The Politics and Practices of Central Clearing in OTC Derivatives Markets

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Chapter 6 in *Governing the World's Biggest Market: The Politics of Derivatives Regulation After the 2008 Crisis.* Eds. Eric Helleiner, Stefano Pagliari, and Irene Spagna. Oxford University Press, forthcoming in 2018.

1. Introduction

An opaque global market for highly complex, securitized derivatives, the concentration of risk in a small handful of enormously powerful private actors, financial institutions deemed "too big to fail" and backstopped by public authorities, and questions about the adequacy of risk models and capital holdings – all of these phenomena have been criticized as contributing to the 2008 global financial crisis. The regulatory proposals that came out of the G-20 meetings during the crisis and its immediate aftermath targeted many of these aspects of global financial markets, recognizing the salience of systemic risk and the need to regulate financial markets at the level of networks, rather than institutions. A key element of these regulatory proposals was a call for non-exchange-traded derivatives to be "cleared" through intermediaries that would act as a single counterparty to both the buy-side and the sell-side, reducing counterparty risk and, in combination with new disclosure requirements, rendering the over-the-counter (OTC) derivatives market and its complex dynamics of risk more legible, tractable, and, ideally, manageable. Six years after the G-20's call for central clearing, the proposal has been implemented in the majority

of the main financial centers.¹ By 2016, 62% of all OTC contracts were conducted through central counterparties (CCPs), and the Bank for International Settlements estimated that the rate of clearing for interest rate derivatives had more than doubled (and perhaps even tripled) between 2008 and 2016 as a result of the clearing mandate.²

Central clearing is one of the most significant post-crisis regulatory changes to a market that was, prior to the global financial crisis, notable for its nearly complete lack of public regulation and oversight. Nonetheless, the clearing requirement has been met with a series of unintended consequences and has reproduced many of the same characteristics of financial markets that were identified as exacerbating and magnifying the 2008 financial crisis. A perusal of the financial news and discussion surrounding the central clearing mandate in 2014-2015 turns up a set of uncertainties and anxieties that could almost as easily come from discussions of investment banks and hedge funds in 2009: concerns about the concentration of trading and risk in a limited number of financial actors, the moral hazard and potential real economic costs of institutions deemed "too big to fail," and questions about the limitations of risk models as a centerpiece of risk management strategies.

What accounts for the recalcitrance of the OTC derivatives market to this regulatory change? Why has a key regulatory mandate, specifically intended to counteract the risk associated with waves of defaults in a highly complex network, ended up reproducing some of the same dynamics? I argue that focusing on the technologies and practices used to govern derivatives markets helps explain the absence of more radical regulatory policy shifts in

¹ As of June 2016, the central clearing mandate had been implemented for at least some categories of derivatives in Australia, China, the European Union, Hong Kong, India, Indonesia, Japan, Korea, Mexico, and the United States (Financial Stability Board, 2016: 22).

² Bank for International Settlements, 2016a: 22-23.

derivatives regulation. Specifically, I contend that although there has been a significant shift in who regulates OTC markets, much less has changed at the level of the specific practices that govern these markets.³ CCPs are much more important players in the OTC market now than they were prior to the crisis and they have changed the structure of trading in significant ways. Nonetheless, the tools they use to manage the risk of counterparty default are quite similar to those cited by key regulatory authorities prior to the crisis as guaranteeing the markets' capacity to govern itself. While these tools may be reasonably well-suited to organize and manage markets during ordinary times, their inadequacy during times of crisis, when complexity and uncertainty dominate over the regularities on which most risk management tools are premised, has already been demonstrated.

Once we look beyond the shift from private to public regulation embodied in the central clearing mandate, central clearing can be seen as a compelling illustration of two of the major themes of this volume, as set out in the introductory chapter by Helleiner, Pagliari, and Spagna: continuity where we might expect to see change; and fragmented implementation where cooperation and coordination would seem to be essential. While the persistent influence of a transnational community of public- and private-sector actors who imagine, endorse, and mandate key regulatory tools helps explain continuity in technologies of market governance, fragmentation in central clearing owes much to the enduring (or perhaps resurgent) significance of national level regulatory actors. Taken together, continuity at the level of practices and

³ The issues associated with central clearing go beyond the continued reliance on pre-crisis risk management practices. For example, some commentators have pointed to possible conflicts of interest between CCPs and their members, whereby CCPs may relax collateral requirements to attract more end users, undermining their capacity to manage systemic risk by containing losses associated with counterparty default (Yagiz, 2014). However, I focus primarily on the former issue in this chapter to more specifically address the central question of continuity that motivates this volume.

fragmentation among national jurisdictions helps account for the unexpected reproduction of potentially crisis-prone financial market dynamics – another theme introduced by Helleiner, Pagliai, and Spagna.

This rest of this paper proceeds in five parts. First, I position my analysis in contrast to public and scholarly claims that the central clearing mandate should be understood primarily as a major shift in the regulatory landscape and a promising solution to the problem of counterparty and systemic risk, arguing that such a perspective overlooks important continuities in financial market governance. Next, I provide some context for the post-crisis clearing requirement, paying particular attention to a set of practices (netting, collateralization, and risk modeling/management) that structured the market for OTC derivatives prior to the crisis – and that were taken by regulators as evidence of the market's capacity to regulate itself. Third, I briefly describe how the OTC market was implicated in the financial crisis and how central clearing emerged as a hallmark policy proposal. Fourth, I sketch out some of the unintended consequences of central clearing, focusing on those that reproduce pre-crisis dynamics. The final section analyzes these changes, emphasizing the continuities in the market for OTC derivatives that have persisted despite a significant regulatory change.

2. Tempering the optimism of central clearing optimists

The clearing mandate represents something of a hard case for the argument that postcrisis derivatives regulation is better characterized in terms of continuity rather than change. The rapid and widely shared consensus among international and national policymakers that most

OTC derivatives should be centrally cleared represents, in some ways, a significant departure from the pre-crisis regulatory environment. The mandate been reasonably successful at altering derivatives market participants' behavior: According to the FSB, 70% of interest rate derivatives and 79% of credit derivatives are being centrally cleared in the United States, though CCP usage varies widely across national jurisdictions and asset classes, with many jurisdictions reporting much lower levels of clearing, even for products for which an appropriate CCP exists.⁴ At a global level, the percentage of contracts cleared through CCPs has increased steadily from less than 10% in 2010 to 26% at end-2013, 31% at end-June 2015, and 64% at end-June 2016 suggesting a widespread, if slow, change in the structure of the derivative industry.⁵ More generally, the clearing mandate marks out an important ideational shift from a regulatory environment in which market self-regulation was held up as the ideal to one in which OTC derivatives were seen as the appropriate object of public regulation and governance. Prior to the crisis, regulatory authorities in the United States and the United Kingdom, in particular, insisted on the virtues of self-regulation for derivatives markets.⁶ Just five years later, following the passage of Dodd-Frank mandating central clearing in the United States, Federal Reserve Governor Daniel Tarullo called for even further public regulation of CCPs, noting that "it is essential that the Committee on Payment and Settlement Systems (CPSS) and the International Organization of Securities Commissions (IOSCO) complete their important work on strengthening the oversight of central counterparties as soon as possible."7

⁴ Financial Stability Board, 2015b: 9; Financial Stability Board, 2015a: 12-13.

⁵ Bank for International Settlements, 2016.

⁶ See Spagna, this volume.

⁷ Tarullo, 2011.

For these reasons, policymakers were (and are) eager to hold up the central clearing requirement as, if not a panacea, at least a compelling solution to the problem of systemic risk. The Bank for International Settlements refers to central clearing as "a key element in global regulators' agenda for reforming OTC derivatives markets to reduce systemic risks."⁸ This rhetoric, which has its origins in the G20's statements after the 2009 Pittsburgh Summit, is echoed by other transnational and national regulatory actors, with European Central Bank Executive Board member Gertrude Tumpel-Gugerell referring to central clearing as "an essential part of the regulatory reform to make this market sufficiently transparent and to allow supervisors and overseers to effectively monitor the build-up of systemic risk."⁹ The IMF has been somewhat more circumspect in its assessment of this regulatory change, but nonetheless describes central clearing as reducing both counterparty and systemic risk.¹⁰ Market participants, too, referred to the central clearing mandate as a "significant change,"¹¹ demanding "profound operational changes."¹²

This optimism about the capacity of central clearing to reduce counterparty and systemic risk is shared by scholars of political economy, as well, particularly in the immediate aftermath of the crisis and the regulatory changes it sparked. For example, writing in 2010, Eric Helleiner and Stefano Pagliari used central clearing as a key piece of evidence supporting their claim that the financial crisis instigated a significant shift in financial market governance, heralding the end of the era of self-regulation "in the sense that public authorities have accepted formal

⁸ Bank for International Settlements, 2015: 2.

⁹ Tumpel-Gugerell, 2010.

¹⁰ International Monetary Fund, 2010.

¹¹ See, for example, Deloitte, 2014.

¹² KPMG, 2012.

responsibility over the regulation of derivatives markets."¹³ Some economists were equally optimistic about the potential for central clearing to ensure greater transparency and ultimately mitigate counterparty risk. As Viral Acharya et al. write in the prologue to their 2010 volume on the Dodd-Frank Act, "Centralized clearing of derivatives ... should enable markets to deal better with counterparty risk, in terms of pricing it into bilateral contracts ..." and they go on to describe the mandate as "welcome" and "admirable."¹⁴

But while the clearing mandate marks an important shift in who is seen as the appropriate regulator of derivatives markets, we should be careful not to overstate the degree of regulatory change; focusing exclusively on which actors are charged with governing global finance can obscure continuities in the technologies and practices used to regulate derivatives markets, as well as the persistent influence of the transnational policy community. There are three reasons to temper optimism about central clearing. First, while *mandated* central clearing is a policy innovation, voluntary central clearing of OTC derivatives pre-dates the crisis by many years and was originally interpreted by regulators in explicitly market-friendly terms as evidence of derivatives markets' capacity to self-regulate. In 2006, for example, Federal Reserve Governor Randall Kroszner observed that, "I have often cited CCPs for exchange-traded derivatives as a prime example of how market forces can privately regulate financial risk very effectively."¹⁵ In this sense, central clearing does not represent a dramatic break with the pre-crisis regulatory deference to the private sector and its claims to responsible risk management. Indeed, the fact that CCPs are private, for-profit actors initially attracted criticism from the Bank of England, which in its 2010 Financial Stability Report wrote that, "CCP treasury units should act not as

¹³ Helleiner and Pagliari, 2010: 90; see also Helleiner, 2011: 149.

¹⁴ Acharya, Cooley, Richardson, Sylla, and Walter, 2010: 8; 31.

¹⁵ Kroszner, 2006.

profit centres, but invest in safe and liquid assets. User-ownership and not-for-profit governance arrangements provide the strongest incentives for effective risk management, aligning CCPs' interests with suppliers of capital."¹⁶ Although the mandate for central clearing comes from national-level regulators, CCPs remain private, and some prominent commentators have continued to question their current for-profit status, even while acknowledging the multiple difficulties associated with nationalizing clearinghouses that serve global markets.¹⁷

A second reason to interpret the central clearing mandate in terms of continuity rather than change is that, aside from the admittedly significant elevation of the position of CCPs in global financial networks, it has done little to fundamentally re-order the centers and relations of power in the global financial system. As the pre-crisis evaluation of central clearing as marketfriendly suggests, the clearing requirement did not meet with the strong opposition from the financial industry that more disruptive proposals (such as banning so-called "naked" or unattached derivatives¹⁸) encountered. As Tett and van Duyn wrote in 2009, "Most senior financiers are willing to move some activity on to a clearing platform. Indeed, this shift was under way before last week's announcement – ventures offering clearing functions for credit derivatives started operating this year."¹⁹ While the clearing requirement increases costs for

¹⁶ Bank of England, 2010: 10.

¹⁷ See for example, Tucker, 2014 who writes in the voice of an imaginary advocate for socializing CCPs: "Quit pretending that clearing houses are something different from what they really are. They're designed to insure the system against one variant of financial market tail risk. They need to be completely safe, with no doubts. They're also in the business of managing externalities, and of leaning against the wind. If central banks should be part of the State, so should CCPs" (8).

¹⁸ Two bills were introduced in the United States Congress in 2009 (the Prevent Unfair Manipulation of Prices Act of 2009 [H.R. 2448, 111th Congress] and the American Clean Energy and Security Act of 2009 [H.R. 2454, 111th Congress] that would have banned trading of at least some forms of "unattached" derivatives, but neither passed. ¹⁹ Tett and van Duyn, 2009.

derivatives dealers,²⁰ it is relatively popular among end-users,²¹ derivatives dealers, anxious about their counterparty exposure,²²and, not surprisingly, private exchanges with clearing capabilities. The clearing mandate reflects the enduring influence of the financial industry, but also of the transnational policy community who acted quickly to shape the post-crisis regulatory agenda.²³ Although International Swaps and Derivatives Association (ISDA) officials have raised concerns about some of the consequences of central clearing, the clearing mandate enjoys the support of the primary private regulator of the derivatives industry, as ISDA CEO Scott O'Malia recently testified before the House Agriculture Committee in the United States.²⁴ Moreover, as Helleiner and Pagliari suggest, the United States, the UK, and the EU were key national actors in pushing for mandated clearing, reinscribing their primacy in the global financial landscape.²⁵

Finally, as I document in the rest of this chapter, we should avoid overstating the impact or benefits of the clearing mandate insofar as CCPs rely on many of the same risk management practices that preceded – and failed to anticipate – the 2008 financial crisis. The unintended consequences of the shift to central clearing and the uneven way in which it has been implemented globally have pushed back against the immediate post-crisis optimism about CCPs' capacity to address systemic risk. In the remainder of this paper, I contend that, despite the shift

²⁰ Deloitte, 2014:5 calculate an additional \in 13.60 in transactions costs (margin requirements, capital requirements, compliance costs) per \in 1 million (notional value) of OTC contracts traded.

²¹ International Swaps and Derivatives Association, 2015a: 6. The ISDA survey reports that of five post-crisis regulatory reforms (clearing, trade execution, trade reporting, increased margin for non-cleared swaps, and cross-border harmonization), clearing has the highest positive and lowest negative ratings among end-users.

²² Helleiner and Pagliari, for example, point to a "widespread backlash against the lack of regulation in derivatives markets," (82-83).

²³ Tsingou, 2010.

²⁴ Scott O'Malia (2015), Testimony of Scott O'Malia, Chief Executive Officer, International Swaps and Derivatives Association Before the US House of Representatives Committee on Agriculture, July 29, 2015. "I would like to stress that ISDA supports the intent of Dodd-Frank to strengthen financial markets and reduce systemic risk. That includes the reporting of all derivatives trades and clearing of standardized derivatives products where appropriate." ²⁵ Helleiner and Pagliari, 2010: 74.

from private to public regulation, the consequences of central clearing are better understood as reflecting continuity at the level of practice. In structuring the OTC market, these practices also delimit thinking about the techniques of market governance.

3. Pre-Crisis Practices of Self-Regulation

Against the backdrop of the end of the Bretton Woods system, the liberalization of capital controls, the development of deep, liquid, and minimally regulated global capital markets, a global market in non-exchange-traded derivatives based on interest rates, exchange rates, and credit risk began to develop in the 1980s.²⁶ Over-the-counter derivatives have historically been bilaterally traded, orchestrated through standardized, nationally enforceable contracts with each party to the contract potentially vulnerable to the risk of default by her counterparty (known as credit risk). Market participants took a series of measures to limit their exposures to counterparty default, most notably through netting arrangements, collateralization, and risk modeling. Prior to the financial crisis, these practices were cited by regulatory authorities as evidence of the market's capacity to regulate itself.

3.1. Legitimizing self-regulation

²⁶ Some commodity derivatives are also traded over-the-counter, but the bulk of the OTC market is made up of interest rate, foreign exchange, and credit derivatives.

Public regulators, especially in the United States under the leadership of Alan Greenspan, took an intentionally hands-off approach to regulating the market for these products in the first decade after they were developed and became widespread. Regulatory intervention was thought to likely distort the efficient allocation of risk, and regulators argued that market actors had sufficient incentives to manage credit risk on their own. Alan Greenspan's 2003 address at the Conference on Bank Structure and Competition is illustrative of this regulatory attitude toward derivatives markets: "[T]he success [of the OTC derivatives market] to date clearly could not have been achieved were it not for counterparties' substantial freedom from regulatory constraints on the terms of their OTC contracts."²⁷ Greenspan recognized that the limited number of market participants in the OTC derivatives market and the concentration of certain types of contracts within "a handful of dealers" risked creating concentrations of counter-party risks, "rais[ing] the specter of the failure of one dealer imposing debilitating losses on its counterparties, including other deals, yielding a chain of defaults."²⁸ Nonetheless, he asserted that "derivatives market participants seem keenly aware of the counterparty credit risks associated with derivatives and take various measures to mitigate those risks," noting that, "market participants usually have strong incentives to monitor and control the risk they assume in choosing to deal with particular counterparties. In essence, prudential regulation is supplied by the market through counterparty evaluation and monitoring rather than by [public] authorities." 29

While perhaps most vocally championed in the United States, this anti-regulatory attitude was shared by the Basel Committee for Banking Supervision, the main international public actor to take up the issue of transnational market regulation, whose recommendations for national

²⁷ Greenspan, 2003: 2.

²⁸ Ibid., 3-4.

²⁹ Ibid., 5.

regulations emphasized "promoting a better foundation for self-regulation."³⁰ The Bank of England similarly resisted proposals from the European Union calling for greater regulation of the financial sector.³¹

The self-regulation of OTC markets prior to the crisis, in general, did not occur over public regulators' objections but was rather endorsed and enabled by a shared worldview that held that efficiency and liquidity in the market were both normatively desirable and best ensured through minimal state intervention. The close relationship between the financial industry and state economies, especially in terms of extending credit to individuals and the use of finance as a growth strategy, meant that the financial industry's interests and public economic authorities' interests were often interpreted and represented as converging. As Kwak notes, "it is difficult to prove that the deregulatory policies pursued by these agencies were clearly not in the public interest as knowable at the time."³²

Prior to the crisis, the risk of counterparty default was addressed through a series of conventional industry practices, rooted in private authority, most notably the International Swaps and Derivatives Association, an industry coordinating and lobbying group. ISDA provided parties to derivatives deals a standardized contract known as the Master Agreement that could be modified to fit the specifics of individual derivative dealings. Although the Master Agreement did not provide all the same functions as a formal, publically regulated derivatives exchange, which limits counterparty credit risk through the use of daily margin calls, the widespread use of

³⁰ Tsingou, 2006: 177.

³¹ Zimmermann, 2010: 121-136.

³² Kwak, 2013: 73.

the Master Agreement nonetheless fostered standardization and comparability of contracts, facilitating market liquidity.³³

3.2 Netting

The Master Agreement also played a critical role in legitimizing self-regulation, mitigating regulators' concerns about the concentration of counterparty risk in a handful of derivative dealer banks by outlining provisions for terminating contracts in the event of counterparty default, most notably permitting parties to "net out" all of their open transactions with each other, rather than undertaking a series of payments back and forth that the defaulting party might not be able to complete.³⁴ The practice of netting thus reduces one firm's exposure to its counterparty. The use of these closeout netting agreements was endorsed by the Basel Supervisory Committee in 1994, which noted that "netting arrangements for [...] forward-value contractual commitments such as foreign exchange contracts and swaps have the potential to improve both the efficiency and the stability of interbank settlements, by not only reducing costs but also credit and liquidity risks"³⁵ and amended the 1988 Capital Accord to permit bilateral netting.³⁶ The netting provision was also lauded by national regulators as an example of marketbased initiatives to reduce counter-party risk. As Darryll Hendricks of the Federal Reserve Bank of New York concluded in 1994, "netting agreements unequivocally lead to reductions in current

³³ ISDA estimated that by 2003, there were more than 54,000 signed bilateral derivatives contracts using the Master Agreement form (cited in Riles, 2011: 75).

³⁴ Zepeda, 2014

³⁵ Basel Committee on Banking Supervision, 1994: 7.

³⁶ The 1988 Capital Accord had previously only permitted netting by novation, which replaced existing contracts between two counterparties for delivery of a specified amount of currency on a specified date by a single contract that took into account all of the original contracts.

credit exposures, which make up the bulk of total credit exposures [and] under certain circumstances, netting agreements reduce fluctuations in the volatility of the credit exposures of dealer institutions, thereby lowering the volatility of the institutions' credit exposures on average ... the second major components of total credit exposures to OTC derivatives."³⁷

3.3 Collateralization

A second practice facilitated by the Master Agreement was the assignment of collateral to derivatives contracts, intended to reduce the risk of large losses in the event of counterparty default. As ISDA writes, "In the case of a privately negotiated derivatives transaction, the essential mechanism by which collateralization works is to provide an asset of value that is to the side of the primary transaction; in the event of default on the primary transaction, the collateral receiver has recourse to the collateral asset and can thus indirectly make good any loss suffered."³⁸ The Master Agreement's Credit Support Annex was widely used to govern collateral agreements between counterparties, specifying the asset (most often cash or treasury bonds) that would be used to secure the counterparty's obligation as well as the conditions under which the collateral-receiving counterparty can use it to satisfy the obligation.³⁹ Anneliese Riles notes that the Master Agreement and its Credit Support Annex governing collateralization aims "to serve as a basis for global self-regulation."⁴⁰ Indeed, U.S. Federal Reserve Chair Alan Greenspan specifically referenced industry collateralization practices, alongside netting and risk modeling

³⁷ Hendricks, 1994: 17.

³⁸ International Swaps and Derivatives Association, 2005: 7

³⁹ Riles, 2011: 34-35

⁴⁰ Ibid., 32

and limits, as evidence of the OTC market's capacity for self-regulation: "Participants in the OTC derivatives markets typically manage their counterparty credit risks to dealers by transacting only with counterparties that are perceived to be highly creditworthy, by entering into legal agreements that provide for closeout netting of gains and losses, and with the exception of most exposures to the few Aaa-rated dealers, by agreeing to collateralize net exposures above a threshold amount. [...] The widespread use of collateral, in particular, usually is a powerful means of limiting counterparty credit losses."⁴¹ The use of collateralization to limit losses in the event of counterparty default was similarly encouraged by the Bank for International Settlements, which incentivized the practice by crediting counterparties for collateralization when calculating capital requirements.⁴²

3.4. Risk measures, models, and management

As referenced by Greenspan above, in addition to the ISDA Master Agreement and its termination and netting provisions, derivatives dealers relied heavily on credit assessments from credit rating agencies, private American corporations (Standard & Poor's, Moody's, and Fitch are the big three), to calculate counterparties' creditworthiness. Credit rating played a

⁴¹ Greenspan, 2005. It should be noted, however, that Greenspan conceded that collateralization is less effective when counterparties hold very large positions in highly illiquid markets (e.g., Long Term Capital Management in 1998), when closing out contracts may move markets, amplifying losses beyond the posted amount of collateral. For further references to the significance of collateral to self-regulation see: Behof, 1993: 21-31 and Greenspan, 1997: "Institutional participants in the off-exchange markets also have demonstrated their ability to manage credit risks quite effectively through careful evaluation of counterparties, the setting of internal credit limits, and the judicious use of netting agreements and collateral ... Thus, there appears to be no need for government regulation of off-exchange derivative transactions between institutional counterparties."

⁴² Riles, 2011: 44.

particularly important role in the market for credit derivatives, contracts used to insure (or hedge) against the risk of default (the credit risk) attached to an underlying portfolio of assets.⁴³

In addition to external measures of risk, derivatives market participants relied on internal (though broadly standardized) risk models, taking the risk of default into account. These were in turn tied to internal bank risk limits and capital requirements, as recommended by the Basel Committee on Banking Supervision in the 1988 Capital Accord, which focused on credit risk, and its 1996 Amendment covering market risk. Banks were required to keep specified amounts of capital to guard against unexpected losses, with the precise amount determined through a combination of risk-weighted assets and models of market risk exposure. These models played an instrumental role in empowering derivatives traders as authoritative, responsible managers of the financial future.⁴⁴ But while the use of technical risk models was perceived as a marker of the industry's ability to effectively govern itself, this view masked considerable disagreement over the content of these models, including the underlying distribution of returns assumed by the model, the strategy for calibration, and the appropriate parameter values. The challenges associated with pricing counterparty risk were amplified for derivative products containing multiple pooled securities. Determining the correlation between default probabilities for assets within a tranched product posed a particularly complex challenge, and while David Li's Gaussian copula function was seized on by investors to price and sell collateralized debt obligations, it was not without its (prescient) critics. Quants like Paul Wilmott and Jon Gregory rightly questioned its underlying assumption that credit default swap markets can accurately price default risk and its reliance on a short window of historical data.⁴⁵ But technical

⁴³ Partnoy, 2006: 73-80.

⁴⁴ Lockwood, 2015.

⁴⁵ Madigan, 2008; Salmon, 2009.

disagreements like these did not rise to the level of bank managers, let alone regulators, and like netting, collateralization, and credit rating, risk modeling – in conjunction with risk limits and capital requirements – was widely interpreted to be a sound private-sector method of governing the future.⁴⁶ In conjunction with risk limits and stress testing, risk model-based capital requirements reassured regulators that the OTC markets should have the authority to govern themselves.⁴⁷

The pre-crisis OTC derivatives market was governed primarily through private industry practices that served to convince and reassure regulators that market actors had the necessary capability to govern themselves and to limit the potential crisis. Statements from the Fed chair and governors, the Bank of England, and the Basel Committee on Banking Supervision suggest that key regulators saw an unregulated OTC market as serving the public good, further forestalling the potential for more intrusive regulatory policies.⁴⁸

4. Financial crisis and the origins of the clearing requirement

Despite private- and public-sector confidence in private forms of risk management, their inadequacy was starkly revealed during the 2008 financial crisis, when waves of defaults by insufficiently collateralized counterparties spread through the derivatives market, hastened by

⁴⁶ Porter, 2010: 62-64.

⁴⁷ Basel Committee on Banking Supervision, 1996: 1; Alan Greenspan, 1999: "Some may now argue that the periodic emergence of financial panics implies a need to abandon models-based approaches to regulatory capital and to return to traditional approaches based on regulatory risk measurement schemes. In my view, however, this would be a major mistake. Regulatory risk measurement schemes are simpler and much less accurate than banks' risk measurement models."

⁴⁸ Market efficiency, wealth creation, and distribution of risk are all variously cited as public ends served by derivatives.

reports of Bear Stearns's and Lehman Brothers' impending insolvency.⁴⁹ The system of bilateral private contracts was recognized as overly complex and severely lacking in transparency, as contracts were unwound rapidly and without sufficient liquidity in the system to ensure full repayment or to accurately price the contracts counterparties had on their books. As losses dramatically exceeded those anticipated by risk models, capital cushions were quickly exhausted and bilateral netting and collateralization arrangements were insufficient to confine losses associated with counterparty default to the immediate parties to the contract. As Andrew Haldane of the Bank of England observed in early 2009, "The financial system is [...] a network, with nodes defined by the financial institutions and links defined by the financial interconnections between these institutions. Evaluating risk within these networks is a complex science; indeed, it is the science of complexity. When assessing nodal risk, it is not enough to know your counterparty; you need to know your counterparty's counterparty too. In other words, there are network externalities. In financial networks, these externalities are often referred to as contagion or spillovers. There have been many examples of such spillover during this crisis, with Lehman Brothers' failure a particularly painful one."50

A full recounting of the role of OTC derivatives in magnifying the effects of the US subprime meltdown is beyond the scope of this paper and has been documented elsewhere;⁵¹ for our purposes, it is most important to recognize that the crisis laid bare the correlations, complexity, interconnectedness, and uncertainty that had structured financial markets all along, even as standardized practices provided temporary stability.⁵² Risk management practices based

⁴⁹ See, for example, Kelly, 2008; Borroughs, 2008.

⁵⁰ Haldane, 2009: 5.

⁵¹ See Ch. 2 of this volume

⁵² Nelson and Katzenstein, 2014: 361-392.

on probabilistic estimates of credit risk, especially ones that had been based on a necessarily (given the relatively newness of derivatives markets) limited set of historical data from non-crisis times, proved to be ill-suited to the massively correlated defaults and unprecedented drying up of liquidity that swept the OTC markets in 2008-2009. Accordingly, collateral and netting arrangements were quickly overwhelmed by the magnitude of losses.

In response to this financial contagion and to systemic risk more broadly, the G-20 and the Financial Stability Board called for a series of substantial reforms of OTC derivative market, including that, "All standardized OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest."53 Central counterparties were represented as a means of reducing systemic risk by decreasing complexity, since the clearinghouse would serve as a counterparty to both buy-side and sell-side market participants. In the event of counterparty default, the CCP guarantees the obligation through its own resources, including a default fund composed of the collateral (or "margin") demanded of other banks, confining (in theory) the consequences of member default solely to the transactions involving that member and forestalling the contagion that spread through Haldane's complex networks. Additionally, CCPs were thought to provide a much more efficient system of netting than when this is done primarily on a bilateral basis, because each firm's exposure to multiple other firms can be netted out multilaterally, rather than as a series of one-on-one transactions. This proposal was widely taken up for consideration by national regulatory agencies in global financial centers (e.g., the de Larosière report

⁵³ G-20, 2009; See also Financial Stability Board, 2010: "The proportion of the market that is standardised should be substantially increased in order to further the G-20's goals of increased central clearing and trading on organised platforms, and hence mitigate systemic risk and improve market transparency."

commissioned by the European Commission and the Turner Review in the UK⁵⁴) and endorsed by key international organizations.⁵⁵

The United States took the lead in implementing mandatory clearing of OTC swaps, with the passage of the Dodd-Frank Wall Street Reform and Consumer Protection Act.⁵⁶ But even before this, central clearing was quickly seized on as a desirable policy. As early as December 2008, the Securities and Exchange Commission granted CCPs temporary exemptions from federal registration requirements to allow them to get up and running quickly and begin clearing derivatives.⁵⁷ Rather than taking advantage of the United States' unilateral increase in regulation, the European Union, with the crucial cooperation of British policymakers (given the centrality of London financial markets), also began the process of implementing mandatory clearing relatively quickly, culminating in 2012 with the passage of the Regulation on OTC Derivatives, Central Counterparties, and Trade Repositories (known as European Market Infrastructure Regulation, or EMIR). While implementation of clearing across different classes of OTC contracts has been much slower in the EU than in the US (and, as I contend below, has contributed to market fragmentation), both actors' commitment to central clearing underscores the extent to which it was seen as a means to manage the counterparty and systemic risk that lay at the heart of the crisis.

As of June 2016, public regulators in Australia, China, the European Union, Hong Kong, India, Indonesia, Japan, Korea, Mexico, and the United States have mandated central clearing for

⁵⁴ The High-Level Group on Financial Supervision in the EU, 2009: 25; Financial Services Authority, 2009: 82-83. ⁵⁵ See for example: International Monetary Fund, 2010. The IMF does note, however, that, "movement of contracts to a CCP is not a panacea, since it also concentrates the counterparty and operational risk associated with the CCP itself" (91).

⁵⁶ Dodd-Frank Wall Street Reform and Consumer Protection Act, §723 2010: 300-307.

⁵⁷ Securities and Exchange Commission, 2008.

at least some OTC derivatives.⁵⁸ Although only relatively recently implemented, central clearing requirements have already had a significant effect on the OTC market. As of June 2016, an estimated 64% of all OTC derivatives were cleared through CCPs, with higher rates for interest rate swaps.⁵⁹ The clearing requirement has increased the percentage of cleared OTC contracts, but it has been less successful at restructuring financial markets to make them less crisis-prone.

5. The unintended (but familiar) consequences of central clearing

5.1. Regulatory and market fragmentation

While ostensibly a move by public regulators to reclaim a measure of control over financial markets, the central clearing requirements have struggled to do just that. Rather than centralizing a market formerly seen as overly complex and decentralized, central clearing requirements have produced regulatory fragmentation, as different jurisdictions have imposed different clearing requirements on different timelines, raising questions about liquidity and the concentration of risk in the global market for derivatives.⁶⁰ While nearly two-thirds of the total volume of OTC derivatives contracts is cleared, the clearing rate is much lower for credit derivatives (37%) and foreign exchange and equity derivatives (>2%).⁶¹ There is also considerable variation in clearing rate across national lines. Table 1, from a 2016 Financial Stability Board report, depicts the unevenness of clearing volumes for OTC interest rate

⁵⁸ Financial Stability Board, 2016: 22.

⁵⁹ Bank for International Settlements 2016b: 4.

⁶⁰ See, for example, International Swaps and Derivatives Association 2014: 1-2; International Swaps and Derivatives Association 2015b

⁶¹ Bank for International Settlements, 2016b: 4.

derivatives alone. Despite the international consensus around the desirability of central clearing in the immediate aftermath of the crisis, enforceable mandates must be implemented through national legislation and there has been significant variation across jurisdictions in the regulatory requirements for both OTC derivatives and CCPs themselves, causing the global market to fragment along jurisdictional lines.⁶²

While both the United States and the European Union's regulatory regimes allow for the recognition of non-domestic CCPs, in practice cross-border recognition has been slow, especially on the part of the EU, due to discrepancies in minimum margin requirements for CCPs.⁶³

Under conditions of regulatory fragmentation, derivative buyers and sellers are less readily able to find each other and make a market. As ISDA chair Eric Litvack observed earlier this year, "There is clear evidence that global derivatives markets are fragmenting. The derivatives market has always been global ... But regulations are implemented at the local level. Conflicting, confusing or overlapping rules can encourage derivatives users to stay local and lose the benefits of competitive pricing and service."⁶⁴ ISDA CEO Scott O'Malia concurred, warning that fragmented markets results in lower liquidity and higher costs.⁶⁵ These dynamics are concerning from the perspective of financial system stability, as fragmented markets may lead to less transparency in the system as a whole, as well as a concentration of risk – dynamics that the clearing mandate was specifically intended to mitigate.

⁶² ISDA found that this fragmentation was particularly acute in the case of euro interest rate swaps, with 88.6% of total euro IRS swaps transacted exclusively between European dealers, up from about 74% is 2013, before the implementation of clearing requirements and mandated trading through swap execution facilities in the United States (ISDA, 2015b).

⁶³ DeWaal, 2015

⁶⁴ Qtd. in Bartholomew, 2015a

⁶⁵ Ibid.

5.2. Too-big-to-fail, scaled up

Market fragmentation is not the only potential cause of a re-concentration of risk in the global financial system. Pulling in the opposite direction are the economies of scale associated with central clearing. For example, the benefits associated with multilateralized netting are greatest when a single CCP clears a particular class of derivative.⁶⁶ Accordingly, and especially given the high levels of capital CCPs are required to hold, only a small number of large CCPs are likely to be profitable. As a result, risk is becoming increasingly concentrated in a handful of prominent clearing houses (LCH.Clearnet, CME, Eurex, Intercontinental Exchange⁶⁷), a dynamic that Federal Reserve Board Governor Jerome Powell acknowledged as concerning in 2014.⁶⁸

Although multilateral netting and collateralization are intended to offset the concentration of risk in CCPs, the possibility of CCPs having inadequate capital reserves is not farfetched. Analysts and market observers have raised questions about the ability of CCPs to effectively mitigate systemic risk. For example, ISDA's chair Stephen O'Connor recently remarked that the two major clearinghouses, LCH.Clearnet and CME "probably" have enough capital on hand in case of widespread default of their members, which many observers found less than reassuring.⁶⁹ The head of global clearing at JPMorgan is similarly concerned about the ability of CCPs to limit losses and forestall crises, locating the responsibility for doing so squarely within the financial industry: "The CCP default fund contribution is woefully inadequate. The CCPs only pay 2%

⁶⁶ Pirrong, 2011: 14.

⁶⁷ LCH.Clearnet, for example, clears around half of all the world's OTC derivatives (Hodgson, 2014).

⁶⁸ Powell, 2014.

⁶⁹ Rennison, 2014.

towards that fund at the moment, and that contribution needs to increase, because we have to rule out the taxpayer picking up the cost. The industry needs to be able to shoulder this burden, and the ring-fencing of losses is vitally important."⁷⁰ Regardless of the position one takes on the question of who bears the responsibility the ensure market liquidity in the event of mass defaults, the possibility that CCPs have reproduced the "too big to fail" dynamic that characterized the 2008 financial crisis looms large. Moreover, given the central position CCPs have been assigned in the post-crisis financial landscape, the failure of a CCP has implications that extend well beyond its immediate clearing members, exposing the system as a whole to the same unexpected losses and liquidity shortages that exacerbated the 2008 financial crisis.⁷¹

Accordingly, one of the major areas of the post-crisis G-20 agenda has related to the regulation of clearinghouses and in particular the question of "recovery and resolution regimes" – that is, what will happen in the event of a CCP default. In 2014, two prominent transnational financial actors, the Bank for International Settlement's Committee on Payment and Market Infrastructures (CPMI) and the International Organization of Securities Commissions (IOSCO) jointly issued a set of detailed principles for the recovery of systemically important financial institutions. While these principles are, on the one hand, evidence of a general agreement about the need to address the possibility of CCP failure, they ultimately require national-level implementation and enforcement, and the report notes that "some jurisdictions may not allow [financial institutions] to use all the tools listed in this report."⁷² Moreover, the recommendations

⁷⁰ Qtd. in Holley, 2014.

⁷¹ Wendt, 2015: 2.

⁷² Committee on Payment and Market Infrastructures & Board of the International Organization of Securities Commissions 2014: 1.

are intended for market participants and are explicitly agnostic on the question of state or central bank support for CCPs.⁷³

Despite this international consensus around the need for CCP recovery and resolution regimes, there has been considerable fragmentation along national lines.⁷⁴ In the United States, for example, policymakers have been very reluctant to guarantee access to central bank lending.⁷⁵ In contrast, the European Central Bank and the Bank of England announced in 2015 their willingness to backstop CCPs under a limited set of circumstances, raising concerns that some of the same problems of moral hazard and excessive risk-taking on the part of investment banks that were cited as conditions of possibility for the financial crisis have merely been transferred to a new set of private financial actors.⁷⁶ As Benoît Cœuré, a member of the European Central Bank Executive Board contends, in the now-foreseeable event of a crisis as bad as or worse than the 2008 financial crisis, even CCPs with clear plans for allocating resources to cover losses (so-called "default waterfalls") are unlikely to have sufficient capital to limit losses to members, and given the mandatory nature of central clearing, public authorities will have no choice but to intervene.⁷⁷ The area of CCP governance, especially as it relates to recovery and resolution, is illustrative of both continuity at the level of financial system dynamics, as well as regulatory fragmentation where international cooperation was have once seemed possible.

⁷³ Ibid.: 6.

⁷⁴ An outcome foreshadowed by the note appended to the CPMI-IOSCO report recording the United States Securities and Exchange Commission's objection to its publication and the SEC's position that "this report does not bind or otherwise reflect a judgment by the SEC with regard to its proposed or final versions of its rules or standards" (CPMI-IOSCO, 2014).

⁷⁵ Yagiz, 2014.

⁷⁶ Jones, 2015.

⁷⁷ Cœuré, 2014.

5.3. Still-unregulated markets

Finally, some commentators have observed that large volumes of trading do not even qualify for central clearing. Not all OTC derivatives have large enough trading volumes to ensure the liquidity necessary for centralized clearing and are exempted from the clearing requirements of Dodd-Frank and EMIR, although under post-crisis regulation, many OTC derivatives that are not subject to the clearing requirement are subject to higher margin requirements than before. Perhaps more significantly, so-called dark pools of capital continue to be unregulated at the public level at all.⁷⁸

6. Making sense of the unintended consequences

6.1. A reversal of regulatory fortune or crisis-prone continuity?

The shift in regulatory thinking from viewing derivatives as an area in which states' regulatory power should accommodate the power of global capital to a view shared by influential regulators in the EU and US that the market for derivatives is an appropriate object of at least some measure of state control is a significant one. Nonetheless, state actors have struggled to assert control over a sphere of social interaction that is constituted by innovation, uncertainty, and adaptability. Having legitimized these forms of un-publically governed social activity in the

⁷⁸ See, for example: Biedermann, 2015.

1990s and early 2000s, recent attempts to put the genie back in the bottle have touched off new dynamics of complex interconnectedness and uncertainty.

What accounts for these consequences and the return of concerns about risk modeling, too-big-to-fail, liquidity, and uncertainty? I contend that while the central clearing requirement undoubtedly marks a shift in thinking about which actors have the authority to regulate OTC markets, it is also characterized by considerable continuity at the level of practices and that adhering to these practices limits policymakers' ability to envision more radical regulatory reforms that might have the potential to more radically restructure global financial markets. Although large volumes of OTC contracts are now cleared through CCPs, the practices used to manage risk are remarkably similar to the ones that were used prior to 2008 and that both industry and regulatory actors alike recognized as inadequate. Central clearing has reshaped the market, but it has done little to fundamentally alter its unpredictable dynamics. On this point, Fed Governor Jerome Powell is worth quoting at some length:

It has also been frequently observed that central clearing simplifies and makes the financial system more transparent. That, too, has an element of truth to it, but let's take a closer look. Charts [...] are frequently offered to illustrate the point that, as a CCP becomes a buyer to every seller and a seller to every buyer, it causes risks to be netted and simplifies the network of counterparties. The dizzying and opaque constellation of exposures that exists in a purely bilateral market, [...] is replaced by a neat hub-and-spoke network that is both known and more comprehensible [...] [A]t the same time, in the real world CCPs bring with them their own complexities [...] [W]e do not live in a simple world with only one

CCP. We do not even live in a world with one CCP per product class, since some products are cleared by multiple, large CCPs. Also, significant clearing members are often members of multiple CCPs in different jurisdictions. The disruption of a single member can have far-reaching effects. Accordingly, while CCPs simplify some aspects of the financial system, in reality, the overall system supporting the OTC derivatives markets remains quite complex.⁷⁹

Powell's analysis suggests that CCPs operate in a world that is, in some ways, just as complex, uncertain, and crisis-prone as the pre-crisis world, not because CCPs have left relationships between financial institutions untouched but because they have replicated some of them at a different scale. Moreover, as clearinghouses rely on many of the same risk management practices that failed in the financial crisis, we should question the extent to which they have successfully mitigated systemic risk.

Three practices, in particular, are commonly cited in regulatory documents as contributing to CCPs' superior capacity to manage credit and systemic risk in OTC markets: netting, collateralization, and risk management systems. Ironically, these are the same practices that public regulators prior to the crisis referenced in their defenses of market self-regulation prior to the crisis. The IMF's description of the merits of central clearing is illustrative of many public sector actors' endorsement of this regulatory change: "the primary advantage of a CCP is its ability to reduce systemic risk through multilateral netting of exposures, the enforcement of robust risk management standards, and mutualization of losses resulting from clearing member failures."⁸⁰ Even Powell, despite his critical evaluation of CCPs, cites this constellation of

⁷⁹ Powell, 2014.

⁸⁰ IMF, 2010: 91.

practices as evidence of their superior risk management potential.⁸¹ Taking these technologies one at a time reveals important similarities with the pre-crisis era, despite shifts in the actors who are performing these practices.

6.2. Netting, in a world of central clearing

CCPs' capacity for multilateral netting is frequently touted as one of the main advantages of central clearing. Rather than the pre-crisis norm of bilateral netting, which did not account for the interconnectedness of derivative dealers and users, as central nodes in financial networks, CCPs are, in theory, better able to "net out" transactions that implicate multiple counterparties. The Bank of England's explanation is representative of how this advantage is explained: "CCPs can reduce counterparty credit risk by netting exposures across their members: that is, offsetting an amount due from a member on one transaction against an amount owed to that member on another, to reach a single, smaller net exposure [...] The netting of payment obligations can also reduce the liquidity needs of members arising from those contractual obligations."⁸²

Multilateral netting is thus taken as evidence of the superior ability of CCPs to limit credit risk, but there is good reason to be cautious of the extent to which multilateralized netting actually makes financial markets more stable. For example, Darrell Duffie and Haoxiang Zhu find that, "for plausible cases, adding a new CCP for a class of derivatives such as credit default swaps (CDS) reduces netting efficiency, increases collateral demands, and leads to a higher average exposure to counterparty default."⁸³ Using both modeling and illustrative evidence from

⁸¹ Powell, 2014: "the intent is not simply to concentrate risk, but also to reduce it--through netting of positions, greater transparency, better and more uniform risk-management practices, and more comprehensive regulation." ⁸² Rehlon and Nixon, 2013: 2-4.

⁸³ Duffie and Zhu, 2011: 75.

the OTC positions of US banks, Duffie and Zhu show that while a single CCP can reduce credit risk, as CCPs fragment along jurisdictional lines, central clearing rapidly loses its advantages in terms of limiting exposure to credit risk.⁸⁴ Craig Pirrong is similarly skeptical of CCPs' capacity to limit risk in practice, regardless of their numbers, noting that, "the primary effect of netting is to redistribute risk to elsewhere in the financial system [...] Specifically, netting redistributes risk away from derivatives counterparties and towards other creditors of bankrupt firms. Since these other creditors (e.g., money market funds) (a) may be systematically important, and /or (b) may have incentives to "run" from financially troubled financial institutions with derivatives positions, this redistribution can be systematically destabilizing."⁸⁵ Moreover, as Jon Gregory observes, determining the optimal number of clearinghouses for purposes of mitigating risk poses something of a paradox: a smaller number of CCPs better reduce credit risk but raise – as noted in the previous section – serious concerns about moral hazard and public backing of private financial institutions.⁸⁶

6.3. Collateralization, in a world of central clearing

Critics of central clearing have raised similar objections to CCPs' ostensible advantages in multilateralizing collateral (referred to as margin, in the context of central clearing). Like netting, the "mutualization of losses" is frequently held up as evidence of CCPs' capacity to confine the effects of counterparty default. Much as bilateral OTC contracts are usually backed by collateral, CCPs demand an initial margin from both parties to all transactions, which can

⁸⁴ Ibid., 76.

⁸⁵ Pirrong, 2013.

⁸⁶ Gregory, 2015: 18.

then be used, in conjunction with a default fund to which all members contribute, to cover any losses. Should those sources be exhausted, the CCP may have to draw on its own capital, followed by contributions to the default fund by non-defaulting clearing members. The "default waterfall" is intended to deal with counterparty default in an orderly, and ultimately, confined, manner. As Amandeep Rehlon and Dan Nixon of the Bank of England observe, "Perhaps the most important benefit [...] is the role that a CCP plays in the event of one of its members defaulting: CCPs have a number of rules and resources in place to manage such a default in an orderly way [...] CCPs typically have access to financial resources provided by the defaulting party, the CCP itself and the other, non-defaulting members of the CCP."⁸⁷ Although the authors go on to assert that, "CCPs set margin policies and requirements such that the probability of sums owed by a defaulting member to the CCP on its cleared positions exceeding the amount of margin held is very small,"⁸⁸ Powell of the US Federal Reserve contends that it is precisely the possibility of such low-probability events that lead to questions about whether CCPs will actually be able to tamp down the contagion through which the 2008 crisis was spread:

During the global financial crisis, governments around the world took extraordinary actions to shore up many of the large financial institutions that are also large clearing members. While it is not possible to say with confidence what would have happened if these measures had not been taken, it is surely the case that whatever pressures CCPs faced would have been many times greater, and the potential consequences much greater as well. Moreover, as CCPs grow into their enhanced role in the financial system, they will represent an ever larger locus for

⁸⁷ Rehlon and Nixon, 2013: 2.

⁸⁸ Ibid.: 5.

systemic risk. It is therefore important not to be lulled into a false sense of security that past performance is a guarantee of future CCP success.⁸⁹

Given the dramatic deviations from rating agencies' evaluations of default risk⁹⁰ and risk models' predictions of losses⁹¹ during the financial crisis, we should be cautious of whether CCPs' margin calculations can account for unpredictable swings in asset prices, market liquidity, and counterparty default in a way that fundamentally alters the vulnerability of the financial system to such events.⁹² Although there may now be more capital available to draw on, in the event of a counterparty default, the technologies for assigning that capital – and more fundamentally, the mitigation of risk through capital reserves (whether in the form of collateral, capital requirements, or default funds) – remains the same, as discussed in more detail below.

6.4. Risk management, in a world of central clearing

In addition to multilateral netting and collateralization, much of the positive rhetoric surrounding central clearing emphasizes "the enforcement of robust risk management standards."⁹³ As described in the preceding paragraph, these risk management techniques are

⁸⁹ Powell, 2014

⁹⁰ See, for example, Carruthers 2010.

⁹¹ Nelson and Katzenstein, 2014.

⁹² Higher margins requirements are often held up as a means of better ensuring CCP solvency in the event of crisis, but here too there is a trade-off as higher margin requirements may deter market participants from clearing their transactions, reducing the number of transactions/liquidity required for central clearinghouses to have enough capital to absorb losses.

⁹³ IMF, 2010.

closely linked to the assignment of margin to member banks. While some regulators, perhaps most notably Andrew Haldane at the Bank of England, have begun to incorporate complexity theory, with its focus on non-linear dynamics, discontinuities, and fat tails into their analysis of the financial system, this innovation in modeling has not extended to CCPs' risk modeling.⁹⁴ A 2015 analysis found that the four biggest CCPs (CME, Eurex, LCH.Clearnet, and ICE) all use some variation of the Value-at-Risk model to calculate margin on OTC transactions.⁹⁵ The limitations of VaR as a method for calculating market risk are well-documented.⁹⁶ Although CCPs have attempted to modify their VaR models to account for these limitations,⁹⁷ the underlying methodology remains the same.

Given the widely recognized failure of the Value-at-Risk model during the financial crisis, some CCPs use instead the Expected Shortfall model to calculate the magnitude of losses against which they must hold capital.⁹⁸ But while Expected Shortfall is often presented as a dramatic improvement on VaR,⁹⁹ this method still fundamentally depends on having a knowable distribution of outcomes and probabilistic reasoning, and therefore does not represent a radical departure from the predictive logic of VaR. As Gregory writes of initial margin calculations by CCPs:

⁹⁴ Haldane, 2015: 2. See also Haldane, 2009 which models the financial system as a complex adaptive system and uses CCPs as an example of reducing the dimensionality of financial networks – provided there is no risk of CCP default.

⁹⁵ Walsh, 2015: 38.

⁹⁶ Lockwood, 2015.

⁹⁷ E.g., by weighting volatilities, embedding stress testing, and using multiday "holding periods," rather than single trading days as observations -- measures designed to better account for extreme tail events, though not without considerable criticism (e.g., Danielsson, 2013).

⁹⁸ Gregory, 2015: 19.

⁹⁹ Hull, 2007; Basel Committee on Banking Supervision, 2013: "ES accounts for the tail risk in a more comprehensive manner [than VaR], considering both the size and likelihood of losses above a certain threshold" (18).

[A] typical calculation might require that initial margin is sufficient to cover the average of the worst 6 losses in the last two and a half thousand days (10 years). [...] However, the problem with the thousands of days of market data changes that are analysed in order to define the initial margins is that on virtually none of them have any CCP members (i.e. banks) actually defaulted. Predicting the market volatility in the aftermath of a default event using data when defaults don't happen is dangerous. The worst six days in the above example are actually pretty much the only days of interests, given that at least some of these represent the last significant OTC default scenario (Lehman Brothers). However, taking the average is less than 'robust' and would imply significant probability of losses exceeding initial margin and spilling over into default fund.¹⁰⁰

Gregory's criticism of CCPs' reliance on historical data in calculating initial margin was borne out in 2016 when the Brexit vote caused GBP swap rates to move by more than the initial margin required by both LCH and CME, the two major clearinghouses for currency swaps.¹⁰¹ LCH and CME calibrated their risk models for setting margin requirements based on ten-year and eightyear-long historical periods, respectively, and neither period included a price movement on the scale of that produced by Brexit. Despite the use of tail loss scenarios, a measure meant to correct for both VaR's and Expected Shortfall's exclusion of very uncommon, very large possible losses, both CCPs' models failed to anticipate the amount of collateral that would be necessary to guard against the change in swap rate caused by an unexpected political event.¹⁰² A

¹⁰⁰ Gregory, 2015, 19.

¹⁰¹ Khwaja 2016. The author thanks Jon Gregory for directing her to this example.

¹⁰² Moreover, although Brexit has now been factored into the initial margin calculations for GBP swaps, it is not clear whether the possibility of a rate movement of that magnitude has affected the initial margin requirements of

reliance on historical data is not the only problem of CCPs' risk models; Jon Danielsson is similarly skeptical that Expected Shortfall allows financial institutions to better risk that is endogenous to the financial system, including "the vicious feedback loops that are at the core of financial crises."¹⁰³

Centrally cleared OTC derivative markets depend on the same core set of risk management practices that failed to limit counterparty, and ultimately systemic, risk during the global financial crisis. These practices were insufficient to control markets when it mattered most, and there is good reason to doubt whether their transfer to central clearinghouses has done enough to prevent another crisis in the future. In failing to recognize the inability of netting, collateralization, and risk modelling to fully account for market complexity and uncertainty, we also overlook the contribution of these practices to that instability, whether through engendering a false sense of security, counterperformativity, or the creation of highly correlated linkages among large financial institutions. We should not, therefore, be surprised that the central clearing requirement has reproduced many of the very dynamics it was intended to forestall. Although the shift from market self-regulation to a governmentally mandated clearing requirement can be interpreted as a fundamental shift in market governance, a closer look at the practices that structure central clearing reveals continuity, rather than change.

It is possible to interpret this outcome as a failure of imagination, in which more radical structural reforms were passed over in favor of modifying existing technologies. A full consideration of why regulatory thinking was so constrained is beyond the scope of this paper.

other currency swaps, raising further questions about the generalizability and limitations of the historical data used to calibrate these risk models.

¹⁰³ Danielsson, 2013.

Nonetheless, the continued acceptance of OTC derivatives markets as legitimate forms of economic exchange surely plays an important role. As long as these markets exist, netting, collateralization, and risk models are likely to play important roles, given the ways in which these practices structure the daily operations of the market. Far from being regulations imposed on the market by public regulators worried about risk, these practices were first developed by the industry itself, then cited by public regulators as evidence of the capacity for self-regulation. Implementing regulation that departed dramatically from these technologies would likely mean a restructuring of the OTC market that would likely leave it unrecognizable or perhaps even non-existent. Having legitimized these practices in the era of self-regulation, policymakers enabled the creation of a hundred-trillion dollar market that was, in part, constituted by them. In not (successfully) disputing the OTC market's right to exist following the crisis, policymakers were limited to regulatory tools that would allow the market to remain profitable. We should not be surprised, then, that central clearing has reproduced so many of the dynamics associated with the OTC market prior to 2008.

7. Conclusion

Given the relative newness of the central clearing requirement, this analysis is necessarily preliminary. But while this novelty represents a potential disadvantage in terms of data collection, it also provides scholars of global political economy with valuable "real time" insight into how markets are constituted and reconstituted – a perspective that is often missing in our analyses of the lead-up to the financial crisis, many of which are retrospective. Accordingly, this chapter is more empirical than theoretical in bent, and my arguments about the limitations of

central clearing and the sources of those limitations in pre-crisis narratives and assumptions about how markets can and should be governed are, of necessity, provisional ones.

Nonetheless, the case of central clearing contributes to an answer to two of the empirical questions that motivate this volume: Why, given the severity of the crisis, have regulatory responses been relatively constrained? And why has post-crisis regulation produced fragmentation where we might expect to see coordination and cooperation? In answer to the first question, the crisis did not put an end to the longstanding regulatory tradition of deferring to market practices. Private clearinghouses were already a part of the financial landscape, albeit a much smaller one, and mandated clearing was tolerated - and in some cases even endorsed - by actors within the financial industry following the crisis. The transnational policy community of national and international regulators, market participants, and industry organizations that encouraged self-regulation in the derivatives industry prior to the crisis were quick to push for central clearing to be included on the influential G-20 agenda in 2009. The handful of more radical reforms that were floated during the height of the crisis – especially those, such as banning unattached CDS and requiring exchange trading of all OTC derivatives, that would have rendered the OTC market unrecognizable, if not ended it entirely – were quickly abandoned in favor of a more market-friendly regulatory regime that relied on a familiar set of risk management practices. This continuity speaks to the influence of the financial industry, but it also reflects the limits of possible regulatory change once public authorities have determined that a particular market should (continue to) exist.

While continuity at the level of practices is explained, at least partially, by transnational dynamics, many of the unexpected, potentially destabilizing consequences of mandated central

clearing are evidence of the salience of national regulatory actors post-crisis. While we have seen international consensus around broad regulatory changes, accompanied by more detailed regulatory principles published by transnational actors like IOSCO and CPMI, public regulation must ultimately be implemented and enforced at the national (or supranational, in the case of the EU) level. Cross-border disputes over recognition and regulatory harmonization have produced regulatory, and in turn, market fragmentation, undermining CCPs' capacity to most effectively mitigate systemic risk. Moreover, as market pressures reduce the number of clearinghouses in each jurisdiction, the debate over the appropriate relationship between public finances and private firms that are "too big to fail" has been re-opened. Despite initial optimism about the ability of publically mandated central clearing to transform the global financial landscape, thus far, the topology appears worryingly familiar.

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