



Credit Default Swaps: Past, Present, and Future

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Abstract

Credit default swaps (CDS) have grown to be a multi-trillion-dollar, globally important market. The academic literature on CDS has developed in parallel with the market practices, public debates, and regulatory initiatives in this market. We selectively review the extant literature, identify remaining gaps, and suggest directions for future research. We present a narrative including the following four aspects. First, we discuss the benefits and costs of CDS, emphasizing the need for more research in order to better understand the welfare implications. Second, we provide an overview of the postcrisis market structure and the new regulatory framework for CDS. Third, we place CDS in the intersection of law and finance, focusing on agency conflicts and financial intermediation. Last, we examine the role of CDS in international finance, especially during and after the recent sovereign credit crises.

1. INTRODUCTION

Credit default swaps (CDS) were engineered in 1994 by the US bank J. P. Morgan Inc. to transfer credit risk exposure from its balance sheet to protection sellers. At that time, hardly anyone could have imagined the extent to which CDS would occupy the daily lives of traders, regulators, and financial economists alike in the twenty-first century. As of this writing, more than one thousand working papers posted on the Social Science Research Network are directly related to the economic role of CDS or involve CDS as a research tool in one way or another. Nevertheless, some key issues on CDS are still hotly debated.

The controversy about CDS is underscored in an early survey by Stulz (2010). CDS have been a factor in recent financial scandals, for example in the subprime crisis of 2007–2008, in instances of trading losses by the London Whale at J. P. Morgan Chase in 2012, and in the \$1.86 billion settlement between a group of plaintiffs and a number of Wall Street banks, which were accused of violating US antitrust laws through anticompetitive practices in the CDS market. However, some hedge funds have successfully exploited opportunities in the CDS market, including Napier Park (Risk 2015) and BlueMountain Capital, the latter of which made profits in the famous London Whale case. Similarly, a fairly large proportion of the hedging and trading activity of the large global banks involves CDS in some fashion. For example, J. P. Morgan has several trillions of dollars of CDS notional outstanding (Off. Comptrol. Curr. 2015). CDS occupy a prominent position in global financial regulation, including in the Basel III guidelines of the Bank for International Settlements, the Dodd–Frank Wall Street Reform and Consumer Protection Act in the United States, and the Markets in Financial Instruments Directive (MiFID II) in the European Economic Area (the European Union plus Iceland, Liechtenstein, and Norway). Indeed, the role played by the purchase of naked (i.e., uncovered) sovereign CDS in shaping pan-European securities regulations clearly demonstrates that the controversy surrounding CDS cannot be reduced to the exchange of sound bites between the prominent investor, Warren Buffett, who has denounced derivatives as weapons of mass destruction (Buffett 2003), and the former Chairman of the Federal Reserve System, Alan Greenspan, who has argued in favor of CDS as efficient vehicles of credit risk transfer (Greenspan 2004).

In a way, the continuing controversy regarding CDS, especially since the global financial crisis, is surprising because in a frictionless world they ought to be redundant securities in financial markets. Indeed, other derivatives, such as interest rate swaps and foreign exchange forwards, do not attract similarly strong reactions, although they are much larger markets in terms of notional amounts traded or outstanding. For example, according to the Bank for International Settlements, the gross notional amount outstanding in over-the-counter (OTC) interest rate contracts totalled \$563.293 trillion in December 2014, compared to \$74.782 trillion and \$19.462 trillion for foreign exchange contracts and credit derivatives, respectively. One possible reason for this may be that there is sufficient anecdotal evidence to suggest that CDS affect the prices of the underlying securities; change the economic incentives of the key agents in the financial system; and alter the behavior of investors, firms, and regulators. This, in turn, is evidence of substantial market frictions, a statement that would have met with considerable skepticism, if not scorn, among financial economists even two decades ago. Once these frictions are acknowledged, the efforts of researchers ought to focus on gathering theoretical and empirical evidence to advance our knowledge of credit derivative products and on analyzing their impact on financial decisions. In this vein, we have certainly come a long way toward improving our understanding of the economic role of CDS contracts. However, it is also fair to say that regulators and other decision-makers have, at times, responded to existing frictions by implementing new financial regulations, often worsening the problem, before accumulating sufficient theoretical analysis and empirical evidence on CDS.

Academic research on CDS was initially concerned with models for the pricing of these financial instruments (Das 1995, Duffie & Singleton 2003) using the fundamental principles of replicating strategies (Duffie 1999). However, research on CDS has quickly expanded into a broad research field in financial economics with a variety of ramifications (Jarrow 2011). In a recent monograph (Augustin et al. 2014), we surveyed the extant literature, which keeps growing even as we write. In that broad survey, we covered a variety of research domains, ranging from cross-asset pricing effects to corporate finance applications to the role of CDS in financial intermediation, among many other topics. In this review, our goal is to elaborate on our views about future research directions in the context of the received literature, rather than to comprehensively survey the existing work. In so doing, we will focus on the issues that need more dedicated attention and that represent fruitful areas for investigation in the years to come.

We first discuss the welfare implications of CDS for corporations, financial intermediaries, and regulators. We then discuss some recent rules and market developments. Because many such issues are in the confluence of law and finance, we explain some of the technical aspects as well. Given recent events in Greece, Argentina, and Puerto Rico, we place considerable emphasis on analyzing the role of CDS in the context of sovereign risk and international finance. Currently, there are many unwarranted assertions on the perverse effects of CDS with little recognition of their salutary consequences. We hope to correct some misperceptions and to present a more balanced view of the relevant issues about CDS.

2. THE WELFARE IMPLICATIONS OF CDS TRADING

CDS contracts have been widely castigated as being among the main causes of the US subprime crisis in 2007–2008 (which led to the global meltdown in September 2008) and of the Eurozone sovereign debt crisis in 2010–2011. In the former case, many have blamed CDS because their leveraged and flexible nature facilitated the creation of synthetic securitized products such as collateralized debt obligations (CDOs) in, for example, the mortgage-backed securities market in the United States. (For a detailed explanation of the role of CDS during the financial crisis, see Stulz 2010; for a discussion of how CDS helped burst the housing bubble, see Fostel & Geanakoplos 2015.) In the latter case, some commentators have discredited CDS as vehicles for speculating against other investors' or governments' assets by accelerating default on the underlying debt. Sophisticated investors such as hedge funds are often accused of buying default insurance without having any economic ownership in the underlying debt. To cite just one example of this criticism in the popular domain, Jon Stewart, the political commentator-comedian, illustrated some of these shortcomings in a hilarious but searing segment on the purchase of CDS protection by Blackstone, a private equity firm, on Codere, a European gambling and casino firm (Stewart 2013). The argument is that the use of CDS contracts for hedging credit risk may have eliminated risk while maintaining negotiating rights, leading to empty creditors. The distorted incentives of such creditors would, in distress situations, favor bankruptcy over a renegotiation of the terms of government debt. (For a theoretical discussion, see Bolton & Oehmke 2011; for an empirical analysis, see Subrahmanyam, Tang & Wang 2014.) As a result of similar accusations in the context of the sovereign debt crisis, some observers have advocated a ban on naked sovereign CDS trading (Portes 2010), which was implemented temporarily by Germany in May 2010 and permanently by the European Union in December 2012.

We prefer to take a more nuanced view of the debate, basing our opinion on the institutional setting of the markets, including the definitions of CDS contracts, and on the available empirical evidence. On the one hand, CDS are simple insurance contracts that protect against default and are widely used by a variety of market participants. On the other hand, we simply do not have sufficient

academic and practical evidence to judge clearly for or against the societal benefits of CDS. Thus, one of the main challenges now facing the CDS literature is to provide a comprehensive analysis of the welfare implications of CDS contracts and their trading. Such an analysis should start by identifying the frictions that justify the existence of CDS in the first place, albeit with attendant side effects. Clearly, in complete markets with fully insurable outcomes, CDS would be redundant assets for society. Yet the existing research does point to both benefits and negative externalities that arise from their introduction. Hence, a challenge for researchers is to fully identify all the frictions that make CDS a useful tool in financial markets. In addition, we need a complete mapping of the cost-benefit analysis of the existence of CDS for all stakeholders in the economy.

There is a segment of the literature that attempts to study the implications of the initiation of CDS trading on the market efficiency, liquidity, and pricing of other asset classes. Other studies seek to understand whether the existence of CDS affects firm characteristics, or whether it changes the behavioral incentives of firms or financial intermediaries. However, these studies typically focus on only one particular aspect of the economy, and usually examine the cost-benefit analysis from a partial equilibrium perspective. Below, we review part of the literature along the following three dimensions: impacts of CDS on asset prices, liquidity, and efficiency; on firm characteristics and economic incentives; and on financial intermediaries and the debtor–creditor relationship.

2.1. Impact of CDS on Asset Prices, Liquidity, and Efficiency

The existing research has examined the effect of CDS on both parts of the capital structure, i.e., bonds and equity. Concerning bonds, Nashikkar, Subrahmanyam & Mahanti (2011), for example, document liquidity spillovers from CDS to the pricing and liquidity in the corresponding bond market. In terms of pricing effects, Das, Kalimipalli & Nayak (2014) and Massa & Zhang (2012) provide opposing views. Whereas the former find that CDS trading hurts bond market efficiency, quality, and liquidity because the alternative trading venue substitutes for bond trading, the latter argue that the existence of CDS improves bond liquidity, as the ability to hedge reduces fire-sale risk when bonds get downgraded to junk status. Ashcraft & Santos (2009) suggest that the initiation of CDS trading can have a screening benefit, as the effect of CDS initiation depends on the borrower’s credit quality: It reduces borrowing costs for creditworthy borrowers and increases them for risky and informationally opaque firms. Kim (2013), however, argues that it is those firms with high strategic default incentives that benefit from a relatively larger reduction in their corporate bond spreads, and the evidence in Asia provided by Shim & Zhu (2014) points toward a more modest discount in yield spreads at issuance owing to CDS trading initiation.

In the sovereign context, Goderis & Wagner (2011) and Salomao (2014) use different models to show that CDS, in equilibrium, reduce borrowing costs, a view that is shared by Ismailescu & Phillips (2011), who empirically show that, after CDS initiation, public bonds become more informationally efficient and bond spreads decrease.

Concerning equity, Boehmer, Chava & Tookes (2015) find that the spillover effects from CDS contracts to equity market liquidity and price efficiency are state-dependent, i.e., negative in bad states (owing to substitution effects) and positive in good states (owing to complementarity effects). There is some debate in the literature about the lead-lag relationship between CDS and equity returns and whether there is information flow from the CDS market to the stock market (Acharya & Johnson 2007) or vice versa (Hilscher, Pollet & Wilson 2015).

The analysis of the empirically mixed evidence about the impact of CDS trading on a firm’s cost of debt mostly omits discussion on how CDS may alter the nature of debt contracts. In particular, there is some evidence that loan covenants are loosened after the initiation of CDS trading (Shan, Tang & Winton 2014), mostly for high-quality and transparent firms. In a parallel

analysis, Nashikkar, Subrahmanyam & Mahanti (2011) show that bond covenants are implicitly priced in the basis between the CDS and the underlying bond.

2.2. Impact of CDS on Firm Characteristics and Economic Incentives

Another strand of research has examined the impact of CDS trading from a corporate finance perspective. In particular, this literature examines how the existence of CDS affects default risk and bankruptcy costs, as well as how this change in firm characteristics alters the economic behavior of corporate decision-makers. Theoretical work by Morrison (2005) suggests that firms may face higher borrowing costs because the ability to hedge their credit exposure reduces their monitoring incentives. This, in turn, may increase firms' funding costs with respect to alternative funding sources, in which companies do not benefit from the bank's certification value because of soft information obtained through an arm's length lending transaction. Bolton & Oehmke (2011) suggest a potential increase in a firm's cost of debt because creditors become empty when they maintain their control rights in the firm despite losing their economic interest through the purchase of default insurance (as argued by Hu & Black 2008). This is particularly the case when creditors overinsure their credit exposure, although the threat of liquidation may also reduce the strategic default incentives in the first place, leading to lower borrowing costs. Campello & Matta (2013) add a time-varying and cross-sectional dimension to the empty creditor problem by arguing that CDS contracts could increase the debt capacity of a firm, particularly during economic booms and for more successful firms. However, the hedging aspect of CDS allows firms to invest in riskier projects, which may accentuate the borrowers' probability of default.

Although Che & Sethi (2014) derive conditions under which CDS allow firms to reduce their funding costs through an improvement in their debt capacity, they also show that optimists may prefer to use their capital to collateralize synthetic speculative credit exposures, which may limit the capital allocated to economically viable investment projects. Such a crowding-out effect can also arise in the model of Oehmke & Zawadowski (2015), where the presence of CDS may push optimistic investors to migrate from the bond market to the CDS market. However, the hedging ability may also attract arbitrageurs to exploit price discrepancies between the CDS market and the bond market that, in equilibrium, will result in a greater demand for illiquid bond positions, provided that the CDS are unconditionally more liquid than bonds. In a related paper, Fostel & Geanakoplos (2015) show that uncovered CDS positions may lead to an underinvestment problem, along the lines of Myers (1977).

Within the empirical dimension, Saretto & Tookes (2013) argue that the existence of CDS leads to an increase in credit supply resulting from greater firm leverage and extended debt maturities; also, Subrahmanyam, Tang & Wang (2014) document that the likelihood of bankruptcy and a credit downgrade is higher following the initiation of CDS trading, a result confirmed by Peristiani & Savino (2011). Such views are echoed by Arentsen et al. (2015), who document that the loan delinquency rate for subprime loans underlying mortgage-backed securities that were subject to CDS coverage increased during the financial crisis and that the existence of CDS increased the supply of lower-quality subprime securities. There is also evidence that the existence of CDS had an influence on corporate restructuring outcomes (as documented by Bedendo, Cathcart & El-Jahel 2016, Narayanan & Uzmanoglu 2012), which could stem from a reduced interest in voting participation as a consequence of the availability of credit insurance (Danis 2013).

There is some preliminary evidence, though, that CDS impact both internal and external corporate policies. For example, Subrahmanyam, Tang & Wang (2016) find that firms respond to the increased bankruptcy risk by increasing their cash holdings, and Colonnello (2013) shows that board independence may increase after CDS trading is initiated. In line with the view that CDS

reduce monitoring incentives, Martin & Roychowdhury (2015) find a reduction in the degree to which the accounting practices of borrowing firms can be deemed to be conservative, measured by an asymmetry in the recognition of losses versus gains. In a similar vein, Du, Masli & Meschke (2013) find increased audit costs for firms with traded CDS. Karolyi (2013) documents that firms increase their financial and operational risk after the initiation of CDS trading on their debt, and Kim et al. (2015) argue that such firms are more likely to issue earnings forecasts after such initiation.

Another important issue for future research is the indirect impact of CDS trading on firms without CDS traded on their own debt, for example through their customer–supplier relationships or through product market competition. Initial steps in this direction have been taken by Li & Tang (2016), who suggest that suppliers respond to CDS trading on their customers' debt by reducing their own leverage, and by Hortaçsu et al. (2013), who document that product prices are negatively related to the magnitude of CDS spreads. Darst & Refayet (2015) examine theoretically how naked and covered CDS affect investment levels and borrowing costs of firms without traded CDS.

2.3. Impact of CDS on Financial Intermediaries and the Debtor–Creditor Relationship

Hakenes & Schnabel (2010) propose a model that justifies an increase in the credit supplied to risky borrowers in the presence of risk sharing from the credit insurance provided by CDS. Such practices may also lead to excessive risk taking (as argued by Biais, Heider & Hoerova 2016), with destabilizing effects on aggregate risk. Similar externalities for systemic risk are possible if CDS are also used for regulatory capital relief for banks (as suggested by Yorulmazer 2013), which can improve regulatory capital adequacy for individual banks at the expense of making them more vulnerable to systemic shocks (Shan, Tang & Yan 2014). Hirtle (2009) finds limited evidence of a greater credit supply for the average firm in response to a hedging facility provided by CDS, with larger firms being able to borrow somewhat more, a benefit that may be offset by higher borrowing costs.

The strategic use of CDS may lead to other unintended externalities with ambiguous welfare implications in the context of financial intermediation, such as reduced monitoring incentives for banks (Morrison 2005, Parlour & Winton 2013, Arping 2014), adverse selection and moral hazard in the bank–debtor relationship (Duffee & Zhou 2001, Thompson 2010, Chakraborty, Chava & Ganduri 2015), counterparty risk (Stephens & Thompson 2014), and contagion because of credit risk transfer (Allen & Carletti 2006), but also more efficient risk sharing (Duffee & Zhou 2001, Thompson 2010, Allen & Carletti 2006) and improved risk management (Norden, Buston & Wagner 2014), which may be passed on to firms in the form of lower borrowing costs. Fung, Wen & Zhang (2012) find that insurance companies that use CDS are associated with greater market risk, deterioration in financial performance, and lower firm value. Jiang & Zhu (2015) focus on mutual funds' quarterly holdings of CDS during the 2007–2009 crisis and document that smaller funds followed larger funds in their CDS trading positions, resulting in an increase in comovement, especially for financial institutions deemed systemically important.

2.4. Future Directions

Several broad conclusions can be drawn from the above survey of the extant literature. First, although it is generally recognized that the economic environment is certainly not frictionless, it is important to recognize the role of specific frictions and their impact on borrowing costs, debt

capacity, incentives, and systemic risk. The existing theoretical and empirical literature, despite being mixed in its conclusions, provides multiple reasons to believe that CDS have nontrivial effects along various dimensions because of these frictions. Whereas some research suggests that CDS reduce frictions, other work takes the view that CDS may have severe unintended consequences that introduce additional frictions for various stakeholders. This may be particularly important to consider with respect to implicit or explicit recommendations for policymakers, and for issuers and buyers of claims. Thus, we encourage a deeper examination of the role of CDS in regulatory frameworks, as well as consideration of the unintended consequences that such regulation may have on different economic stakeholders.

Second, the summarized literature seems largely mixed in its conclusions about the effects of CDS trading on firm characteristics and firm economic incentives. This may not be surprising, given that detailed, transparent transactions data on CDS, particularly over the long term, are still not publicly accessible, with only a few researchers having privileged access. This needs to change by means of various regulatory bodies, including the Office of Financial Research, disseminating data to the broader market, perhaps with a delay, much in the way that the Financial Industry Regulatory Agency (FINRA) has disseminated corporate bond data through its Trade Reporting and Compliance Engine (TRACE) platform. The data lacuna is further compounded, in terms of identification strategies, by the demand nature of the empirical tests using the available data. This makes results vulnerable to critiques of the endogeneity of the key effects, throwing in doubt any claims of causality, which are important for policymaking. The silver lining is that the global financial crisis and the Eurozone crisis may be considered structural shifts, with the many regulatory changes to the trading and clearing of CDS providing opportunities for the conducting of natural experiments. [For example, Campello, Ladika & Matta (2015) exploit CDS spreads in the context of the passage of IRS Regulation TD9599, a change to the US tax code in 2012, to show that it was effective in reducing creditors' costs for out-of-court restructurings.] Thus, we believe that further empirical research is warranted to validate or invalidate the existing theoretical predictions, as well as the existing empirical findings through replication both over time and across jurisdictions and regions. As time goes by, we will benefit from the availability of more granular data to answer new and old questions; hence, we encourage regulators to enable better public access to data that will allow such studies, which would be of significant relevance to policymakers, to be conducted.

In order to understand the full extent of how CDS contracts affect the various stakeholders in a firm, it is important to study the real effects of CDS trading initiation on a firm's incentives, its behavior, and its actions, such as deciding on the size of its cash holdings (Subrahmanyam, Tang & Wang 2016), capital structure (Saretto & Tookes 2013), and investments, for example. Although most research today examines the impact of the initiation of CDS trading on firms with CDS traded on them, little is known about how CDS trading initiation collaterally affects non-CDS firms, or how it affects the interaction between CDS and non-CDS firms. These real dimensions are important to consider in the evaluation of the overall welfare effects of CDS trading. The existing evidence is almost exclusively confined to US data, with few studies focusing on firms in Europe or Asia. Applying the existing conceptual frameworks to a truly international dimension, with cross-country differences in cultures and regulations, will further improve our understanding of the welfare implications of CDS. Finally, whereas existing research primarily looks at the existence of CDS or at CDS trading initiation, future research ought to focus also on the intensity of CDS trading. In fact, other than the work by Oehmke & Zawadowski (2016), our understanding of CDS trading volumes is still in its infancy.

Given the lack of empirical data at this stage, it becomes important to address the question of welfare implications for all stakeholders from a fully or partially theoretical perspective, as done

by Oehmke & Zawadowski (2016) and by Danis & Gamba (2014), who implement a calibration of a dynamic model. Fully structural estimations in the future would provide further insights. Although there is some existing theoretical literature on the welfare effects of CDS, more remains to be done to bring in the additional dimensions discussed above.

3. POST-CRISIS CDS MARKET, DODD-FRANK, AND BASEL III

Much of the public outcry and policy debate on credit derivatives, especially CDS, was triggered by the government bailout of insurance giant AIG in 2008 following the global financial crisis. Public awareness of CDS was heightened by popular accounts of the crisis, such as those of Tett (2009) and Lewis (2011). A major lesson of the crisis was the insufficient regulatory oversight over CDS, which was blamed as one of the main causes for the turmoil. In its Final Report, the US Financial Crisis Inquiry Commission (FCIC 2011, p. 50) notes that a “key OTC derivative in the financial crisis was the credit default swap.” On July 21, 2010, the Dodd–Frank Act, the greatest regulatory overhaul of financial markets since the Glass–Steagall Act almost eight decades earlier, was signed into US federal law by President Barack Obama, with similar legislation, such as MiFID II in the European Economic Area, to follow in October 2011.

There are at least three regulatory aspects of the Dodd–Frank Act that are likely to have a direct impact on the CDS market: the Volcker Rule, with the separation of proprietary trading from commercial banking activities; the central clearing of CDS indices; and the gradual phasing out of uncleared single-name CDS. Acharya, Shachar & Subrahmanyam (2011) provide an early discussion of these three aspects of the act and their implications. About two years after the Dodd–Frank Act was passed, public attention was once again focused on CDS after the large trading loss sustained by J. P. Morgan in the first half of 2012; dubbed the London Whale case, this event was largely the result of ineffective risk management in the context of CDS trading strategies. It further reignited the controversies about the misuse of CDS and the need for more stringent CDS regulations, especially given that depository institutions benefit from implicit government guarantees, and even more so if they are deemed to be too big to fail.

At the time of this writing, in the second half of 2015, the CDS market is at a critical junction in terms of its evolution. A \$1.86 billion settlement, whose plaintiffs include the Los Angeles County Employees Retirement Association and whose defendants include 12 major Wall Street banks, the CDS industry representative International Swaps and Derivatives Association (ISDA), and the CDS data provider Markit Group Ltd., concerning alleged coordinated “efforts to delay or prevent exchanges from trying to put . . . swaps contracts onto open, regulated platforms where prices would be more transparent” (Burne 2015a), is the latest blow to the market’s reputation (see also Drucker & Van Voris 2015). Deutsche Bank, a major participant in the CDS market, closed their books for single-name corporate CDS in October 2014 (Burne & Henning 2015). Single-name CDS trading activities have shrunk dramatically since then. Fearing the long-term externalities associated with a market decline, the world’s largest asset manager, BlackRock, called for a market-wide effort to jointly revive the single-name CDS market in May 2015 (Ahmed & Natarajan 2015). A report by the Milken Institute (2014) highlighted the importance and contribution of derivatives, including CDS, to our economic growth.

These developments occurred against the backdrop of unprecedented monetary easing by all major central banks, including the Federal Reserve System in the United States, the European Central Bank (ECB) in the Eurozone, and the Bank of Japan, among others, leading to historically low interest rates. Bolstered by these low rates, a large quantity of corporate bonds was issued in the years after these interventions. The size of the US corporate debt market jumped from \$5.4 trillion in late 2008 to \$7.8 trillion in early 2015, in outstanding amounts, according to the

Securities Industry and Financial Markets Association (SIFMA). Banks have not felt much pressure to buy single-name CDS protection to hedge their credit exposures, given the low default rates of the past few years. However, as the business cycle turns, the current low-interest, low-default environment is likely to be followed by high default rates in the years to come, if history is any guide. In such distressed periods, a well-functioning CDS market may prove essential to credit risk sharing and resource allocation in the real economy.

Central clearing is an important requirement of Dodd-Frank and will eventually cover most CDS, including CDS contracts. [As of July 2015, Standard & Poor's (2015) estimates that the requirement on OTC derivatives clearing is 75% completed.] CDS index trades have been required to be traded on Swap Execution Facilities and centrally cleared since February 2014. Unlike CDS indices, single-name CDS are not yet required to be centrally cleared. Hence, given that many market players use CDS indices to hedge their overall portfolio risk, without an active market for single-name CDS, the CDS index market may also be affected and distorted, with potentially extreme outcomes such as a market collapse. It is conceivable that central clearing could be costly, given the extra layers of compliance that market participants, particularly end-users, would have to go through, and that is an area of concern. However, banks are required to hold more capital for non-centrally cleared, single-name CDS, following the Basel III and Dodd-Frank reforms. Some market participants anticipate two separate pricing schemes for centrally cleared and non-centrally cleared CDS contracts, which would further segment the market and inhibit market efficiency. An early indication of this is provided by Loon & Zhong (2016). Another aspect of Dodd-Frank is the Volcker Rule, which restricts banks from engaging in proprietary trading, including CDS trading, unless they can prove that their CDS positions are for market making or to facilitate client positions.

The most controversial provision of the Dodd-Frank Act with respect to CDS was the swap “push out” rule (Section 716 of the act). According to this rule, commercial banks and bank holding companies would have been required to trade uncleared single-name CDS through a separate subsidiary with higher capital requirements. Notably, however, the “push out” of riskier derivatives such as CDS from deposit-taking institutions was repealed in December 2014.

During the November 2010 Seoul Summit, leaders of the G-20 countries endorsed the new bank capital and liquidity regulations (Basel III) proposed by the Basel Committee on Banking Supervision. Basel III aimed to close some loopholes that banks have exploited using CDS contracts. The incentives of banks to use CDS to manage regulatory capital are examined by Shan, Tang & Yan (2014) and Yorulmazer (2013). Whereas banks may appear safer (as measured by regulators or bank examiners) if many of their activities are moved off their balance sheets, their portfolio risk could in fact be higher. The aforementioned London Whale case was allegedly caused in part by a reaction to the so-called Basel 2.5 bank capital regulation, which requires banks to have more capital for CDS trading (Watt 2012). Moreover, banks' use of CDS can create systematic risk because banks are both major buyers and sellers of CDS and are usually at the core of the CDS dealer network. Siriwardane (2015) shows that the network has become even more concentrated since the 2007–2008 global financial crisis.

3.1. Impact of Regulation

Although some commentators were disappointed by the real impact of Dodd-Frank (see, for example, Hensarling 2015), Loon & Zhong (2014) show that central clearing can improve market liquidity and transparency. Moreover, Loon & Zhong (2016) argue that Dodd-Frank was helpful to the CDS market in terms of reducing transactions costs and liquidity. However, Duffie, Scheicher & Vuillemeij (2014) point out that central clearing could increase dealers' overall

collateral requirements and make it more difficult for a market to be made for CDS. The partial closure of the CDS trading business by Deutsche Bank in late 2014 reflects this. Moreover, Deutsche Bank reported a record loss of \$7 billion for the third quarter of 2015 and claimed that the majority of the loss was because of tougher regulations that imposed higher costs of capital.

As discussed above, major CDS dealer banks, as well as other market organizers, recently settled with a group of investors regarding an allegation of market manipulation (Burne 2015b). On the one hand, it is possible that this settlement and the consequent removal of legal uncertainties may improve the CDS market's further development. On the other hand, this case may serve as a precedent for future lawsuits. There is the risk that CDS market makers and participants may be more subject to legal scrutiny in the future.

Regulations often lag behind market developments. It is possible that even before the existing regulations are fully phased in, a new crisis may hit the market, causing some regulations to be rolled back or causing new regulatory proposals to be enacted. For relatively new financial instruments, like CDS, it should be expected that the market rules and regulations will evolve until the market reaches its steady state. Moreover, international coordination and regulatory convergence will be necessary, as market participants often operate across borders to trade such derivatives contracts.

3.2. Future Directions

The above discussion suggests it is safe to conclude that both Dodd–Frank and Basel III are still works in progress (some commentators are even discussing the emergence of Basel IV). Unfortunately, however, their effects on CDS markets remain largely under-researched so far. On the one hand, the market is severely affected by the new regulations, but on the other hand, the market is responding by inventing new products, such as CDS index swaptions and CDS futures. In our earlier survey (Augustin et al. 2014), we provide an account of the many externalities that CDS can produce in various dimensions of the financial markets. Thus, if the regulatory overhaul has an impact on CDS markets, it will similarly affect these very dimensions through the CDS trading channel. Although there is a need for deeper and more extensive studies on the impact of the new regulatory environment on CDS markets, we believe that the development of new products belonging to the CDS family gives rise to exciting future research opportunities. Although the new rules seem to restrain banks' use of CDS (Brunsdon 2013), exchange-traded funds consisting of CDS contracts, for example, may circumvent some of the regulatory requirements.

4. CDS IN LAW AND FINANCE

The work of La Porta et al. (1998) spawned a new literature in law and finance, covering many issues both at the economy-wide level and related to individual contracts, instruments, and markets. CDS contracts and markets are a new, fertile area for more focused inquiry in the intersection of law and finance. Although research on CDS encompassing the fields of law and finance is in its infancy, we believe that this is an important direction for financial economists to take in the future. Although there are many aspects of CDS that have legal ramifications, there are two specific dimensions that we highlight here. The first is related to the externalities associated with the creation and existence of CDS contracts, research we also discussed in Section 2. We expand on this dimension here and relate it specifically to the implications for the legal discipline, while trying to avoid any significant overlap in our discussion. The second concerns the legal uncertainties embedded in CDS contracts, and how these may be reflected in asset prices and/or in the decision processes of various stakeholders.

4.1. Legal Implications of CDS and the Decoupling Theory

As previously discussed, the existence of CDS has altered the financial landscape and influences the incentives of economic agents in complex ways. One interesting aspect is highlighted by Bolton & Oehmke (2015), who emphasize that derivative counterparties are in a much stronger position than other claimants under US bankruptcy law because derivatives enjoy privileged, super-senior treatment when firms file for bankruptcy. This has obvious implications for the collateral required by counterparties, the amount of credit insurance underwritten, and the choice of funding resources. Another significant development in the CDS literature that relates to law and finance is the appearance of the decoupling theory, which arises because CDS allow for the separation of cash flow rights from creditor rights. A well-known possible consequence of this decoupling is that insured lenders may prefer socially inefficient foreclosures (with resultant job losses and welfare destruction) over a corporate restructuring (without such adverse consequences) in order to maximize their own insurance payouts. (For a detailed discussion on the decoupling theory, see Hu 2015.) Theoretical research on empty creditors (Hu & Black 2008) is now growing, having started with Bolton & Oehmke (2011) (see also Campello & Matta 2013, Che & Sethi 2014, Danis & Gamba 2014, Oehmke & Zawadowski 2015). These theoretical models have led to empirical tests of their testable predictions, such as by Subrahmanyam, Tang & Wang (2014) (see also Peristiani & Savino 2011, Lubben & Narayanan 2012, Narayanan & Uzmanoglu 2012, Danis 2013, Bedendo, Cathcart & El-Jahel 2016.)

CDS contracts may bring about real externalities beyond those related to the creation of empty creditors. Indeed, the empty creditor problem may just be the tip of the ice-berg. Anecdotal case evidence shown by Hu (2015) suggests intriguing effects of CDS on the behavior of activist investors, corporate governance, and the incentives of CDS sellers. For example, when RadioShack experienced severe financial stress in 2014, it received emergency loans from three investment funds, BlueCrest Capital Management LLP, DW Investment Management LP, and Saba Capital Management LP, to stave off potential default. Later on, it was revealed that the emergency lenders had previously sold CDS against the default of RadioShack. Thus, the rescue lenders had a clear interest in preventing their debtor from defaulting and so engaged actively in the provision of emergency funds. In another striking counterexample, an investment entity of Blackstone Group LP refused to roll over its loans with Codere unless it agreed not to honor its other existing outstanding debt commitments and postpone an interest payment. Thus, the intervention by Blackstone eventually triggered a payout on CDS contracts it had previously purchased (Wirz, Jarzemsky & McGinty 2014). Hence, CDS contracts could create incentives for activist investors to either forestall or trigger potential default.

4.2. Legal Uncertainties in CDS Contracts

Aside from the legal implications of the externalities of CDS initiation, uncertainty about the interpretation of the contracts themselves creates frictions for asset pricing and decision-making by the stakeholders of a firm, which provides a promising future research direction. One such example is the uncertainty surrounding the effective CDS insurance payout following the default or restructuring of a sovereign borrower. This uncertainty in the definition of credit event triggers became particularly tangible with the Greek debt crisis and Greece's first formal default in 2012. Numerous press articles debated whether a restructuring of Greece's debt would effectively trigger a CDS payment. The motivation behind these discussions was linked to the fact that the restructuring was meant to be voluntary, although the prospects of everyone agreeing deliberately to the new lending terms were rather slim. In general, a restructuring credit event can be declared only if the terms of the restructured debt are binding on all outstanding bond holders. Initially, the Determinations

Committee of ISDA, which formally calls credit events, did not recognize the escalation of the priority of the ECB's claims in its emergency funding as such an event, thereby ignoring the rights of the existing lenders. Eventually, they formally declared that the Greek restructuring did constitute a credit event trigger, even though the decision to restructure was voluntary. The reason was that more than 66.7% of all debt holders agreed to the amended terms, which allowed the Hellenic Republic to enact a collective action clause that coerced the holdout parties into accepting the newly issued bonds, so that the economic value of the affected bonds was reduced for all holders of Greek debt. In contrast, Greece's failure to repay an International Monetary Fund loan in June 2015 did not seem to trigger a credit event, as the conventional contract clauses exclude defaults on bilateral loans from other sovereigns or supranational agencies. Salomao (2014) provides an example of how this legal uncertainty about CDS payouts can influence the debt renegotiation process in a model of endogenous sovereign default. The defaults of Ecuador, Greece, and Argentina in 2008, 2012, and 2014, respectively, represent the only three sovereign defaults for which the CDS payout has been publicly documented through the information available from auction settlement outcomes. (For a detailed account of the sovereign default of Argentina and its consequences for equity prices and economic activity, see Hebert & Schreger 2015.) Whether CDS were or should have been triggered in other default situations is unclear. However, our emphasis on the uncertainty of the CDS payouts is supported by the existence of many legal interpretations publicly offered by law firms and industry participants, such as in Morgan Stanley (2011). In addition, anecdotal evidence suggests that such uncertainty may also arise for corporate defaults, as is demonstrated by the failure of Seat Pagine Gialle to pay a €52 million coupon in December 2011 (Harrison & Whittall 2011).

Another dimension of legal uncertainty relates to the type of sovereign CDS contracts. Sovereign contracts specify conventional transaction-type characteristics that depend on the geography and the economic situation of the sovereign borrower. As such, contracts written on debt issued by emerging countries contain restrictive provisions that limit the currency, type, and scope of deliverable reference obligations. Moreover, there is a tight restriction as to which debt obligations are eligible to trigger a credit event. For example, for emerging countries, domestically issued debt does not usually qualify for a credit event trigger, and only bonds or loans issued under foreign law in any of the lawful currencies of Canada, Japan, Switzerland, the United Kingdom, or the United States, or in the Euro, can be referenced for a public default notice. These restrictions raise intriguing questions about the economic value of sovereign CDS contracts for emerging countries that only have domestically issued debt. A case in point is China, which, according to data from the Bank for International Settlements, has not issued any foreign-denominated bonds since 2008. Yet any bond or loan issued under domestic law and in its domestic currency is not an eligible candidate for triggering a credit event. In this situation, what scenario could trigger a credit event for Chinese CDS? What is the purpose of such contracts? In the case of a credit event, what reference obligation would be delivered? Our interactions with legal experts suggest that there is no clear agreement on many of these issues and the answers remain ambiguous, at best, and contradictory, at worst. Although we can only hazard a guess, it may be that markets attribute some probability to China issuing foreign-denominated debt over the life of the CDS contract, or to China inheriting foreign-denominated debt through bank nationalization. Although this interpretation would make Chinese CDS conceptually equivalent to a deep out-of-the-money put option, it is questionable what other argument would justify the contract having any positive economic value. Similar questions arise in the case of Argentina, whose government was frozen out of the New York jurisdiction, yet continued to issue local-jurisdiction dollar debt. Moreover, when the discussion is centered around foreign debt, it is unclear whether all jurisdictions are considered equal and whether the choice of jurisdiction for debt issuance, i.e., London, Paris, New York, or local, is reflected in the prices of CDS.

CDS contracts can also be traded with different contractual clauses attached to them. This feature is connected to the restructuring credit event clause, which guides whether a sovereign or corporate restructuring would trigger an insurance payout [complete restructuring (CR)] or not [no restructuring (XR)]. Such contractual differences undoubtedly add a certain degree of complexity to CDS, although it is today well known that these differences are priced (Berndt, Jarrow & Kang 2007). Other pricing effects have arisen because of a cheapest-to-deliver option, which arises when the insurance buyer physically delivers a bond of the defaulted reference entity to the protection seller against the full par value (Jankowitsch, Pullirsch & Veza 2008, Ammer & Cai 2011). As the CDS contract typically references a number of bonds that can be delivered, the insurance holder will naturally deliver the one with the lowest value. Such legal uncertainties are of less concern today, as the regional markets have adapted by limiting the maturity of deliverable obligations, creating additional restructuring-type clauses such as modified restructuring (MR, contract by convention in the United States until the Big Bang regulatory overhaul in 2009) or modified modified restructuring (MMR, contract by convention in Europe). In addition, as cash settlement has become hardwired into CDS contracts through the auction settlement process, physical delivery has become less common.

A final contractual uncertainty in CDS contracts that we highlight is the handling of succession events such as mergers, acquisitions, and spinoffs. An interesting case in this context is the merger between UPC Germany and Unitymedia, in which the newly created entity assumed all debt of both companies and eventually adopted the exact same legal name, Unitymedia, in September 2010. The rebranding led industry participants to miss the succession, so that the outstanding CDS contracts on Unitymedia did not follow the debt, but became orphaned and effectively worthless. This ultimately affected \$340 million in net notional amounts outstanding, according to data from the Depository Trust and Clearing Corporation (Pollack 2012). Hence, the treatment of CDS contracts in the presence of corporate actions is complex, and this complexity is emphasized by an ISDA-published document that itemizes close to 2,000 remaining questions relating to historical succession events. The 2014 Credit Derivatives Definitions have certainly reduced some of the complexity and uncertainty associated with corporate successions. Yet we believe that it will be difficult to eliminate them completely. To quote a Financial Times article (Pollack 2012), “All derivatives industries have evolved in various ways, but credit really takes the cake in the *oops, didn’t think of that stakes*.”

4.3. Future Directions

The previously cited cases relating to the decoupling theory are just two examples of the burgeoning case-based evidence of agents with zero, or even negative, net economic ownership in debtor firms, but with the ability to influence the decisions of firms. More formal research that is theory driven and empirically testable is required to guide the legal discipline in court rulings. This research ought to take both a positive and a normative view. The anecdotal evidence is sufficient to stimulate our interest, but more detailed evidence is needed to provide formal guidance on whether and how to update guidelines, rules, and laws to minimize the costs of these externalities. The decoupling of economic ownership pushes us to rethink whether we should allow more stakeholders to join the negotiating table in bankruptcy proceedings. It raises several intriguing questions, such as: Should we exclude investors from a restructuring negotiation when they have positive creditor control rights with negative net cash flow rights? Given the evidence of the presence of activist investors in a firm, do we need to rethink how voting rights are allocated? Although these illustrations only scratch the surface of the implications of CDS for corporate governance, we require a more in-depth analysis of how CDS influence the rule of law to help legislatures and courts to decide whether it is necessary to alter the status quo.

In summary of this section, the existence and initiation of CDS introduce frictions into financial markets that affect asset prices and economic incentives and potentially have unintended consequences for the rule of law. There are also legal details inherent in CDS contracts that introduce distortions and uncertainties into decision-making processes and asset prices. The fact that these issues extend broadly to the legal and economic disciplines makes research in CDS a promising avenue for scholars in the fields of both law and finance.

5. CDS AND INTERNATIONAL FINANCE

CDS feature several advantages over bonds that make them particularly appealing for financial market research in international settings. They are constant-maturity-spread products with homogeneously defined contracts that are less plagued by issuer-related differences in covenants or legal systems and by country-related differences in legal origins. Thus, they allow for a much cleaner comparison in empirical work across countries and companies than do bond yield spreads. Further, many of them are denominated in US dollars, mostly removing the currency risk dimension from the analysis. Although some papers make use of international CDS data, papers usually focus on pure pricing implications and are mostly confined to the sovereign context. The use of CDS in international settings as an economic tool for answering corporate finance or asset pricing related questions is, in our opinion, not very developed.¹ One contrasting example is the work by Ang & Longstaff (2013), who, motivated by economic arguments, compare the decomposition of CDS spreads of sovereign states in the United States and sovereign governments in the European Union to draw inferences on the determinants of systemic sovereign credit risk.

The existing CDS studies with an international finance flavor adhere primarily to two research agendas. First, there are those studies that make use of sovereign CDS data to learn about the determinants of sovereign credit risk, the sovereign–bank nexus, and contagion. The linkage between sovereign and financial-sector credit risk is expected to be tight because of the risk transfer that occurs when governments bail out financial institutions, which are exposed to sovereign lenders through their holdings of government bonds and both explicit and implicit bailout guarantees, as documented by Acharya, Drechsler & Schnabl (2014). In addition, distressed governments can transfer their debt burden to individual firms by increasing corporate tax rates, by imposing capital controls, or through reductions of subsidies and infrastructure investments. Such types of risk transfer motivate the second group of studies, which use international CDS data to investigate the transfer of credit risk from sovereigns to nonfinancial corporations. We survey some of the key contributions in this literature in the following two subsections. We then discuss opportunities we see for research on the use of CDS in international settings.

5.1. Determinants of Sovereign Credit Risk

Ever since the seminal works of Eaton & Gersovitz (1981) and Bulow & Rogoff (1989), academics have tried to understand why governments are able to borrow, despite repeated evidence of sovereign default. With the development of the CDS market, researchers have obtained useful tools with which to also study the cross-country pricing of sovereign credit risk. This is of particular relevance in light of an aging population, a growing pension fund industry, and both banking

¹ One likely reason for the gap in CDS research within the international finance dimension is the lack of CDS databases that are easily mapped into international corporate balance sheet and stock price data. We have encountered this problem ourselves, as we are currently engaged in research on the effects of quantitative easing on corporate decisions, and CDS contracts are clearly a variable of interest in that research.

and insurance regulations that encourage investment in government debt, for a range of financial institutions. Thus, understanding the nature of sovereign credit risk and how government debt fits into the investment opportunity set is undeniably important.

To date, the key debate in the literature on sovereign credit risk has circled around the question of whether sovereign credit spreads are determined by global or country-specific risk factors. (For an exhaustive survey, see Augustin 2014.) For most of the time prior to the financial crisis, the empirical evidence suggested that global risk factors were the primary determinants of sovereign credit risk. These risk factors are mostly associated with the United States and are deemed to be either financial (Pan & Singleton 2008, Longstaff et al. 2011) or macroeconomic (Chernov, Schmid & Schneider 2015; Augustin & Tédongap 2016) in nature. Longstaff et al. (2011) even argue that both risk premia and default probabilities are better explained by US financial risk factors than by country-specific fundamentals. The dominant role of global risk factors was essentially justified by the particularly strong comovement of sovereign spreads, at least until the financial crisis.²

The recent global financial crisis and subsequent Eurozone sovereign debt crisis highlighted an intrinsic relationship between governments and their local economies. Banks are often heavily invested in government bonds because of regulatory capital arbitrage facilitated by banking regulation, and they benefit from both explicit and implicit bailout guarantees. Thus, banks' exposure to sovereigns turned out to be systemic once governments engaged in excessive risk transfer. These intricate linkages have dampened the focus on the role of global risk factors as a source of variation. Given the intensity of the recent debt crisis, which was especially acute in Europe, most studies that use CDS to examine the relationship between sovereign credit risk and the financial sector are confined to the European countries. Acharya, Drechsler & Schnabl (2014), for example, model the feedback loop between sovereign and bank credit risk. Excessive risk transfers from the bank to the sovereign balance sheet can weaken the financial sector because of the decreased value of government debt holdings and government guarantees. The authors test and confirm these predictions using CDS rates on European sovereigns and banks between 2007 and 2011. Many other authors contribute to the understanding of the sovereign–bank nexus, including Sgherri & Zoli (2009), Altman & Rijken (2011), Dieckmann & Plank (2011), Ejsing & Lemke (2011), Alter & Schuler (2012), and Kallestrup, Lando & Murgoci (2014). [Dieckmann & Plank (2011) focus on developed economies, whereas most other papers focus only on the European countries.]

The above short (and somewhat incomplete) review of the literature hints at a dichotomy in the explanations that are put forward for the time variation in sovereign credit risk: Some argue in favor of global risk factors, whereas others prefer to reason in terms of domestic financial risk. According to Augustin (2013), it is plausible that both camps are right. He argues that both sources of risk affect sovereign credit risk, although their influence is time-varying. Their relative importance can be identified using the shape of the term structure. A negative slope, which typically coincides with sovereign distress, is indicative of country-specific risk being the main factor in the time variation in sovereign spreads, whereas a positive slope is indicative of global risk being more important.³

²An interesting contribution is also provided by Benzioni et al. (2015), who explain how the comovement in sovereign spreads can arise through contagion. Focusing on US CDS spreads, Chernov, Schmid & Schneider (2015) develop an equilibrium macrofinance model with endogenous default to show that the empirically observed prices for US default insurance are consistent with high risk-adjusted fiscal default probabilities.

³In a study of 28 emerging economies, Remolona, Scatigna & Wu (2008) suggest that risk aversion is unconditionally the driver of sovereign risk premia, whereas country fundamentals and liquidity determine default probabilities. Dockner, Mayer & Zechner (2013) argue that a combination of common and country-specific risk factors extracted from forward CDS spreads improves the predictability of government bond returns primarily for distressed countries.

In the future, it may thus be useful to integrate the information from the term structure and higher-order moments to improve our understanding of the nature of sovereign credit risk.

Another strand of literature has focused on identifying or disproving the existence of contagion, either across sovereign CDS spreads or between sovereign and financial CDS. Summarizing these contributions in detail is beyond the purpose of this review, so we limit ourselves to enumerating a few of the key contributions. Studies examining spillovers across sovereign CDS include those by Beirne & Fratzscher (2013), Caporin et al. (2013), Aït-Sahalia, Laeven & Pelizzon (2014), Benzoni et al. (2015), and Brutti & Sauré (2015). Studies concerned with spillovers between sovereign and financial CDS include those by Bruyckere et al. (2013) and Alter & Beyers (2014).

5.2. Corporate and Sovereign Credit Risk

International CDS data have also been used to study spillover effects from sovereign onto corporate credit risk. A government's distress may be felt by its nonfinancial corporations, as any financial pain at the level of the sovereign may be passed on through a hike in corporate tax rates, reduced investments in public infrastructure, or lower subsidies, which could harm long-term growth. Augustin et al. (2015a) exploit the first Greek bailout on April 11, 2010, which was a shock to the sovereign credit risk of all European countries, to document a sovereign-to-corporate risk transfer. Public ownership, financial dependence, and the sovereign ceiling are channels that appear to increase the interdependence between sovereign and corporate credit risk. Bai & Wei (2012) investigate the risk transfer from the sovereign to the corporate sector, using a sample of international CDS data from 30 countries. They document a significant influence of sovereign CDS on corporate CDS that is increasing with a deterioration in a country's property rights.

Lee, Naranjo & Sirmans (2016) explore how firms in Europe are affected by the sovereign ceiling for credit ratings and how they can "delink" from their corresponding sovereign risk. The authors propose both an institutional and an informational channel that insulate companies from sovereign risk transfers. In a sample of 2,364 firms from 54 countries between 2004 and 2011, the study finds that firms are less constrained by the sovereign ceiling the greater their asset exposure is to countries with better property rights (institutional channel), and the stricter are the disclosure requirements of the stock exchanges on which they have listed their stocks (informational channel).

5.3. Future Directions

The use of international CDS data is in its infancy, which allows for the future growth of the literature in multiple directions. For now, studies of international CDS have primarily focused on the sovereign context. Although most focus on the level of spreads, using the information embedded in the term structure may prove useful for advancing our understanding of sovereign credit risk from an asset pricing perspective. Getting a precise picture of sovereign risk and rewards will certainly be challenging, but it will be of the utmost importance, given that new regulations such as the naked sovereign CDS ban in Europe have been implemented to prevent negative externalities arising from trading in sovereign CDS contracts. Having said that, we stress that almost all studies on sovereign CDS to date focus exclusively on prices, whereas studying quantities based on trading volumes will be necessary to sharpen our current understanding. Another related agenda, which we feel is currently under-researched, is that of quanto CDS, which places itself at the intersection of two literatures, that of international finance/sovereign risk and that of currency risk premia.

Finally, the use of CDS data as a research tool in international corporate finance is likely the most unexplored area. Thus, combining high-frequency CDS data with equity data in

international settings around corporate events such as, for example, mergers and acquisitions, earnings announcements, or cross-listings will help us to answer open questions with respect to capital structure effects and international integration. Along these dimensions, Augustin et al. (2015b) exploit international cross-listings as an exogenous source of variation in capital structure dynamics to show how an increase in information can improve capital structure integration.

6. CONCLUSION

There is significant uncertainty about the CDS market, with a major player, Deutsche Bank, having decided to leave the market, and with some observers even claiming that “the CDS market is dead” (Burne & Henning 2015). However, others in the industry think the market is here to stay. For example, Bob Pickel, former chief executive of ISDA, believes that the departure of big investment banks from the CDS market may simply open up opportunities for other players. Indeed, the best-performing hedge fund of 2014, Napier Park Global Capital, made its money by buying CDS, even as banks were reducing their positions (Risk 2015). Even though the single-name CDS market has retreated somewhat since the financial crisis, partially because of trade compressions and netting of positions, the market was still worth an impressive \$20 trillion at the end of 2014. In our view, the market has proven resilient, despite the reputational losses suffered because of the global credit and sovereign debt crises. The continuous standardization and regulatory push toward central clearing will likely accelerate the activity in the years to come. (For anecdotal evidence that confirms this view, see Rennison 2015.) CDS can certainly be misused, but they also provide valuable risk-sharing services. Throwing out the baby with the bathwater before having drawn a complete picture of the costs and benefits of trading CDS may be ill-advised.

In this review, we have laid out several research areas that we believe need further and better understanding, and that, consequently, offer fruitful research avenues for the future. Numerous researchers have contributed tremendously to the exponential growth in this literature over the past years. We hope that this momentum continues. CDS are interesting and exciting products, and they have implications that touch upon several policy questions. We hope that academics will continue to push the boundaries of knowledge in this field in the years to come.

SUMMARY POINTS

1. Although research on CDS has grown tremendously, there remain gaps that offer fruitful directions for future research.
2. CDS contracts have real effects on agency conflicts of financial intermediaries and other economic agents. CDS also have externalities for the prices, liquidity, and efficiency of related markets, including bond, equity, and loan covenants. More research on the overall welfare implications of CDS is needed.
3. The postcrisis CDS market is undergoing structural changes, with a substantial regulatory overhaul, which itself may have a direct impact on the CDS market. The most relevant regulatory changes for CDS include the Volcker Rule, the central clearing of CDS indices, the swap push out rule under the Dodd–Frank Act, and the new bank capital and liquidity regulations under Basel III.

4. The existence of CDS has legal implications for agency conflicts, and the legal uncertainties embedded in CDS contracts may affect economic decision-making and asset prices. Future research in law and finance may provide additional guidance to minimize the costs of negative CDS externalities arising from legal uncertainties.
5. International CDS data have been used primarily to study the determinants of sovereign credit risk, the linkage between sovereign and financial-sector risk, and contagion from sovereign to nonfinancial corporations. A broader use of CDS data in international finance settings seems significantly lacking.

DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review. M.G.S. sits on the boards of several financial institutions that may have positions in CDS contracts.

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