The Product Market Effects of Derivatives Trading: Evidence from Credit Default Swaps*

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Abstract

Creditors are less stringent on borrowers' activities when they can buy credit protection from the market and when they can learn more about their borrowers' conditions from market prices. We find that, upon the inception of credit default swaps (CDS), the reference firms experience faster sales growth than their non-CDS industry rivals, resulting in larger market share for CDS referenced firms. This CDS effect on industry structure is more pronounced for less transparent sectors and for financially more constrained sectors. CDS firms gain market share by cutting prices and by increasing investment after CDS trading on their debt. Our findings are consistent with CDS attenuating the agency costs of debt on product market policies and suggest that credit derivatives trading affects product market competition.

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Abstract

Creditors are less stringent on borrowers' activities when they can buy credit protection from the market and when they can learn more about their borrowers' conditions from market prices. We find that, upon the inception of credit default swaps (CDS), the reference firms experience faster sales growth than their non-CDS industry rivals, resulting in larger market share for CDS referenced firms. This CDS effect on industry structure is more pronounced for less transparent sectors and for financially more constrained sectors. CDS firms gain market share by cutting prices and by increasing investment after CDS trading on their debt. Our findings are consistent with CDS attenuating the agency costs of debt on product market policies and suggest that credit derivatives trading affects product market competition.

1. Introduction

Can derivatives market for the trading of contingent claims affect the structure of the product market? This is an important question for consumers, producers, and policy-makers alike given the size of the multi-trillion-dollar derivatives market and the increasing interactions between financial markets and the real economy. In this paper, we examine the real effect of credit derivatives on product market competition in the context of credit default swaps (CDS). We provide the first evidence of how trading of financial derivatives impacts product market structure.

In a conventional setting, market shares and predation between industry competitors are shaped by the commitment of their creditors to provide long-term financing. Due to borrowers' limited ability to commit to repay debt, creditors will not provide "deep pockets" for borrowers to drive out their competitors right away. Instead, creditors prefer staged financing and provide new capital only when initial results are sufficiently good (Bolton and Scharfstein (1990)). The rise of the credit default swaps (CDS) market can attenuate such agency problems, as shown by Bolton and Oehmke (2011), and in turn may affect the borrowing firms' product market strategies. CDS enable lenders to separate their control rights from cash flow rights. Such a separation strengthens lenders' position in ex post debt renegotiations and helps to solve the limited-commitment problem for borrowers. The theories of Bolton and Scharfstein (1990) and Bolton and Oehmke (2011) thus predict that CDS firms will become more aggressive in the product market, especially when their non-CDS rivals are still stuck with agency problems in the credit market.

However, CDS have effects other than strengthening lenders' commitment of credit supply.[1] When creditors are hedged with CDS, they will have less interest in helping out financially distressed borrowers. Indeed, Subrahmanyam, Tang, and Wang (2014) find that firms are more likely to be downgraded and file for bankruptcy after the inception of CDS trading on their debt. If borrowing firms are concerned of such excessively tough creditors, they may want to be more conservative and to avoid getting into financial distress. Under such a scenario, CDS firms may become less aggressive in product market competition. Ultimately, the relationship between CDS trading and reference firms' product market competitiveness is best resolved empirically.

We construct a large sample of CDS inceptions from 1997 to 2008 for U.S. industrial firms and analyze the impact of CDS trading on product market competition. Clean inference is challenging because CDS trading is likely correlated with unobserved firm and/or industry conditions that endogenously affect product market performance. To tackle this endogeneity, we first exploit the scenario that a borrower is more likely to have CDS if this firm's major lenders prefer borrowers with CDS in general. We construct an instrumental variable (IV) for a firm's likelihood of having CDS using its major lenders' loan exposure to CDS firms in unrelated industries. There is no direct reason why lenders' preference for CDS borrowers, after excluding borrowers in the broadly-defined industry of the firm in focus, would be related to the characteristics of this one particular firm and its industry.

Using IV regression, we find a positive and significant relationship between CDS trading and product market performance. CDS firms' market share growth (sales growth) is 12.4% (15.3%) higher than non-CDS firms' on average. This magnitude is approximately equal to an

[1] Augustin, Subrahmanyam, Tang and Wang (2014, 2016) provide overview of the CDS market and extant literature. We review the related studies in the next section.

increase of sales growth or market share growth from its 50th to 75th percentile. Our results hold in either four-digit SIC code industries or Hoberg and Phillips's (2016) text-based network industries. [2]

To further validate the causal effect, we exploit large import tariff cuts as exogenous shocks to product market competition and focus on firms whose CDS were initiated more than three years before the tariff cuts. In this setting, even if unobserved industry conditions have promoted CDS introduction to some firms, this endogeneity should be largely absent when the competition shock hits years later. One remaining concern is that such endogenous industry conditions are persistent. This is very unlikely. If anything, CDS inception should be correlated with unfavorable industry conditions, but it is hard to imagine the government imposing large import tariff cuts on industries that have been struggling for years. Thus, we have a clean setting for a causal identification. Again, we find CDS firms significantly outperform their non-CDS rivals after tariff cuts.

Finally, we use the synthetic control method (see, e.g., Abadie et al. (2015)) and Acemoglu et al. (2016))) to compare a CDS firm's sales growth with that of a synthetic non-CDS rival. The synthetic control firm is essentially a portfolio of non-CDS rivals whose optimally weighted sales growth and related characteristics mimic the CDS firm's before CDS inception. This approach circumvents the difficulty to find a single non-CDS rival that approximates the most relevant characteristics of a CDS firm. The semi-nonparametric comparison also precludes the type of model-dependent extrapolation that regression results are often based on (Abadie et al. (2010)). While the sales growth of CDS firms and their synthetic non-CDS controls are very similar before CDS begin trading, suggesting good quality of this matching method, we find that

[2] We also examine non-CDS firms' performance after rivals' CDS inception using a similar 2SLS framework. We find that non-CDS firms sales growth significantly decreases in a three-year window after CDS begin trading on some of their rivals.

CDS firms' sales growth are significantly greater than their synthetic controls after CDS trading.[3]

Overall, using various methods, we find robust evidence of a positive, causal effect of CDS trading on firms' product market performance. We then aim to understand the mechanisms for this effect. If the competitiveness of CDS firms is driven by CDS alleviating borrowers' limited commitment problem, we expect the results to be more pronounced among firms with severer commitment issues. Indeed, we find firms with high analyst dispersion, large R&D expenses, and unconventional technologies enjoy greater sales growth after CDS trading, consistent with CDS alleviating commitment problems associated with information asymmetry. The effect is also stronger for firms with low payouts and low credit ratings and during industry downturns, consistent with CDS alleviating commitment problems associated with adverse selection.[4]

We further show that CDS firms are better able to renew large amounts of long-term debt coming due than their non-CDS counterparts. Given the critical role of debt renewal in putting borrowers' agency problems in check, this result provides direct evidence of CDS mitigating borrowers' limited-commitment problem.[5] This financial contracting flexibility can be an important booster of firms' competitiveness. Indeed, consistent with CDS alleviating concerns of borrowers' near-term profitability, we find that after CDS start trading, firms implement deeper cuts of their markup than non-CDS rivals to gain market share.

[3] We find robust results using a traditional propensity-score matched sample of CDS and non-CDS firms as well.
[4] The counteracting force, namely, CDS firms acting conservatively to avoid forced bankruptcy, although being dominated in the full sample, seems to be at work as well. Specifically, we find the outperformance of CDS firms is largely muted if the firm is highly indebted, has inadequate cash, or has low operating cash flow. For these firms, CDS-induced "empty creditor" problem likely overshadows the alleviation of the limited-commitment problem.
[5] This result complements the finding in Saretto and Tookes (2013) of CDS firms' greater leverage and debt maturity.

CDS's aiding effect on firms' predation strategies should be more pronounced in industries prone to predation. Consistent with prior findings that predation is more likely to occur in more oligopolistic industries or less competitive segments of an industry (Kovenock and Phillips (1997) and Zingales (1998)), we find larger market share gains of CDS firms in more concentrated industries (with higher Herfindahl index) and more disaggregated industries (with more five-digit SIC codes). These results are consistent with CDS firms' predation strategy – cutting markup to boost sales, which would be impractical in highly competitive industries with thin margins. In addition to cutting markup, CDS firms also actively expand real activities such as capital investment and R&D. Meanwhile, non-CDS rivals' sales growth significantly drops in face of CDS firms' increased aggressiveness in price competition, capital investment, and R&D.

We provide the first evidence on how derivatives trading affect product market structure and add to the growing literature on the feedback effects of capital markets on corporate strategies.[6] The literature so far has mostly focused on the impact on product market performance of actions taken by the firms themselves, such as their leverage (Campello (2003)), hedging decisions (Zhu (2011)), or cash holdings (Fresard (2010)). We provide new insights from the perspective of the financial market, confirming the role of CDS as a market-based solution to agency problems that interfere with product market competition. Our paper is also related to Billet, Garfinkel, and Yu (2016), who show that information quality affects industry structure. To the extent that CDS trading improves reference firm's information environment (Kim et al. (2015) and Batta, Qiu, and Yu (2016)), our findings are consistent with those in Billet, Garfinkel, and Yu (2016).

[6] For example, Chen, Goldstein, and Jiang (2007) show that when firms' stock prices are high, these firms as well as their peers take their cue from the price information and form corporate investment strategies accordingly.

A recent paper by Grullon, Larkin, and Michaely (2015) shows that industry concentration in the U.S. has been steadily increasing over the last two decades, with big public firms gaining market share at the expense of small firms. Perhaps not coincidentally, we observe that the CDS market has been one of the fastest growing derivatives markets in the past two decades. Our finding that CDS firms are more competitive in the product market suggests a potential link between these trends. An important implication is that if financial instruments are more likely to be traded on large firms (as they mostly are, for various reasons), this increasing industry concentration could persist and may have deep consequences on market competitiveness.

Our paper also contributes to the literature on the interaction of CDS and corporate finance policies. Saretto and Tookes (2013) provide the first evidence of CDS's ability to increase corporate debt capacity. Subrahmanyam, Tang, Wang (2014) testify the dark side of CDS by documenting firms' increased likelihood of bankruptcy after CDS trading. Li and Tang (2016) show that CDS trading has propagating effects along the supply chain. We advance this line of research to study how CDS's relaxing effect on financial contracting interacts with product market competition. In this regard, our paper bridges the traditional literature on financial contracting and product competition with the newly rising literature on CDS and financial structure.

The rest of the paper is organized as follows. We first discuss the background and related literature in Section 2. We describe the data and summary statistics in Section 3. Our baseline results and endogeneity discussions are presented in Section 4. We discuss the channels and mechanisms for our main findings in Section 5. Section 6 concludes.

2. Background and related literature

This paper builds on the literature on the interaction between the financial market and product market. One strand of thinking focuses on the role of debt as a contingent claim in shaping firms' product market strategies. On one hand, higher leverage stimulates equity-holders' risk taking incentives and aggressive product market behavior (Brander and Lewis (1986), Maksimovic (1986), and Maksimovic and Zechner (1991)). On the other hand, cash flow committed to servicing debt makes high-leverage firms vulnerable to rivals' predatory actions (Telser (1963) and Brander and Lewis (1988)). This interesting interaction also spurs a large body of empirical work, with most evidence in support of the dampening effect of high leverage on firms' competitiveness through the financial distress channel (e.g., Opler and Titman (1994), Chevalier (1995), Phillips (1995), Zingales (1998), Khanna and Tice (2000, 2005), and Campello (2003)).

Another strand of thinking emphasizes the agency problem in the financial market and its interaction with product market competition. Bolton and Scharfstein (1990) study the optimal financial contract in face of a trade-off between financial constraints designed to curb agency problems of the borrower and the borrower's competitiveness in the product market. Reducing the sensitivity of the lender's refinancing decision to the borrower's near-term profit strengthens the borrower's competitiveness but exacerbates the borrower's incentive problems. Depending on the relative importance of the agency problem, the optimal contract may or may not make the borrower a strong competitor in the product market.

Regarding financial solutions that promote product market competitiveness, researchers have mostly focused on corporate policies that mitigate financial distress. For example, Campello (2006) shows that moderate debt taking is associated with product market outperformance relative to industry rivals. Fresard (2010) finds that when competition intensifies,

large cash reserves lead to market share gains at the expense of industry rivals. Zhu (2011) shows that during unfavorable industry shocks, ex ante unconstrained and hedged firms gain market share from constrained and unhedged firms. Haushalter, Klasa, and Maxwell (2007) find that hedging and cash holding provide strategic benefits in face of predation risk.

In contrast, direct financial solutions to the agency problem that hinders the borrower's product market competitiveness is in large part unexplored. In this paper, we argue that the recent development of credit derivatives, especially CDS, can improve underlying firms' competitiveness in the product market because CDS provide a market-based solution to the agency problem between the creditor and the borrower. As Bolton and Oehmke (2011) note, CDS enable lenders to separate their control rights from cash flow rights. Such a separation, by strengthening lenders' position in ex post debt renegotiations, helps to curb borrowers' incentive problems. As stringent financial reign becomes unnecessary, lenders with CDS protection can better accommodate borrowers' need for competitiveness.[7] Indeed, Chakraborty, Chava, and Ganduri (2015) and Shan, Tang, and Winton (2016) provide empirical evidence that CDS enhance the flexibility of debt contracting. Thus, under the theories of Bolton and Scharfstein (1990) and Bolton and Oehmke (2011), we expect CDS firms to be stronger competitors in the product market, especially when rivals without CDS are still stuck with the limited commitment problem.

CDS can also improve product market performance by improving the underlying firms' information environment. Kim et al. (2015) show that CDS trading pressures managers into enhancing their voluntary disclosures. Batta, Qiu, and Yu (2016) find that CDS trading improves information production and price discovery. As Billet, Garfinkel, and Yu (2016) show, better

[7] Gunduz et al. (2016) use firm and loan data to show that banks use CDS to hedge their credit exposures on the borrowers and increase credit supply accordingly.

information quality can also alleviate the lender's agency concerns of the borrower and help the borrower outperform in the product market.

However, if lenders are hedged from default risk with CDS, they may have little incentive to help borrowers out of temporary financial distress, e.g., through debt renegotiation or continued financing. In fact, if lenders over-insure their cash flow rights with CDS, they may have a pervert incentive to terminate funding to borrowers even if refinancing is a more efficient solution (Bolton and Oehmke (2011) and Subrahmanyam, Tang, and Wang (2014)). Such an "empty creditor" problem may induce borrowers, especially those close to distress, to act more conservatively in the product market, while their non-CDS rivals may have an incentive to strategically press them into distress. Thus, the effect of CDS on firms' competitiveness in the product market is ultimately an empirical question.

3. Data and summary statistics

We compile a data set of CDS trading sourced from two major CDS interdealer brokers: CreditTrade and GFI. The data are based on actual transaction information such as committed quotes and trades rather than non-tradable quotes. We identify the starting date of each firm's CDS trading from these records.[8] Similar data are used by Subrahmanyam, Tang, and Wang (2014), among others. CreditTrade data cover the period from June 1997 to March 2006, and GFI data cover the period from January 2002 to April 2009. The overlapping period helps assure the data quality from each source.[9] We focus on North American, single-name corporate CDS (i.e., CDS referencing a corporation as opposed to a sovereign entity). We regard the underlying

[8] CreditTrade merged with Creditex in 2007, and Creditex is now part of ICE (Intercontinental Exchange). CreditTrade was the biggest data source for CDS transactions during the earlier period of the CDS market. GFI Group is a major wholesale market brokerage in the derivatives markets, and it has also become a leading CDS data provider in recent years.

[9] We also validate the overall data quality by comparing Markit CDS quote data with ours.

firm as a CDS-referenced firm since the first transaction date. Because our data begin in 1997, which is regarded by many market observers as the inception of the CDS market, there is minimal concern about the possible censoring of a firm's CDS trading status.[10]

Our base sample comes from WRDS's Compustat-CRSP merged database, with financial information and stock return data between 1997 and 2008. We only include firms that are incorporated in the U.S and are not in the financial or utility industries. We then merge this sample with the above CDS firm sample to identify firms with CDS trading and the year when the trading starts. Our key independent variable, *CDS trading*, is a dummy variable that equals 1 if the firm has CDS trading in the year concerned. In our main analysis, we identify product market rivals using four-digit SIC code. We supplement this conventional classification with Hoberg and Phillip's (2016) text-based network industry classification. We use two measures of product market performance. The first is *Sales growth*, i.e., the annual sales growth of a firm. The second is *Market share growth*, computed as sales growth relative to the median of the firm's industry.

We follow the literature and construct the following determinants of product market performance. *Market-to-book* is the ratio of market assets to book assets. *LnAssets* is the natural log of total assets. *Leverage* is the sum of long-term debt and debt in current liabilities divided by total assets. *Cash* is the firm's cash and short-term investments divided by total assets. *Stock return* is the firm's cumulative stock return minus its industry's average cumulative stock return in the last 12 months. *HHI* (the Herfindahl-Hirschman Index) is the sum of squared product market share in terms of sales of Compustat firms in the firm's industry.

[10] Nevertheless, it is possible that some less actively traded CDS contracts are not captured by our data set. Therefore, our estimated effect represents a lower bound of the actual effect because such a misclassification will bias the estimate toward zero.

As discussed in the introduction, to identify the causal effect of CDS trading on product market performance, we use a firm's major lenders' loan exposure to CDS borrowers in unrelated industries as an IV. Specifically, *Lender CDS preference* is the average, across the firm's major lenders over the past 3 years, of each lender's fraction of loan amount to "unrelated CDS borrowers" over the lender's total loan amount. Unrelated CDS borrowers are defined as borrowers with CDS trading that are in different *three-digit* SIC industries than the firm concerned (note that the firm's own industry is defined by *four-digit* SIC code). A firm's major lender is defined as a lender whose outstanding loan amount to the firm is above the median of all borrowers of the lender. We obtain loan and lender-borrower relationship data from DealScan and merge this data to Compustat firms using the link file constructed by Chava and Roberts (2008).

Table 1 reports the summary statistics of the above variables. While raw sales growth has positive mean (0.19) and median (0.09), market share growth has negative mean (-0.14) and median (-0.08). This contrast suggests that although firms have been growing in general, industry revenues have been tilting toward large firms.[11] We also note that 8.4% of the sample firm-years have CDS trading.

4. Main results

A firm's CDS trading and its product market performance are likely to be jointly determined. For example, some risky product market strategies may lead to good performance while inducing creditors' desire to hedge with CDS. Ignoring such endogeneity could lead to

[11] To see this point, assume for simplicity a constant aggregate revenue in an industry. A sales growth of, say, 10%, at a large firm has to come at the expense of a 10% sales drop at a number of small firms, simply due to the gap between their revenue bases. As small firms account for a larger portion of the sample, a negative average (and median) market share growth suggests that small firms has been losing market share to their large competitors over the sample period.

biased results. Therefore, in our main analysis, we carefully address potential endogeneity using four different methods.

4.1. Instrument variable regression

It is plausible that a borrower is more likely to have CDS if the firm's major lenders prefer borrowers with CDS in general. Based on this argument, we instrument a firm's CDS status with its major lenders' loan exposure to CDS firms in other three-digit SIC industries that are different from the firm's. Because we consider product market rivalry within a four-digit SIC industry, lenders' preference for CDS-referenced borrowers in a different and broader three-digit SIC industry should have no direct relationship with the characteristics of the firm or its four-digit SIC industry being examined. Therefore, the IV are likely to satisfy the exclusion assumption too. We note from the first stage regression (see Table A1 in the Appendix) that this IV indeed has a statistically significant and positive relationship with firms' CDS status. The first-stage F test (306.96) also rejects the IV being weak.

Table 2 reports the results from 2SLS regressions using the above IV while controlling for various determinants of product market performance and firm and year fixed effects. We find that CDS trading is positively and significantly associated with firm's product market performance. CDS firms' market share growth (sales growth) is 12.4% (15.3%) higher than non-CDS firms' on average. This magnitude is approximately equal to an increase of sales growth or market share growth from its 50^{th} to 75^{th} percentile. We obtain similar results when using Hoberg and Phillips's (2016) text-based network industries to define product market rivals (see Table A2 in the Appendix).

4.2. Non-CDS firm sample

We now focus on the sample of non-CDS firms and examine whether non-CDS firms' sales growth slows down after some of their rivals start to have CDS trading. Focusing only on non-CDS firms in each industry has the advantage that it is unlikely that a *particular* rival's unobserved characteristics that determine its CDS inception would affect non-CDS firms' product market performance in general. Although unobserved industry characteristics may still affect non-CDS firms' performance and certain rivals' CDS inception simultaneously, we instrument rivals' likelihood of having CDS with the four-digit SIC industry's major lenders' loan exposure to CDS borrowers in industries with different three-digit SIC. This IV follows a similar intuition as in section 4.1. If major lenders to an industry prefer CDS borrowers in general, then it is more likely that firms in this industry that borrow from these lenders also have CDS trading. However, it is unlikely that the preference of major lenders for CDS borrowers in unrelated industries is directly related to the characteristics of the non-CDS firm's industry being examined, thus satisfying the exclusion assumption.

Table 3 reports results from 2SLS regressions.[12] The key independent variable, *Rival CDS trading*, is a dummy variable that equals 1 if the firm has one or more rivals that started to have CDS trading in the last three years, and it is instrumented by *Industry lender CDS preference*, the IV we described above. We find that non-CDS firms' sales growth significantly decreases in a three-year window after CDS begin trading on their rivals. The magnitude of the decrease (16% on average) is comparable to the positive effect on CDS firms we documented in the full sample. Non-CDS firms' sales loss upon their rivals' CDS inception is consistent with CDS firms' predation in the product market.

[12] Since we only include non-CDS firms in each industry in the regression sample, we consider their raw sales growth without adjusting for the industry median. The results are virtually the same if we use their market share growth as the dependent variable.

4.3. Import tariff cuts

To further alleviate potential endogeneity concerns, we exploit a setting where industries experience exogenous competition shocks while CDS introduction is orthogonal to these shocks. Specifically, we use import tariff cuts as exogenous shocks to domestic product markets. The large literature on barriers to trade has long argued that lower trade barriers trigger intensified competition pressure from foreign rivals (see, e.g., Tybout (2003) and Bernard, Jensen, and Schott (2006)). Recently, finance researchers have used import tariff reductions as exogenous shocks to study the relationship between competition and corporate financial policies such as cash, cost of debt, and capital structure (see. e.g., Fresard (2010), Valta (2012), and Xu (2012)).

To measure reductions in import tariffs at the (four-digit SIC) industry level, we gather U.S. manufacturing import data during the period 1995-2005 from Peter Schott's website (Schott (2008); the data is also an update of those compiled by Feenstra (1996) and Feenstra, Romalis, and Schott (2002)). The match of these import data with our sample results in 2,035 distinct firms in 328 four-digit SIC industries. For each industry-year, we compute the ad valorem tariff rate as the duties collected by U.S. Customs divided by the Free-on-Board value of imports. Following the literature (e.g., Valta (2012)), we identify an import tariff cut if an industry-year change in tariff rate is negative and three times larger than its median value. We then construct a dummy variable, *Tariff cut*, which equals 1 if the firm's industry has experienced an import tariff cut over the last two years. To make sure that the tariff cuts truly reflect non-transitory changes in the competition environment, we exclude tariff cuts that are preceded or followed by equivalently large increases in tariff rates.

Importantly, to make sure that CDS trading is orthogonal to these competition shocks, we exclude from the baseline sample (Table 2) firms whose CDS inception occurred within three years before import tariff cuts of their industries. That is, the sample CDS firms in this setting all had CDS inception more than three years before import tariff cuts of their industries. If unobserved industry conditions have prompted CDS trading on these firms, these conditions are unlikely to affect CDS firms' performance relative to non-CDS rivals years later following the tariff cuts. Thus, unless CDS inception is associated with some unobserved industry conditions that persist over time, endogeneity should not be a significant concern in this setting. In fact, this remaining chance of endogeneity is very slim because, if anything, CDS inception should be correlated with unfavorable industry conditions, but it is hard to imagine the government imposing tariff cuts on industries that have been struggling for years.

We run similar regressions to Table 2 while further controlling for *Tariff cut* and its interaction with *CDS trading*.[13] Because we now use exogenous competition shocks more than three years after CDS introduction for identification, we no longer instrument for *CDS trading*.[14] As shown in Table 4, *CDS trading* × *Tariff cut* has a significantly positive impact on firms' market share growth and sales growth, and the impact is economically meaningful. The point estimates indicate that, following import tariff cuts, the market share growth (sales growth) of firms with CDS trading are 5.30% (5.75%) better than their industry peers without CDS. We interpret this evidence as the causal effect of CDS trading on product market competitiveness.

4.4. Synthetic control method

[13] It turns out that the sample CDS firms all have CDS trading throughout their respective sample periods. Therefore, the individual term *CDS trading* drops out due to collinearity with the firm fixed effects.
[14] Using 2SLS gives qualitatively similar results.

As a final attempt to tackle potential endogeneity, we use the synthetic control method (see, e.g., Abadie et al. (2015)) and Acemoglu et al. (2016))) to compare a CDS firm's sales growth with that of a synthetic non-CDS rival. The synthetic control firm is essentially a portfolio of non-CDS rivals whose optimally weighted sales growth and related characteristics mimic the CDS firm's before CDS inception. This intuitive approach circumvents the difficulty to find a single non-CDS rival that approximates the most relevant characteristics of a CDS firm. It also precludes the type of model-dependent extrapolation that regression results are often based on (Abadie et al. (2010)).

Specifically, for each given CDS firm, we construct a synthetic non-CDS firm as a matched control using a "donor pool" of non-CDS firms that are in the same four-digit SIC industry as the CDS firm.[15] The synthetic control is a portfolio of non-CDS firms in the donor pool whose portfolio weights are determined to minimize the distance between the outcome variable (*Sales growth*) and covariates (*Market-to-book*, *LnAssets*, *Leverage*, and *Cash*) of the synthetic non-CDS firm and of the CDS firm during a 6-year window before CDS inception.[16] We then compute and plot in Figure 1 the average sales growth of the CDS firms (the solid line), that of their synthetic control firms (the dashed line), and the difference between the two (the dash-dot line) from t-6 to t+3, where t is the year of CDS inception. Note that the sales growth of CDS firms and of their synthetic controls are very similar before CDS begin trading, suggesting good quality of the synthetic control. However, and more importantly, CDS firms' sales growth are markedly greater than their synthetic controls after CDS trading, with the difference ranging from 3% to 5%. The emergence of a sales growth gap after CDS inception suggests that CDS trading has a positive impact on product market competitiveness.

[15] Firms in the donor pool are required to be non-CDS firms or are not referenced by CDS in the next four years.
[16] See Abadie et al. (2010) for more technical details.

We also conduct a simulation-based test of the difference in product market performance between the CDS firms and their synthetic controls. We simulate the distribution of the average treatment effect using placebo treatment groups following Acemoglu et al. (2016). Specifically, for each CDS firm, we randomly pick one firm from its donor pool (non-CDS rivals) as a placebo. Then for each placebo, we follow the procedure above to construct a synthetic non-CDS control. We compute the average treatment effect (ATE) using all the placebos together with their synthetic controls. We repeat the above procedure for 1000 times to simulate the distribution of ATE of placebo CDS treatment. As shown in Figure 2, the ATE of actual CDS treatment (the vertical bar on the far right) is far beyond the entire ATE distribution of placebos. Therefore, the observed effect on product market performance is indeed associated with CDS trading and cannot be driven by some unobserved factors that also exist in non-CDS firms.

For any remaining endogenous factors to drive our results would require that these factors be nonexistent or well hidden in a six-year window before CDS inception so that they cause no noticeable differences in important characteristics between the treated and control firms during this long period, and then they suddenly materialize to drive market share gains right away while inducing CDS trading on the same set of firms. Moreover, for these factors to deliver spurious results through our IV regression, they also have to be related to lenders' preference for CDS borrowers in largely unrelated industries. It would be a long shot to think of plausible economic factors with all these properties.[17]

5. Mechanisms

[17] In the Appendix, We conduct a traditional propensity-score matching between CDS firms and non-CDS rivals and find qualitatively similar results.

With robust evidence that CDS trading has a positive effect on reference firms' product market performance, we now explore the underlying mechanisms. We start with detailed examination of how key components in the theories of Bolton and Scharfstein (1990) and Bolton and Oehmke (2011) mediate the positive CDS effect on product market competitiveness. We then examine CDS firms' competition strategies to understand how they manage to gain market share from rivals.

5.1 Limited commitment

As we explained above, CDS trading promotes product market competitiveness because CDS alleviate lenders' concerns of borrowers' ability to repay debt. Such concerns should be especially strong for firms that cannot credibly commit their profit to the lender, e.g., firms with great information asymmetry and/or firms with financial characteristics conducive to adverse selection. We thus interact *CDS trading* with a variety of indicators of information asymmetry and vulnerability to adverse selection.

Specially, *High analyst dispersion* is a dummy variable that equals 1 if a firm's analyst dispersion is above the annual sample median, where analyst dispersion is the standard deviation of analyst forecasts scaled by the absolute value of the mean. Dispersed analyst opinions regarding a firm is often associated with severe information asymmetry of the firm. *High R&D* is a dummy variable that equals 1 if a firm's R&D expense as a fraction of sales is above the annual sample median. Intensive R&D is often associated with uncertain technology development and opaque prospects of the firm. *Fringe technology* is a dummy variable that equals 1 if the absolute value of the deviation of a firm's capital-labor ratio from its industry-year median, scaled by the industry-year range of this absolute deviation, is above the annual sample

median, where capital-labor ratio is defined as net property, plant, and equipment divided by the number of employees. This variable is used by MacKay and Phillips (2005) to capture whether a firm's production technology is very different from the core technology of the industry. Firms using fringe technologies often have more uncertainty and are more difficult to understand.

Low rating or unrated is a dummy variable that equals 1 if a firm has a S&P credit rating below BBB- or does not have a rating. *Low payout* is a dummy variable that equals 1 if a firm's dividends plus stock repurchase divided by profit is below the annual sample median. *Industry distress* is a dummy variable that equals 1 if a firm's industry's median sales growth is negative. Firms with no or low credit ratings, firms with low cash payouts, and firms struck by industry downturns are often more vulnerable to adverse selection in external financing.

We run IV regressions with *CDS trading* instrumented by *Lender CDS preference* and *CDS trading* × *X* instrumented by *Lender CDS preference* × *X*, where *X* is the indicator variables discussed above. If CDS's ability to alleviate the limited commitment problem is driving our results, we expect the interaction terms to be positive and significant. This is indeed what we find. As shown in Table 5, the positive effect of CDS trading on product market performance is stronger for firms with high analyst dispersion (Panel A), large R&D expenses (Panel B), and unconventional technologies (Panel C), consistent with CDS alleviating commitment problems associated with information asymmetry. Firms with low credit ratings (Panel D) and low payouts (Panel E) also enjoy greater sales growth after CDS trading. We also find a stronger performance boost by CDS trading when the firm's industry is in distress (Panel F). These results are consistent with CDS alleviating commitment problems associated with adverse selection.

Although we find that the effect of CDS trading on firms' product market competitiveness is positive in general, it is useful to see whether the dark side of CDS, albeit

being dominated, works in certain pockets of the data. As we discussed above, lenders with CDS protection may have little interest in debt renegotiations and continued financing when CDS-referenced borrowers get into temporary financial troubles, and they may prefer liquidation even if refinancing is a more efficient solution for overall welfare. Under this scenario, CDS firms, especially those close to financial distress, may have an incentive to act conservatively in the product market to avoid inefficient bankruptcy.

We thus interact *CDS trading* with indicators of a firm's financial strength and run IV regressions similar to those in Table 4. We find the outperformance of CDS firms is largely concentrated among firms with sound financial conditions. The CDS effect on product market performance is muted or even reversed to negative if the firm is highly indebted, has inadequate cash, or has low operating cash flow (Table A4 in the Appendix reports the results). For these firms, CDS-induced "empty creditor" problem likely overshadows the alleviation of the limited-commitment problem, and therefore creates a drag on firms' product market competitiveness.

5.2 Debt refinancing

The lender's decision to refinance when large amounts of debt are due is critical for the borrower to implement competitive strategies in the product market, and is the very reason that the lender's discretion at this moment is an important tool to discipline the borrower's commitment problem. We therefore examine how CDS trading affects debt renewal to better understand the mechanism for CDS to promote product market competitiveness.

Table 6 reports the results. The dependent variable, *LT debt renewal*, is equal to the firm's long-term debt issue minus long-term debt due scaled by lagged total assets. Again, given potential endogeneity, we run IV regressions with the key independent variable, *CDS trading*,

instrumented by *Lender CDS preference*. We also control for a host of firm characteristics and firm and year fixed effects. Because agency concerns become serious when the debt amount up for refinancing is sufficiently large, we focus on firm-years where the long-term debt due as a proportion of total assets is above the annual median or 67th percentile of our Compustat sample. We find that CDS trading has a positive and significant impact on the amount of debt refinancing that a firm can get when it has large amounts of long-term debt due. When long-term debt due is above the annual median, CDS firms' debt refinancing is 9.5 percentage points more than non-CDS firms', which is approximately equal to an increase in *LT debt renewal* from its 25th to 75th percentile. When long-term debt due is above the annual 67th percentile, the CDS effect is even larger. These results indicate that CDS trading improves underlying firms' financing flexibility, especially at the critical moments when large amounts of debt need to be refinanced. Consistent with Bolton and Scharfstein (1990), it is this relaxing effect on debt contracting that helps the firm to stay competitive in the product market.

5.3. Competition strategies

We further examine CDS firms' competition strategies to see how they manage to gain market shares from rivals. We conduct our analysis from several angles to develop a robust understanding of CDS's impact on competition strategies.

5.3.1. Price competition

Because of CDS's ability to separate the lender's cash flow rights from the actual cash flow of the borrower, lenders with CDS protection care less about borrowers' near-term profitability. As a result, CDS firms can implement more aggressive pricing strategies aimed at long-term market share gains while concerning less about short-term losses in profit. We test this

conjecture by regressing firms' *Markup*, defined as sales divided by cost of goods sold, on *CDS trading*. As before, we instrument *CDS trading* with *Lender CDS preference* and control for a host of firm characteristics and firm and year fixed effects. The column labeled "All firms" in Table 7 reports the results. CDS trading is associated with a 39 percentage points decrease in firms' markup. This decrease is statistically significant and is equivalent to a 22% standard deviation change or a 19% decrease from the mean. This result is consistent with CDS firms using aggressive price cuts to gain market shares.

What are non-CDS firms' response to CDS rivals' aggressive pricing strategy? Although the full sample analysis above suggests that CDS firms make deeper price cuts than non-CDS rivals, it is interesting to see whether non-CDS firms take a confronting or accommodating stance. We therefore focus on the non-CDS firm sample, and conduct an IV regression similar to that in Table 4 but change the dependent variable to *Markup*. The key independent variable is still *Rival CDS trading*, a dummy variable that equals 1 if there were CDS started trading on rivals in the same four-digit industry in the previous three years, which is instrumented by *Industry lender CDS preference* as in Table 4. The column labeled "Non-CDS firms" in Table 7 reports the results. Non-CDS firms appear to cut their markup as well in a three-year window following rivals' CDS inception. This finding suggests that non-CDS firms actively engage CDS rivals in a price competition. However, as the results from the "All firms" regression suggest, CDS firms are able to cut price more aggressively than non-CDS rivals. This is perhaps an important reason that CDS firms gain market shares on average.

5.3.2. Industry structure and predation

CDS firms' ability to gain market share by aggressive price competition should also depend on the competition structure of their industries. In highly competitive industries where

profit margins are already thin and rivals are used to price wars, price competition would be hardly effective. Indeed, prior research has shown that predation is more likely to occur in more oligopolistic industries or less competitive segments of an industry (Kovenock and Phillips (1997) and Zingales (1998)). Therefore, if CDS trading promotes reference firms' competitiveness and facilitates predation on rivals, we expect this effect to be more pronounced in less competitive or highly segmented industries.

We test this conjecture by interacting *CDS trading* with two different indicators of a firm's industry structure while following the same regression framework as in Table 5. Specifically, *Concentrated industry* is a dummy variable that equals 1 if the Herfindahl index of a firm's industry is above the annual sample median, where the Herfindahl index is computed using all Compustat firms in the firm's four-digit SIC industry. *Disaggregated industry* is a dummy variable that equals 1 if the number of five-digit SIC codes in a firm's four-digit SIC industry is above the annual sample median. Industries with detailed segments tend to have more differentiated products and are likely to be less competitive. As reported in Table 8, we find CDS firms realize greater sales growth in more concentrated industries and more disaggregated industries. These results are consistent with CDS facilitating predation on rivals, which are more likely to occur in less competitive industries. They are also consistent with CDS firms' predation strategy documented above; cutting markup to boost sales would be more practical and effective in less competitive industries.

5.3.3. Competition through real investment

With CDS alleviating agency concerns in credit supply, reference firms may have more discretion in real investment. Investing in production capacities or growth opportunities can be an important channel to boost competitiveness in the product market. We examine the

relationship between CDS trading and real investment, considering both *Capx* and *R&D*. *Capx* is computed as capital expenditures divided by lagged total assets. *R&D* is R&D expense (missing values replaced with 0) divided by lagged total assets. Again, we instrument *CDS trading* with *Lender CDS preference* and control for firm characteristics and firm and year fixed effects.

Table 9 reports the results. We find that CDS firms spend significantly more on both assets-in-place and growth opportunities. The increase in investment upon CDS trading is approximately equal to a ¼ (½) standard deviation increase in *Capx* (*R&D*). Thus, firms with CDS trading appear to expand through real investment as well.

5.3.4. Impact on non-CDS rivals

So far our evidence indicates that firms implement aggressive pricing strategies and expansive investment strategies upon CDS trading. To further verify that these strategies contribute to CDS firms' market share gains, we examine non-CDS firms' product market performance in face of rivals' CDS inception and these rivals' competition strategies.

The exercise is similar to that in Table 4 and we interact *Rival CDS trading* with *CDS rival sales growth*, *CDS rival markup growth*, *CDS rival capx growth*, and *CDS rival R&D growth*, respectively. *Rival CDS trading*, as defined above, is a dummy variable that equals 1 if there were CDS started trading on rivals in the same four-digit industry in the previous three years. *CDS rival sales growth* is the average sales growth of rivals that started CDS trading in the past three years. *CDS rival markup growth* is the average markup growth of rivals that started CDS trading in the past three years. Markup growth is computed as a CDS rival's current markup (sales divided by cost of goods sold) minus its markup in the year before CDS introduction. *CDS rival capx growth* is the average capital expenditure growth of rivals that started CDS trading in the past three years. Capital expenditure growth is computed as a CDS

rival's current capital expenditure as a fraction of lagged total assets minus its capital expenditure as a fraction of lagged total assets in the year before CDS introduction. *CDS rival R&D growth* is the average R&D expense growth of rivals that started CDS trading in the past three years. R&D expense growth is computed as a CDS rival's current R&D expense as a fraction of lagged total assets minus its R&D expense as a fraction of lagged total assets in the year before CDS introduction. We run IV regressions with *Rival CDS trading* instrumented by *Industry lender CDS preference* and *Rival CDS trading* × *X* instrumented by *Industry lender CDS preference* × *X*, where *X* is *CDS rival sales growth*, *CDS rival markup growth*, *CDS rival capx growth*, or *CDS rival R&D growth*.

Table 10 reports the results. Similar to what we find in Table 4, non-CDS firms' sales growth drops in a three-year window after CDS trading starts on their rivals, especially when these CDS rivals attain fast sales growth (column 1). Importantly, non-CDS firms' loss in sales growth is much more pronounced when the rivals with CDS inception implement aggressive strategies in price competition (column 2), capital investment (column 3), and R&D (column 4).

The overall results in this section provide a consistent picture of how firms with CDS trading compete in the product market. They implement aggressive pricing strategies, build new assets, and develop growth opportunities to gain market shares from non-CDS rivals. These results further support the view that CDS's ability to alleviate agency problems in debt contracting promote product market competitiveness; the above aggressive strategies would not be feasible if borrowers are constrained by rigid debt terms aimed to protect lenders' cash flow rights.

6 Conclusion

Industry structure has gone through rapid changes as financing pours in and new technologies arrive. In this paper, we examine how the rise of credit derivatives, represented by credit default swaps (CDS), affects product market competition. Examining data over the 1997-2008 period, we find that reference firms increase sales after the inception of CDS on their debt at a rate faster than their non-CDS rivals. Consequently, they gain market share at the expense of their competitors. They do so, at least partly, by cutting product prices and increase investments. Our study presents the first analysis connecting financial derivatives market with product market.

Our empirical evidence is consistent with a predation model when financiers are more willing to support the borrowers who in turn take a more aggressive competition strategy. This is facilitated by CDS resolving part of creditors' agency concerns and increasing their commitment in both financing and termination. Understanding the implication of CDS market is important given the recent controversies about how CDS may create perverse incentives and new evidence that U.S. industries have been more concentrated among large firms over the last two decades.

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Figure 1 Sales growth of CDS firms and their synthetic control firms

The graph depicts the average sales growth of CDS firms (solid line), that of their synthetic control firms (dashed line), and the difference between the two (dash-dot line), from year *t*-6 to *t*+3 around the treatment (CDS trading inception) year, *t*. The synthetic control for a given CDS firm is constructed using data from year *t*-6 to *t*-1.

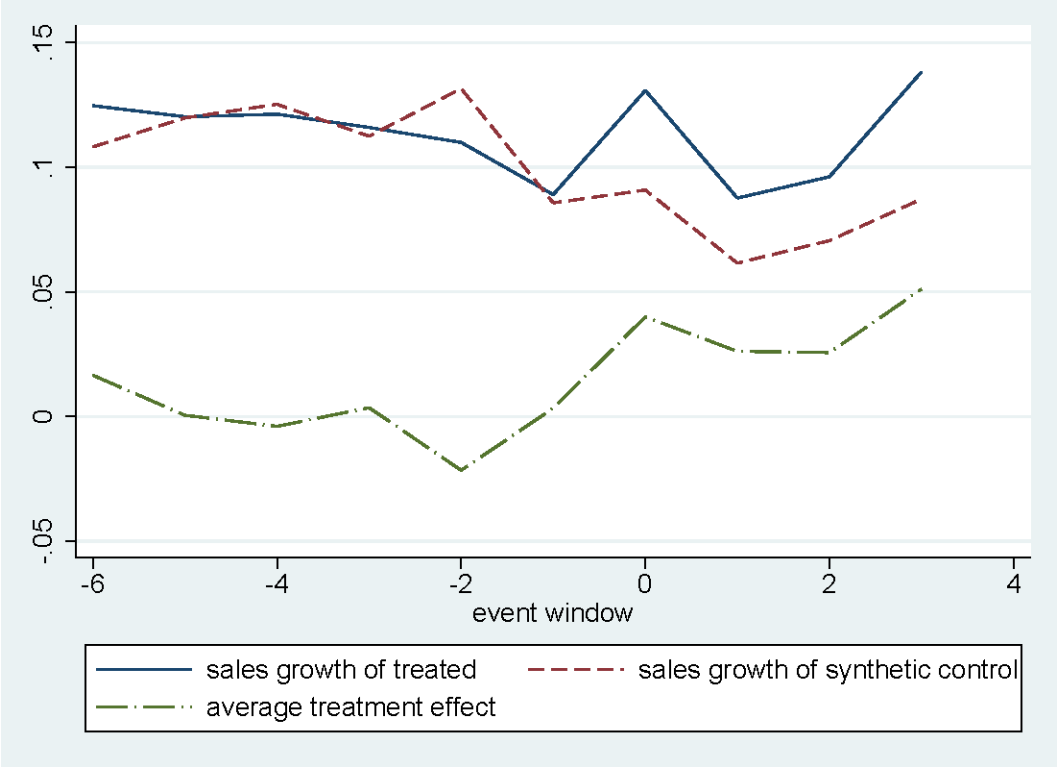

Figure 2 Average treatment effect for placebo CDS firms

The graph depicts the simulated distribution of the average treatment effect of placebo CDS firms (the vertical bars) and the position of the average treatment effect of actual CDS firms (the vertical line to the right). To simulate the distribution of placebo average treatment effect, we do the following. 1) For each CDS firm (treated frim), randomly draw a non-CDS rival (placebo) in the same 4-digit SIC industry as the CDS firm. 2) Compute the treatment effect for each placebo using the synthetic control method. Specifically, for each placebo, we construct a synthetic control using firms in the placebo's 4-digit SIC industry with data from year *t*-6 to *t*-1, where *t* is the placebo treatment year. Then we compute the average difference of sales growth between the placebo and its synthetic control over *t*+1 to *t*+3. 3) Compute the average treatment effect across all the placebos. 4) Repeat 1) - 3) for 1000 times to get the distribution of the average treatment effect for placebo CDS firms.

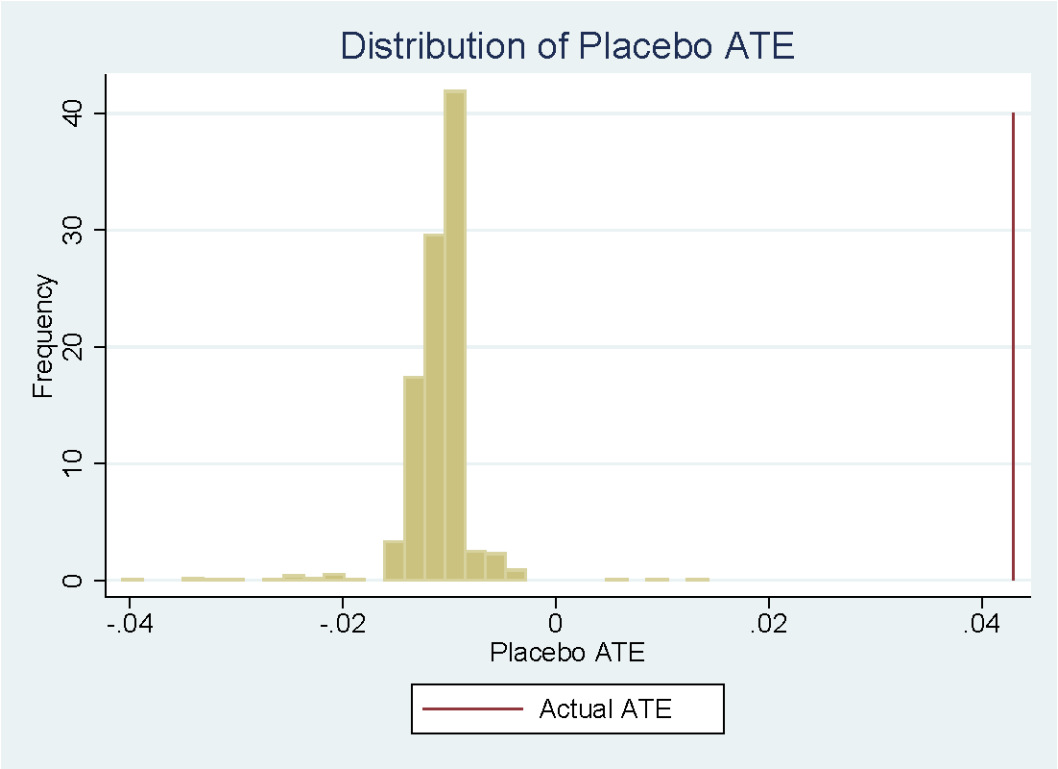

Table 1 Summary statistics

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. *Market share growth* is the firm's sales growth, i.e., sale(t)/sale(t-1)-1, minus the median sales growth of the firm's 4-digit SIC industry. *Sales growth* is the firm's sales growth, i.e., sale(t)/sale(t-1)-1. *CDS trading* is a dummy variable that equals 1 if the firm has CDS trading in the year concerned. *Market-to-book* is the ratio of market assets to book assets, i.e., (prcc_f*csho+at-ceq-txdb)/at. *LnAssets* is the natural log of total assets, i.e., ln(at). *Leverage* is the sum of long-term debt and debt in current liabilities divided by total assets, i.e., (dltt+dlc)/at. *Cash* is the firm's cash and short-term investments divided by total assets, i.e., che/at. *Stock return* is the firm's cumulative stock return minus its 4-digit SIC industry's average cumulative stock return in the last 12 months. *HHI* is the sum of squared product market share in terms of sales of Compustat firms in the firm's 4-digit SIC industry. *Lender CDS preference* is the average, across the firm's major lenders over the past 3 years, of each lender's fraction of loan amount to "unrelated CDS borrowers" over the lender's total loan amount. Unrelated CDS borrowers are defined as borrowers with CDS trading that are in different 3-digit SIC industries than the firm concerned. A firm's major lender is defined as a lender whose outstanding loan amount to the firm is above the median of all borrowers of the lender.

Variable	N	Mean	Std. dev.	Min	25th pctl.	50th pctl.	75th pctl.	Max
Market share growth	52527	-0.144	0.695	-3.736	-0.304	-0.083	0.044	3.015
Sales growth	52527	0.191	0.558	-0.692	-0.026	0.090	0.251	3.863
CDS trading	52527	0.084	0.277	0.000	0.000	0.000	0.000	1.000
Market-to-book	52527	2.111	1.958	0.540	1.068	1.430	2.283	12.827
LnAssets	52527	5.758	2.186	0.870	4.147	5.611	7.206	11.477
Leverage	52527	0.220	0.217	0.000	0.020	0.172	0.353	0.947
Cash	52527	0.193	0.227	0.000	0.025	0.092	0.289	0.917
Stock return	52527	1.163	0.372	0.464	0.956	1.097	1.264	2.487
HHI	52527	0.246	0.290	0.006	0.007	0.135	0.367	1.000
Lender CDS preference	52527	0.040	0.073	0.000	0.000	0.000	0.048	0.298

Table 2 Product market performance and CDS trading: 2SLS

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference*. Variables are defined in Table 1. Dependent variables are shown at the head of each column. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Market share growth	Sales growth
CDS trading	0.124**	0.153**
	(2.148)	(2.514)
Market-to-book	0.0611***	0.0632***
	(17.65)	(17.47)
LnAssets	-0.0980***	-0.110***
	(-11.03)	(-11.61)
Leverage	-0.0200	-0.0202
	(-0.575)	(-0.551)
Cash	0.315***	0.340***
	(8.087)	(8.338)
Stock return	-0.0287***	0.0548***
	(-3.528)	(6.156)
HHI	-0.0355**	-0.0275
	(-2.006)	(-1.367)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered std. err.	Yes	Yes
N	52,527	52,527
Adj. R-sqr	0.163	0.183

Table 3 Predation by rivals with CDS trading

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, are not in the utility and financial industries, and do not have CDS trading. The dependent variable is *Sales growth*. Reported are the second stage of 2SLS with *Rival CDS trading* instrumented by *Industry lender CDS preference*. *Rival CDS trading* is a dummy variable that equals 1 if there were CDS started trading on rivals in the same 4-digit industry in the previous 3 years. *Industry lender CDS preference* is the average, across major lenders to firms in the same 4-digit SIC industry over the past 3 years, of each lender's fraction of loan amount to "unrelated CDS borrowers" over the lender's total loan amount. Unrelated CDS borrowers are defined as borrowers with CDS trading that are in different 3-digit SIC industries than the firm concerned. A firm's major lender is defined as a lender whose outstanding loan amount to the firm is above the median of all borrowers of the lender. Other variables are defined in Table 1. In parentheses are t-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Sales growth
Rival CDS trading	-0.157**
	(-2.204)
Market-to-book	0.0602***
	(11.08)
LnAssets	-0.0873***
	(-5.794)
Leverage	-0.00597
	(-0.0947)
Cash	0.389***
	(6.349)
Stock return	0.0574***
	(3.981)
HHI	-0.0713*
	(-1.737)
Firm fixed effects	Yes
Year fixed effects	Yes
Clustered std. err.	Yes
N	19,652
Adj. R-sqr	0.159

Table 4 Product market performance and CDS trading: competition shocks orthogonal to CDS introduction

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. We exclude firms whose CDS introductions are within three years before import tariff cuts in their industries. *Tariff cut* is an indicator which equals 1 if the firm's industry has experienced an import tariff cut over the last two years. A tariff cut occurs when an industry-year change in tariff rate is negative and three times larger than its median value. Other variables are defined in Table 1. Dependent variables are shown at the head of each column. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Market share growth	Sales growth
CDS trading × Tariff cut	0.0530**	0.0575*
	(3.198)	(1.961)
Tariff cut	0.00692	-0.0178
	(0.469)	(-0.877)
Market-to-book	0.0559***	0.0567***
	(5.257)	(4.852)
LnAssets	-0.120***	-0.144***
	(-3.776)	(-3.859)
Leverage	-0.0207	-0.0628
	(-0.163)	(-0.398)
Cash	0.314**	0.345**
	(3.171)	(3.248)
Stock return	-0.00129	0.0672*
	(-0.0552)	(1.995)
HHI	0.00879	-0.0186
	(0.148)	(-0.362)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered std. err.	Yes	Yes
N	5,635	5,635
Adj. R-sqr	0.176	0.201

Table 5 Product market performance and CDS trading: commitment problem

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference* and *CDS trading* × *X* instrumented by *Lender CDS preference* × *X*. *High analyst dispersion* is a dummy variable that equals 1 if the firm's analyst dispersion is above the annual sample median, where analyst dispersion is the standard deviation of analyst forecasts scaled by absolute value of the mean. *High R&D* is a dummy variable that equals 1 if the firm's R&D expense as a fraction of sales is above the annual sample median. *Low rating or unrated* is a dummy variable that equals 1 if the firm has a S&P credit rating below BBB- or does not have a rating. *Low payout* is a dummy variable that equals 1 if the firm's dividends plus stock repurchase divided by profit is below the annual sample median. *Industry distress* is a dummy variable that equals 1 if the firm's industry's median sales growth is negative. Other variables are defined in Table 1. All regressions include the same control variables and firm and year fixed effects as those in Table 2. Dependent variables are shown at the head of each column. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A	Market share growth	Sales growth
CDS trading	0.119	0.171*
	(1.440)	(1.957)
CDS trading × High analyst dispersion	0.105***	0.114***
	(2.810)	(2.897)
High analyst dispersion	-0.0438***	-0.0466***
	(-3.909)	(-3.979)
N	20,845	20,845
Adj. R-sqr.	0.238	0.272

Panel B	Market share growth	Sales growth
CDS trading	0.0524	0.0369
	(0.793)	(0.534)
CDS trading × High R&D	0.185***	0.300***
	(3.031)	(4.534)
High R&D	-0.0238	-0.0433
	(-0.958)	(-1.558)
N	52,527	52,527
Adj. R-sqr.	0.163	0.183

Panel C	Market share growth	Sales growth
CDS trading	0.205**	0.252***
	(2.536)	(2.958)
CDS trading × Fringe technology	0.0813*	0.101**
	(1.695)	(1.986)
Fringe technology	-0.0179	-0.0288**
	(-1.609)	(-2.472)
N	32,734	32,734
Adj. R-sqr.	0.174	0.197

Table 5 Continued

Panel D	Market share growth	Sales growth
CDS trading	0.127***	0.197***
	(3.876)	(5.783)
CDS trading × Low rating or unrated	0.534**	0.470*
	(2.407)	(1.814)
Low rating or unrated	-0.185**	-0.149
	(-2.327)	(-1.613)
N	52,527	52,527
Adj. R-sqr.	0.162	0.182

Panel E	Market share growth	Sales growth
CDS trading	0.0958	0.119*
	(1.630)	(1.921)
CDS trading × Low payout	0.0644*	0.0945**
	(1.848)	(2.532)
Low payout	-0.0211***	-0.0299***
	(-2.696)	(-3.570)
N	46,537	46,537
Adj. R-sqr.	0.165	0.182

Panel F	Market share growth	Sales growth
CDS trading	0.121**	0.152**
	(2.093)	(2.496)
CDS trading × Industry distress	0.105**	0.187***
	(2.115)	(3.245)
Industry distress	-0.0149	-0.171***
	(-1.448)	(-14.86)
N	52,527	52,527
Adj. R-sqr.	0.163	0.187

Table 6 Long-term debt renewal and CDS trading

The original sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference*. The dependent variable is *LT debt renewal*, which is defined as long-term debt issue minus long-term debt due in the year, scaled by lagged total assets, i.e., (dltis(t)-dd1(t-1))/at(t-1). *Fixed Assets* is fixed assets as a fraction of total assets, i.e., ppent/at. *Profit volatility* is the volatility of firms operating income after depreciation in the past five years. *Rated* is a dummy variable that equals 1 if the firm has a Standard & Poor long-term issuer credit rating. *ROA* is operating income before depreciation scaled by total assets, i.e., oibdp/at. Other variables are defined in Table 1. In the column "LT debt due above median" ("LT debt due in top tercile"), the sample is restricted to firm-years where long-term debt due is above the sample median (67^{th} percentile). In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	LT debt due above median	LT debt due in top tercile
CDS trading	0.0947*	0.158**
	(1.694)	(1.974)
Market-to-book	0.0214***	0.0272***
	(7.281)	(6.718)
Fixed assets	0.0167	0.0206
	(0.416)	(0.415)
LnAssets	-0.0799***	-0.0939***
	(-9.470)	(-7.855)
Profit volatility	-0.0247	-0.0662
	(-0.506)	(-1.043)
Rated	-0.0631***	-0.0459**
	(-4.245)	(-2.564)
Leverage	-0.290***	-0.321***
	(-11.05)	(-9.732)
Cash	-0.188***	-0.257***
	(-6.532)	(-6.142)
ROA	0.0697***	0.0947***
	(3.008)	(3.264)
Stock return	0.00213	-0.00143
	(0.353)	(-0.181)
HHI	-0.00845	0.000948
	(-0.493)	(0.0435)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered std. err.	Yes	Yes
N	20,530	12,845
Adj. R-sqr	0.463	0.480

Table 7 Markup and CDS trading

In the column labeled "All firms", the sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference*. Variables are defined in Table 1. In the column labeled "Non-CDS firms", the sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, are not in the utility and financial industries, and do not have CDS trading. Reported are the second stage of 2SLS with *Rival CDS trading* instrumented by *Industry lender CDS preference*. Variables are defined in Table 4. In both columns, the dependent variable is *Markup*, defined as sales divided by cost of goods sold (sale/cogs). In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	All firms	Non-CDS firms
CDS trading	-0.391**	
	(-2.034)	
Rival CDS trading		-0.232*
		(-1.854)
Market-to-book	0.0217***	0.0371***
	(3.106)	(3.842)
LnAssets	-0.00809	0.0304
	(-0.334)	(0.731)
Leverage	0.0449	0.319**
	(0.513)	(2.096)
Cash	-0.0749	-0.199
	(-0.856)	(-1.297)
Stock return	-0.0267*	-0.0287
	(-1.878)	(-1.209)
HHI	-0.0271	-0.0506
	(-0.644)	(-0.656)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered std. err.	Yes	Yes
N	52,722	19,867
Adj. R-sqr	0.709	0.652

Table 8 Product market performance and CDS trading: industry structure

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference* and *CDS trading* × *X* instrumented by *Lender CDS preference* × *X*. *Concentrated industry* is a dummy variable that equals 1 if the Herfindahl index of the firm's industry is above the annual sample median, where the Herfindahl index is computed using all Compustat firms in the firm's four-digit SIC industry. *Disaggregated industry* is a dummy variable that equals 1 if the number of five-digit SIC codes in the firm's four-digit SIC industry is above the annual sample median. Other variables are defined in Table 1. All regressions include the same control variables and firm and year fixed effects as those in Table 2. Dependent variables are shown at the head of each column. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A	Market share growth	Sales growth
CDS trading	0.0823	0.118*
	(1.381)	(1.879)
CDS trading × Concentrated industry	0.301***	0.255***
	(4.714)	(3.501)
Concentrated industry	-0.0427***	-0.0383**
	(-2.900)	(-2.228)
N	52,527	52,527
Adj. R-sqr.	0.163	0.182

Panel B	Market share growth	Sales growth
CDS trading	0.0825	0.0370
	(0.987)	(0.422)
CDS trading × Disaggregated industry	0.0873	0.217***
	(1.368)	(3.183)
Disaggregated industry	0.0108	-0.0133
	(0.696)	(-0.784)
N	52,527	52,527
Adj. R-sqr.	0.164	0.183

Table 9 Investment policies and CDS trading

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference*. Dependent variables are shown at the head of each column. *Capx* is capital expenditures divided by lagged total assets, i.e., capx(t)/at(t-1). *R&D* is R&D expense (missing values replaced with 0) divided by lagged total assets, i.e., xrd(t)/at(t-1) Other variables are defined in Table 1. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Capx	R&D
CDS trading	0.0710**	0.0522***
	(2.051)	(6.235)
Market-to-book	0.00914***	0.00760***
	(5.841)	(17.20)
LnAssets	0.0261***	-0.0314***
	(5.305)	(-23.87)
Leverage	-0.127***	0.00246
	(-6.114)	(0.611)
Cash	0.221***	-0.0156***
	(10.52)	(-3.398)
Stock return	0.0138***	-0.00278***
	(3.344)	(-3.455)
HHI	-0.0138	0.00114
	(-1.264)	(0.518)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered std. err.	Yes	Yes
N	52,044	53,581
Adj. R-sqr	0.548	0.840

Table 10 Predation by rivals with CDS trading: rival aggressiveness

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, are not in the utility and financial industries, and do not have CDS trading. The dependent variable is *Sales growth*. Reported are the second stage of 2SLS with *Rival CDS trading* instrumented by *Industry lender CDS preference* and *Rival CDS trading* × *X* instrumented by *Industry lender CDS preference* × *X*. *Rival CDS trading* is a dummy variable that equals 1 if there were CDS started trading on rivals in the same 4-digit industry in the previous 3 years. *Industry lender CDS preference* is the average, across major lenders to firms in the same 4-digit SIC industry over the past 3 years, of each lender's fraction of loan amount to "unrelated CDS borrowers" over the lender's total loan amount. Unrelated CDS borrowers are defined as borrowers with CDS trading that are in different 3-digit SIC industries than the firm concerned. A firm's major lender is defined as a lender whose outstanding loan amount to the firm is above the median of all borrowers of the lender. *CDS rival sales growth* is the average sales growth of rivals that started CDS trading in the past 3 years. *CDS rival markup growth* is the average markup growth of rivals that started CDS trading in the past 3 years. Markup growth is computed as a CDS rival's current markup (sale/cogs) minus its markup in the year before CDS introduction. *CDS rival capx growth* is the average capital expenditure growth of rivals that started CDS trading in the past 3 years. Capital expenditure growth is computed as a CDS rival's current capital expenditure as a fraction of lagged total assets minus its capital expenditure as a fraction of lagged total assets in the year before CDS introduction. *CDS rival R&D growth* is the average R&D expense growth of rivals that started CDS trading in the past 3 years. R&D expense growth is computed as a CDS rival's current R&D expense as a fraction of lagged total assets minus its R&D expense as a fraction of lagged total assets in the year before CDS introduction. Other variables are defined in Table 1. In parentheses are t-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 10 continued

	(1)	(2)	(3)	(4)
Rival CDS trading	-0.118	-0.277**	-0.150	-0.151*
	(-1.361)	(-2.545)	(-1.596)	(-1.777)
Rival CDS trading × CDS rival sales growth	-0.659**			
	(-2.461)			
CDS rival sales growth	0.261**			
	(2.556)			
Rival CDS trading × CDS rival markup growth		0.174*		
		(1.744)		
CDS rival markup growth		-0.0858**		
		(-1.991)		
Rival CDS trading × CDS rival capx growth			-2.930**	
			(-2.105)	
CDS rival capx growth			1.512**	
			(2.022)	
Rival CDS trading × CDS rival R&D growth				-1.901*
				(-1.716)
CDS rival R&D growth				0.793
				-0.789
Market-to-book	0.0610***	0.0614***	0.0602***	0.0601***
	(11.11)	(11.20)	(11.01)	-11.61
LnAssets	-0.0770***	-0.0862***	-0.0919***	-0.0910***
	(-4.855)	(-5.621)	(-5.938)	(-7.304)
Leverage	0.0356	0.0229	0.00415	-0.00127
	(0.551)	(0.353)	(0.0644)	(-0.0113)
Cash	0.369***	0.388***	0.389***	0.397***
	(5.851)	(6.242)	(6.279)	-5.643
Stock return	0.0607***	0.0558***	0.0602***	0.0626***
	(3.959)	(3.711)	(3.978)	-3.48
HHI	-0.0369	-0.0385	-0.0397	-0.0424
	(-0.745)	(-0.806)	(-0.854)	(-0.911)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Clustered std. err.	Yes	Yes	Yes	Yes
N	19,175	19,132	19,054	19,131
R-sqr	0.244	0.260	0.265	0.266
Adj. R-sqr	0.136	0.153	0.159	0.160

Table A1 First stage of the instrumental variable regression

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported is the first stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference*. Variables are defined in Table 1. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	CDS trading
Lender CDS preference	0.744***
	(17.52)
Market-to-book	0.000
	(0.11)
LnAssets	0.00960***
	(3.37)
Leverage	0.01792*
	(1.70)
Cash	0.0381***
	(5.58)
Stock return	-0.00470**
	(-2.16)
HHI	-0.0518***
	(-4.72)
Firm fixed effects	Yes
Year fixed effects	Yes
Clustered std. err.	Yes
N	52,527
Adj. R-sqr	0.707
Within R-sqr.	0.0514
Partial R-sqr.	0.046
1st stage F	306.96

Table A2 Market share growth and CDS trading: Hoberg and Phillips' (2006) Text-based Network Industry Classification

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference*. Variables are defined in Table 1. The dependent variable is the firm's sales growth minus its industry median, where industries are defined according to Hoberg and Phillips's (2006) Text-based Network Industry Classification. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

CDS trading	0.115*
	(1.955)
Market-to-book	0.0535***
	(15.19)
LnAssets	-0.0996***
	(-10.64)
Leverage	0.000552
	(0.0155)
Cash	0.315***
	(7.783)
Stock return	-0.00652
	(-0.797)
HHI	-0.0134
	(-0.719)
Firm fixed effects	Yes
Year fixed effects	Yes
Clustered std. err.	Yes
N	46,205
Adj. R-sqr	0.151

Table A3 Product market performance and CDS trading: distressed firms

The sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. Reported are the second stage of 2SLS with *CDS trading* instrumented by *Lender CDS preference* and *CDS trading* × *X* instrumented by *Lender CDS preference* × *X*. *High leverage* is a dummy variable that equals 1 if the firm's book leverage ((dltt+dlc)/at) is above the 67th percentile of the year. *Low cash* is a dummy variable that equals 1 if the firm's cash divided by total assets (che/at) is below the 33th percentile of the year. *Low ROA* is a dummy variable that equals 1 if the firm's operating income before depreciation divided by total assets (oibdp/at) is below the 33th percentile of the year. Other variables are defined in Table 1. All regressions include the same control variables and firm and year fixed effects as those in Table 2. Dependent variables are shown at the head of each column. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Panel A	Market share growth	Sales growth
CDS trading	0.170***	0.218***
	(2.630)	(3.190)
CDS trading × High leverage	-0.0964**	-0.134***
	(-2.141)	(-2.786)
High leverage	0.0136	0.0154
	(1.039)	(1.108)
N	52,527	52,527
Adj. R-sqr.	0.164	0.183

Panel B	Market share growth	Sales growth
CDS trading	0.169**	0.183**
	(2.500)	(2.566)
CDS trading × Low cash	-0.0900**	-0.0587
	(-2.137)	(-1.310)
Low cash	0.0247**	0.0191*
	(2.528)	(1.839)
N	52,527	52,527
Adj. R-sqr.	0.163	0.183

Panel C	Market share growth	Sales growth
CDS trading	0.170***	0.203***
	(3.080)	(3.465)
CDS trading × Low ROA	-0.421***	-0.492***
	(-2.867)	(-3.119)
Low ROA	0.182***	0.199***
	(15.84)	(16.47)
N	50,779	50,779
Adj. R-sqr.	0.174	0.194

Appendix: Propensity score matching

As an alternative identification method, we compare the product market performances of CDS firms and non-CDS firms using a propensity-score matching procedure. We match a non-CDS firm with a CDS firm if the former's probability of having CDS in the next year is closest to the latter's probability of having CDS in the next year in which the CDS trading indeed begins. The probability of CDS trading is modeled in a logit framework taking into account a host of firm characteristics and industry and year fixed effects. We also include the IV used above, *Lender CDS preference*, as a determinant of CDS propensity in the logit model. As reported in Table A4, the matched firms have very similar probabilities of having CDS. They also resemble each other in terms of size, leverage, and working capital. However, CDS firms tend to be more profitable, better rated, more capital-intensive, have higher market-to-book ratio but have lower cash holdings.

We then regress firms' product market performance on their CDS status using the matched sample. Table A5 reports the results. Again, we find CDS firms significantly outperform matched non-CDS firms in both sales growth and market share growth. CDS firms' market share growth (sales growth) is 8.5% (11.7%) higher than non-CDS firms' on average.

Table A4 Characteristics of matched firms

The table reports the means of predicted probability of CDS trading and the independent variables in the logit model for propensity score matching, for the treated and control groups respectively before the treatment year, the differences in means, and the *t*-statistics that test the differences in means. Construction of the matched sample and variable definitions are described in Table A5.

	Treated	Control	Difference	T-test
Predicted CDS trading probability	0.630	0.629	0.001	0.06
LnAssets	8.429	8.531	-0.102	-1.19
Leverage	0.305	0.318	-0.012	-0.93
ROA	0.153	0.102	0.051	9.09***
Abnormal return	0.107	0.049	0.058	1.76*
Volatility	0.027	0.028	-0.002	-1.79*
Fixed assets	0.362	0.300	0.063	3.56***
Turnover	1.012	0.756	0.257	5.19***
Working capital	0.111	0.103	0.008	0.69
Retained earnings	0.174	-0.015	0.189	4.33***
Cash	0.075	0.102	-0.027	- 3.14***
Capx	0.067	0.052	0.016	4.03***
Market-to-book	2.112	1.572	0.540	5.67***
Rated	0.934	0.868	0.065	3.09***
Investment grade	0.746	0.537	0.209	6.25***
Lender CDS preference	0.057	0.109	-0.051	-9.42***

Table A5 Product market performance and CDS trading: propensity score-matched sample

The original sample contains Compustat firms between 1997 and 2008 that are incorporated in the U.S., have common stocks covered by CRSP, and are not in the utility and financial industries. A CDS firm is matched with a non-CDS firm in the year right before CDS started trading on the former. We use propensity-score matching such that the non-CDS firm's predicted (one year lead) probability of having CDS are closest to the CDS firm's one year before its CDS trading, based on a logit regression on *LnAssets*, *Leverage*, *ROA*, *Abnormal return*, *Volatility*, *Fixed assets*, *Turnover*, *Working capital*, *Retained earnings*, *Cash*, *Capx*, *Market-to-Book*, *Rated*, *Investment grade*, and *Lender CDS preference*, with industry and year fixed effects. *ROA* is operating income before depreciation scaled by total assets, i.e., oibdp/at. *Abnormal return* is the firm's cumulative return minus the market cumulative return in the past 12 months. *Volatility* is the firm's daily stock return volatility in the past 12 months. *Fixed Assets* is fixed assets as a fraction of total assets, i.e., ppent/at. *Turnover* is sales divided by total assets, i.e., sale/at. *Working capital* is current assets net of current liabilities as a fraction of total assets, i.e., (act-lct)/at. *Retained earnings* is retained earnings as a fraction of total assets, i.e., re/at. *Capx* equals capital expenditure divided by lagged total assets, i.e., capx(t)/at(t-1). *Rated* is a dummy variable that equals 1 if the firm has a Standard & Poor long-term issuer credit rating. *Investment grade* is a dummy variable that equals 1 if the firm's S&P credit rating is above or equal to BBB-. Other variables are defined in Table 1. Dependent variables are shown at the head of each column. In parentheses are *t*-statistics. Standard errors are clustered at the firm level. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

	Market share growth	Sales growth
CDS trading	0.0847***	0.117***
	(4.611)	(6.057)
Market-to-book	0.0678***	0.0639***
	(12.74)	(11.46)
LnAssets	-0.165***	-0.189***
	(-13.37)	(-14.59)
Leverage	-0.0528	-0.0988*
	(-0.996)	(-1.778)
Cash	-0.349***	-0.347***
	(-4.539)	(-4.308)
Stock return	-0.0307**	0.101***
	(-2.083)	(6.572)
HHI	0.168***	0.157***
	(5.278)	(4.702)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Clustered std. err.	Yes	Yes
N	6,663	6,663
Adj. R-sqr	0.207	0.241