, *Modelling Risk in Central Counterparty Clearinghouses: A Review*, Fin. Stability Rev. 162, 164 (2002). Also, if one takes a longer view, CCPs do not appear quite as robust. For example, in the 19th century, the "Bourse" in Paris, which was essentially an early derivatives exchange, had to be bailed out by the Banque de France more than once. *See* Angelo Riva & Eugene N. White, *Danger on the Exchange: Counterparty Risk on the Paris Exchange in the Nineteenth Century* (working paper, April 2008).

[124] *See, e.g.*, Lucian A. Bebchuk & Holger Spamann, *Regulating Bankers' Pay*, 98 Geo. L. J. 327 (2010).

[125] *See, e.g.*, Claire A. Hill & Richard W. Painter, *Berle's Vision Beyond Shareholder Interests: Why Investment Bankers Should Have (Some) Personal Liability*, U. Seattle L. Rev. (forthcoming 2010).

because it under-estimates market risk – perhaps it underestimates the probability that the price of the derivatives will fluctuate by more than a reasonable range in a given day. If, contrary to the model's prediction, the price does fluctuate outside of this reasonable range, then the dealer will have to post additional collateral. Since this collateral posting requirement is by definition "unexpected," the dealer may be forced to sell assets in another market in order to meet the collateral obligation in the OTC derivatives market. If that second market is one of the "new markets" discussed in Part I, the sale of assets in the new market and the corresponding downward pressure on price in the new market could cause that market the type of stress that caused the CDO market to freeze up. In this way, a CCP's model risk relative to bilateral markets can actually result in the transmission of shocks from the OTC derivatives market to other, entirely distinct markets.

B. Reframing the Debate Part I: "Information Asymmetries" and "Standardized Terms"

As an encapsulation of the analysis in Part II, the cost-benefit problem also suggests that the debate concerning a mandatory CCP-clearing rule for OTC derivatives itself has overlooked, or at least minimized the importance of, information asymmetries in the modern financial innovation process in general and the OTC derivatives market in particular. Consequently, it suggests that a fundamental reframing of the discussion is in order. Part II proceeded on the assumption that the proposed mandatory CCP-clearing rule would require the mandatory CCP clearing of all OTC derivatives. In actuality, however, this isn't quite right. Rather, the most prominent proposals, including that of the U.S. Treasury and the Committee on Capital Markets Regulation, would require the mandatory CCP clearing of all "standardized" derivatives, with the definition of "standardized" to be filled in by Congress or regulators.[126] However, the problem with such a rule is the same problem with a rule requiring mandatory CCP clearing of all OTC derivatives: it ignores information asymmetries.

As explored throughout this Article, the standardization of terms is only one of the drivers of the process by which products migrate to markets, whether from banks to arm's length transactions or from arm's length transactions to CCPs and exchanges. The absence of information asymmetries, of course, is the other key driver, and, as argued at some length in Part II, there is reason to believe that in the case of OTC derivatives, there is the potential for substantial asymmetries between dealers and a CCP. Nor is it the case that a "standardized" product will necessarily be free of substantial information asymmetries between the financial intermediary and the market. Indeed, one need look no further than asset-backed CDOs for an example of a security that was sufficiently standardized to migrate from financial intermediaries to markets but that still exhibited substantial information asymmetries.

Furthermore, these informational asymmetries are not something that can be resolved through regulatory oversight. The Committee on Capital Markets Regulation focuses on the need for regulatory oversight of CCPs. Since a CCP would likely become a systemic institution in its own right, there is little doubt that regulatory oversight would be necessary. But regulatory oversight itself cannot change the information structure of

[126] *See supra* note 84.

the OTC derivatives market, which is an information structure that produces certain chunks of counterparty risk-related information for CCPs at a cost that is substantially higher than for market participants in the bilateral markets. What these considerations suggest is a need for the mandatory CCP clearing debate to return to the basic lesson derived from this Article's description of the modern financial innovation process: Products subject to clearing should only be those that are standardized and that exhibit minimal information asymmetries between the financial intermediary and the market (in this case, the CCP).

C. Reframing the Debate Part II: Who Decides What Gets Cleared?

The cost-benefit problem set forth in Part II suggests the need not only for a reframing of the inputs that must enter the decision regarding what gets cleared in the OTC derivatives market, but perhaps also a reframing of who – market actors, regulators, or CCPs themselves – should make the decision in the first place. Proponents of a mandatory CCP-clearing rule would allocate decisionmaking authority to Congress or regulators. At first blush, this is not necessarily the most intuitive choice, even if one endorses the standard argument for mandatory CCP clearing, which rests on two pillars: multilateral netting and resolution of the "counterparty risk externality." Yet on their face, these two pillars suggest that market participants themselves should prefer markets cleared by CCPs since these pillars confer private benefits on market actors.[127] After all, multilateral netting should lead to a reduction in costly collateral requirements, since netting would take place over a larger number of contracts. And by taking into account all outstanding derivatives positions among dealer firms in order to model a firm's probability of default, thereby resolving the "counterparty risk externality," a cleared OTC derivatives market should at a minimum reduce uncertainty concerning a dealer's probability of default and may also lead to a reduction in collateral requirements.[128]

Thus, to maintain that regulators, not market actors, must decide what gets cleared while at the same time endorsing the standard argument for mandatory CCP clearing, one must point to some inefficiency in the market preventing market actors from making the socially efficient choice, which according to proponents of the mandatory rule, is a migration to a cleared market. These potential inefficiencies come in essentially two varieties: market failures and incentive problems. The account developed in Part II regarding information asymmetries complicates these inefficiency stories because it suggests that there might be a different explanation for why OTC derivatives have not migrated to CCP-cleared markets.

1. Market Failure: Systemic Risk as an Externality

One possible reason why financial intermediaries haven't moved OTC derivatives contracts to CCP-cleared markets is that bilateral OTC derivatives markets exhibit a

[127] Others have made the point that the benefits of a cleared market are largely private. *See, e.g.*, Robert R. Bliss & Robert S. Steigerwald, *Derivatives Clearing and Settlement: A Comparison of Central Counterparties and Alternative Structures*, 30 Econ. Persp. 22, 25 (2006) (noting that the delegation of credit risk management to CCPs typically reduces costs to dealers); Pirrong, *supra* note 106, at 47 (same).
[128] *See* Part III.1.

market failure due to externalities. "An externality occurs whenever the activities of one economic agent affect the activities of another agent in ways that are not reflected in market transactions."[129] The paradigmatic example of an externality is the costs that a firm imposes on other firms as a result of pollution. Perhaps two firms are located on a river, and the downstream firm's output decreases as the upstream firm dumps more pollution into the river. The polluting firm doesn't take into account these social costs and therefore produces more pollution than is efficient from a societal standpoint.[130] If the polluting firm were forced to internalize these costs, for example through an excise tax equivalent to the cost of the externality, then the market might be able to overcome this inefficiency.

In the case of dealers in bilateral OTC derivatives markets, instead of pollution, the externality in question is thought to be systemic risk, or the risk that one financial institution's failure will cause a domino effect of failures at other major financial institutions."[131] Thus, the counterparty risk of one firm imposes costs on other firms – not just counterparties, who are able to force the risky firm to internalize these costs through mechanisms like the use of collateral, but other firms that are not involved in derivatives transactions as a result of the domino-like effect of systemic risk. The costs imposed on this second group of firms – those who aren't involved in the derivatives transactions – are the source of the externality. Thus, if the lion's share of the benefits from clearing fall on these third parties instead of on the dealers themselves, dealers will have little incentive to move to CCPs.

The problem with this argument, however, is that it is not evident that the lion's share of the benefits from a CCP-cleared market falls on third parties. In the paradigmatic externality case, the polluting firm is not on its own initiative going to scale back production in light of the costs imposed on the third-party because it would bear all of the costs and none of the benefits. Thus, policy makers can conclude with near certainty that the firm's behavior is not socially efficient and intervene in the market. But according to the "standard argument" for mandatory CCP clearing itself, dealers in bilateral markets would reap substantial benefits from moving to a CCP. Of course, third parties would gain as well by this move. But because these third-party benefits are bundled with benefits that redound to the dealers themselves, there is no way of inferring from dealers' refusal to move to CCP-cleared markets that this failure to act is socially inefficient. CCPs do not price collateral so as to force dealers to internalize the costs of default to society as a whole (i.e., systemic risk). Rather, they price collateral so as to force dealers to internalize the costs of default as applied solely to the other members of the CCP. Thus, the metaphor of the polluting firm is entirely misleading as applied to OTC derivatives clearing. The more apt metaphor paints a considerably more complex regulatory problem. It might go something like this: The polluting firm is overproducing for a reason independent from the externality, for example, its failure to efficiently manage its own cost structure. In other words, because of a lack of information, coordination or sheer human error, the polluting firm thinks that its costs of production are much lower than they actually are and has to decide whether to outsource

[129] Walter Nicholson, Microeconomic Theory 730 (1988).
[130] *See, e.g., id*. at 731.
[131] *See, e.g.*, Darrell Duffie et al., *Policy Perspectives on OTC Derivatives Market Infrastructure*, Federal Reserve Bank of New York Staff Report No. 424 (January 2010).

management of its cost structure to some third party (call it "Cost Crusading Pirates" or "CCP" for short). In that case, the polluting firm would reap substantial benefits from hiring "Cost Crusading Pirates" to manage its cost structure, and the firm located downstream would also obtain benefits if production were curbed. But, unlike in the case of the paradigmatic externality example, regulators cannot even be reasonably comfortable (let alone certain) that the polluting firm's failure to incur the costs to hire Cost Crusading Pirates is socially inefficient. The same is true of the "counterparty risk externality" in the OTC derivatives market. Consequently, the argument that market failure due to a "systemic risk externality" requires that regulators and not market actors decide what gets cleared is weak at best.

2. Incentives

In addition to arguments about market failure, incentive-based arguments have also been deployed to explain why market participants are incapable of reaching the socially efficient result of when to move particular OTC derivatives contracts to a CCP. One prominent example of this type of argument focuses on the notion that dealers might reap higher profits in a bilateral market to the extent that it is less liquid than a cleared market.[132] Dealers who buy and sell OTC derivatives on behalf of clients are market makers in these securities. They match up buyers with sellers and profit from the spread between the two prices. Thus, a dealer might have one client, Client B, who wants to buy a derivative at a certain price, say $10, and another client, Client S, who wants to sell the same derivatives for another price, say $9.50. So, the dealer in a sense buys the derivatives from Client S for $9.50 and sells it to Client B for $10. The spread between these two prices is the "bid-ask" spread, and it represents the profit that the dealer makes for facilitating the transaction.

Dealers of course would prefer a wider "spread" since that would imply greater profits, and the width of the spread is in part a function of the liquidity in the market. The greater the transparency regarding the quantities being traded and the prices at which those quantities are being traded, the greater the liquidity in the market and the narrower the spread. OTC derivatives markets are likely less liquid than CCP-cleared markets because CCP-cleared markets increase transparency regarding prices and quantities of securities traded. [133] Thus, the crux of this argument is that dealers prefer bilateral markets because they lead to less transparency, wider spreads and therefore higher profits.

This liquidity-based argument certainly seems plausible. But it's unclear why this argument supports the notion that regulators instead of market actors should decide what derivatives products get cleared. After all, there are ways of increasing transparency in OTC derivatives markets, for example through central information depositories, that do not require the implementation of a mandatory CCP-clearing rule.

These arguments based on market failure and misaligned incentives in the OTC derivatives market may support a mandatory CCP-clearing rule, although even that

[132] *See, e.g.*, Darrell Duffie et al., *Policy Perspectives on OTC Derivatives Market Infrastructure*, Federal Reserve Bank of New York Staff Report No. 424, 10-11 (January 2010).
[133] *See, e.g.*, Stephen G. Cecchetti et al., *supra* note 93, at 45, 49; Bliss & Steigerwald, *supra* note 127, at 26 (explaining that one of the benefits of a CCP-cleared market is increased liquidity).

proposition is problematic because, as discussed above, a CCP does not really resolve the market failure problem and is not the only way to resolve the incentive-based problem. However, the possibility of substantial information asymmetries complicates these arguments even further because they offer a reason whey the decision of "what gets cleared and when" should be allocated to those with greater information: the dealers.

D. Reframing the Debate Part III: The "New" Governance and the Search for a "Third Way" for Regulating the Financial Innovation Process

At a high level of generality, the mandatory CCP clearing argument goes something like this: The OTC derivatives market, a predominantly unregulated market, proves unable to regulate counterparty risk on its own as evidenced by its contributing role in the most severe economic downturn since the Great Depression, and therefore the regulatory fix is to shift the risk-management role from private market actors to a third-party operating under the watchful eye of regulators. Underlying this argument, there is an assumption that the choice here is between bottom-up solutions and top-down prescriptions, regulation versus deregulation, the administrative state versus the private market actor. It is common to characterize the history of financial regulation as a pendulum swinging back and forth between these two regulatory poles, and the rhetoric pertaining to the most recent financial crisis is no different.[134] Yet as we have seen, the regulatory problem presented by OTC derivatives itself is considerably more complex than is suggested by these simple dichotomies. Along certain dimensions, CCP-cleared markets provide advantages over bilateral markets, and market failures and misaligned incentives may prevent unregulated market actors from capturing these benefits. Yet at the same time, significant information asymmetries between financial intermediaries and CCPs threaten not only to undermine the potential benefits of cleared markets but, paradoxically, to create a system that is even more sensitive to economic shocks and systemic events than the current one.

This type of regulatory problem simply requires a different regulatory paradigm than that provided by the starkness of New Deal-era categories. This new paradigm must be able to harness the greater expertise and information of private market actors and supplement it with government-sponsored institutions that can pick up the slack or help correct for private market actors' misaligned incentives. Framed in these terms, the regulatory problem presented by the modern process of financial innovation in general, and the OTC derivatives market in particular, bears some resemblance to regulatory problems that contemporary legal thought has sought to address through what has been referred to as the "new governance paradigm."[135]

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[134] Lawrence Summers, *The Pendulum Swings Towards Regulation*, Fin. Times, October 26, 2008, at C1; Bob Davis et al., *Amid Turmoil, U.S. Turns Away from Decades of Deregulation*, Wall St. J., July 25, 2008, at B2 (characterizing financial regulatory history as a "pendulum swinging back and forth); Jackie Calmes, *Both Sides of the Aisle See More Regulation*, N.Y. Times, October 13, 2008 (quoting Robert E. Litan as asking rhetorically whether "the pendulum [is] going to go completely over in the other direction [(i.e., away from deregulation)]); Joseph E. Stiglitz, *Principles of Financial Regulation: A Dynamic Portfolio Approach*, 16 World Bank Research Observer, 1 (2001).

[135] *See* Orly Lobel, *The Renew Deal: The Fall of Regulation and the Rise of Governance in Contemporary Legal Thought*, 89 Minn. L. Rev. 342 (2004); *see also* Ian Ayres & John Braithwaite, Responsive Regulation: Transcending the Deregulation Debate (1992).

Motivated in part by "new levels of complexity, unpredictability, and dynamic change in society,"[136] this new regulatory paradigm emphasizes, among other things, collaboration between market participants and regulators with due regard for the "localness" of human knowledge.[137] Below I sketch the broad outlines of two potential alternatives to a mandatory CCP-clearing rule that seek to fit within this description of the new governance paradigm. The first alternative draws on collaboration between dealers and regulators to overcome the type of information asymmetries that threaten to undermine the effectiveness of CCPs. The second alternative solves this problem in a different way – by centralizing elements of bilateral markets and subjecting these elements to regulatory oversight but maintaining management of and liability for default risk with dealers. Each has its benefits and deficiencies, although the second may ultimately hold more promise.

1. Centrally-Cleared Markets with Bilateral Features

The first possible alternative to a mandatory CCP-clearing rule is not so much an alternative to the rule itself – indeed, under this proposal, there would still be a mandatory rule – but rather a modification to the way in which the typical CCP-cleared market functions. Typically, a CCP develops its own counterparty risk models without input from its members, the dealer firms. The approach suggested here, by contrast, would require the dealer firms to share their models with CCPs so that CCPs could benefit from dealers' greater expertise and proximity to products. Perhaps the parties could even collaborate on the development of the model to be used by the CCP. The benefits of such an approach should be obvious: harness dealer firms' comparative advantage at modeling counterparty risk, particularly market risk, while preserving a CCP's informational advantage regarding outstanding positions and the benefits from multilateral netting. Would dealer firms be willing to share these models with the CCP? They might. But once dealers share these models initially, they would subsequently have an extremely strong incentive to develop better models to exploit circumstances where the CCP underprices counterparty risk, thus leading right back to the same concerns that animated the discussion in Part III.A. in the first place. Thus, dynamic concerns constitute a significant hurdle to this type of institutional alternative.

Is there a way of addressing these dynamic concerns? Not without some sort of mandatory rule requiring dealers to update the CCP regarding model upgrades and improvements and provided that such a rule is actively enforced with sanctions. But even if the enforcement costs of such an arrangement were not prohibitive (a big "if"), there are potentially significant costs from encouraging that level of homogeneity in risk modeling, as homogeneity can cause markets to overreact to unexpected market shocks, potentially causing asset "fire sales" and plummeting prices.[138] And even if one were to overcome these admittedly severe drawbacks, there are limits even then to how much of a benefit this type of institutional alternative would provide. In addition to market risk,

[136] Lobel, *supra* note 135, at 358.
[137] *Id*. at 376, 382.
[138] *See* Erik F. Gerding, *The Outsourcing of Financial Regulation to Risk Models and the Global Financial Crisis: Code, Crash, and Open Source*, 84 Wash. L. Rev. 127, (2009) (discussing Carol Alexander, *The Present and Future of Risk Management*, 3 J. Fin. Econometrics 3 (2005)).

dealers have an informational advantage with respect to estimating a trading party's "balance sheet risk." Yet it would most likely not be cost-effective for dealers to share with the CCP information concerning these risks, as this information changes constantly. And even if they did, this type of information, gathered through informal networks, is more likely to be deployed in the type of flexible, backroom negotiating that takes place in bilateral markets over collateral calls[139] rather than in the rigid modeling of CCPs.

2. Bilaterally Cleared Centralized Markets

A potentially more promising institutional alternative might be a modified version of bilateral markets that seeks to capture many of the benefits of a CCP while at the same time avoiding the information asymmetries that may increase a CCP's model risk. In some respects, bilateral OTC derivatives markets have been moving in this direction for some time now. Yet they have been evolving without regulatory oversight and in the presence of potentially misaligned dealer incentives. What this proposal would accomplish would be to create an institutional alternative to a CCP that is subject to proper regulatory oversight and that accounts for the complexities of the modern financial innovation process, including its increasing product and institutional complexities and potentially fragile markets. The proposal focuses on two elements: (a) netting counterparties and (b) increased transparency.

(a) "Netting Counterparties"

One of the clear benefits of a CCP is the availability of multi-lateral netting. Because the CCP is a party to every contract, there is greater opportunity to reduce outstanding default risk exposure through netting than in the bilateral markets. Nevertheless, netting in bilateral markets could be improved substantially through the use of mandatory netting counterparties. Like a CCP, these netting counterparties would perform netting services for dealer firms. However, unlike a CCP, they would not insure against default risk and therefore wouldn't manage default risk; nor would they, as a legal matter, become a party to any OTC derivatives contracts between dealers. The benefit of this structure over bilateral markets would arise from the counterparty's detecting redundant positions and notifying dealers of these redundancies so that dealers can take appropriate steps to eliminate them. For example, recall the depiction of bilateral clearing in Figure 3(a). A netting counterparty might reduce the exposures in this case by identifying the fact that there is a redundancy in the $D \rightarrow A \rightarrow C \rightarrow D$ path. This redundancy could be eliminated by subtracting $100 from each cash flow depicted in that path, which would reduce each dealer's default risk exposure by $100, leaving Dealer C with no exposure at all. To be sure, the reduction in default risk exposure overall would not necessarily be as great as with a CCP, as illustrated by comparing the exposure outcomes described here to those depicted in Figure 3(c). But the benefit would likely be substantial, and the more redundancies, the greater the benefit.

Netting counterparties would be feasible for two reasons. First, there is a historical precedent. The Chicago Board of Trade ("CBOT") didn't establish a CCP until

[139] For an example of this type of negotiating, see Tett, *supra* note 12, at 232 (describing how J.P. Morgan entered into a negotiation with Lehman Brothers over collateral that Lehman owed).

1925; instead, beginning in 1883, it successfully operated an institution that had no liability in the event of default and simply calculated net margin obligations, just like a netting counterparty as defined here.[140] Second, there are already private parties, such as a company called TriOptima, that offer the type of netting services that would be performed by a netting counterparty.[141] These private services are relatively new, but have proven useful for those dealer firms that have decided to use their services. There are a number of issues that would need to be worked out, of course, and this Article leaves those issues for another day. However, it is worth noting that any netting counterparty would likely need to be subject to close regulatory oversight. It is likely that netting would be optimized under a single netting counterparty,[142] and therefore regulators would need to ensure that the counterparty's monopoly position didn't detract from netting quality. Regardless, however, even alternative industry structures would likely need regulatory oversight considering the value of the service provided.

(b) Increased Transparency

As explained in the preceding sub-part, dealers may prefer the relative opaqueness of OTC derivatives markets to the extent that it decreases liquidity, bid-ask spreads and ultimately the dealers' profits. For this reason, proponents of mandatory CCP clearing tout the benefits of the increased transparency that accompanies a CCP-cleared market. Yet there are other means of increasing market transparency without having to resort to mandatory CCP clearing. One way would be to encourage the establishment of central information depositories,[143] perhaps in connection with the creation of a netting counterparty. Such a depository would need to be accessible to other dealers through the internet, and would need to include information concerning prices and quantities of derivatives traded. Further, the depository would need to be archived so that dealers could access historical trading patterns as well.

There are already attempts to create such depositories, and the successful creation of an information depository for certain OTC derivatives,[144] but these efforts are not being coordinated and in some cases they are focused solely on collecting data on trade volumes, not pricing. That is where regulators would come in. Regulators would oversee the creation of such depositories and then monitor them on an ongoing basis to ensure that information regarding new products are making their way into such depositories. Such information depositories would go a long way to create increased transparency in bilateral markets, thereby minimizing dealers' incentives to seek refuge

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[140] Craig Pirrong, *The Industrial Organization of Execution, Clearing and Settlement in Financial Markets*, 54 (working paper, October 9, 2007).

[141] *See* Robert R. Bliss & Robert S. Steigerwald, *Derivatives Clearing and Settlement: A Comparison of Central Counterparties and Alternative Structures*, 30 Econ. Persp. 22, 27 (2006); Elisabeth Ledrut & Christian Upper, *Changing Post-Trading Arrangements for OTC Derivatives*, BIS Quarterly Rev. 83, (December 2007).

[142] *See* Darrell Duffie & Haoziang Zhu, *Does a Central Clearing Counterparty Reduce Counterparty Risk?* (working paper, March 4, 2010) (finding that the benefits of netting are greater where there is a single CCP in the market).

[143] Elisabeth Ledrut & Christian Upper, *Changing Post-Trading Arrangements for OTC Derivatives*, BIS Quarterly Rev. 92, (December 2007).

[144] *See id*; Michael Mackenzie, *TriOptima Makes OTC Rates Data Available* , Fin. Times, January 20, 2010, at C1 (describing TriOptima's information depository for interest rate derivatives).

in the bilateral markets from increased pressure on dealer profits.[145] But in addition, information depositories would also improve the currently noisy signals that dealers in the bilateral markets rely on to estimate outstanding derivatives positions, which as explained in Part, is a central variable in calculating default risk.

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I have provided here only a very rough sketch of what a centrally cleared bilateral market might look like. The goal of such a market structure should be first and foremost centralization – of both information and netting activities – but importantly not centralization of default risk. Centrally cleared bilateral markets structured with this primary goal in mind would avoid the information asymmetries of a mandatory CCP-clearing rule while capturing many of the other benefits of a pure, centrally cleared market. Importantly, this type of structure would also improve incentives among dealers to move derivatives contracts to centrally cleared markets, and because the decision of what gets cleared would remain with market actors, the products that migrate to CCPs would likely be only those that satisfy the two pre-requisites to market migration: the elimination of information asymmetries and the standardization of terms.

For proponents of a mandatory CCP-clearing rule, both of the alternatives presented here will inevitably be unacceptable. They lack the "elegance" of the mandatory CCP-clearing rule and in any case fail to articulate a satisfactorily proportionate response to what most perceive as a dramatic failure of private ordering. However, since this Article began with an insight from the "New Institutional Economics" literature, it seems only fitting to end with another insight from that same literature: the importance of eschewing hypothetical ideals by focusing on the least flawed of competing policy alternatives.[146] As Part II demonstrated, the standard argument for mandatory CCP clearing is based on a conception of the trade-offs of the problem that ignores, or at the very least discounts substantially, the importance of information asymmetries created by the financial innovation process. Thus, the mandatory CCP-clearing rule may simply be a hypothetical ideal. Are the alternatives sketched here perfect? Of course not. Nor do they purport to be. However, they hopefully will serve as guideposts in a reframing of the debate.

IV. CONCLUSION

In this Article, I have argued that any approach to financial regulation in the wake of the most significant financial crisis since the Great Depression must take into account the modern financial innovation process and its effect on instruments, institutions and markets. I have attempted to develop an account of this process by focusing on the

[145] *But see* Aline van Duyn, *Derivatives Transparency is Key Battleground*, Fin. Times, March 11, 2010, at C1 (describing dealers' opposition to such disclosure efforts on the ground that it would decrease liquidity "because rivals could detect what positions were held").

[146] *See, e.g.*, Oliver E. Williamson, *Foreword: The New Institutional Economics Guidebook*, in New Institutional Economics: A Guidebook xxiv (Eric Brousseau & Mean-Michel Glachant, eds., 2008) ("With the benefit of hindsight, key features of [new institutional economics] projects include . . . eschewing hypothetical ideals by focussing [sic], always and everywhere, on feasible alternatives, all of which are flawed.").

dynamic relationship between financial intermediaries and markets, arguing that banks and markets are at once substitutes and complements in the provision of financial products and the management of risk and that this relationship predicts increasing product complexity, increasing institutional complexity and the emergence of new markets that may exhibit fractures in times of stress. This pattern, I concluded, complicates the economics of financial regulation by increasing informational asymmetries between market participants and regulators and implies the need for a new regulatory paradigm that eschews New Deal-era dichotomies between bottom-up solutions and top-down prescriptions. I explored these claims by conducting a critical analysis of a current policy proposal to regulate the financial innovation process by forcing a migration of OTC derivatives from bilateral markets to markets that are "cleared" by a centralized clearing party. My analysis suggests that that the debate over mandatory centralized clearing overlooks important information asymmetries that result from the complicating effect that the financial innovation process has on instruments, institutions and markets. Instead of a mandatory CCP-clearing rule, the economy would likely be better served by an alternative institutional structure that capitalizes on the local knowledge of market participants concerning product and institutional complexity but that seeks to capture some of the benefits of a CCP-cleared market. While I sketch two such alternatives, these are merely suggestions that will hopefully serve as useful guideposts in the ongoing policy debate regarding the regulation of the OTC derivatives market in particular and the financial innovation process in general.