Naughty Firms, Noisy Disclosure

Effects of Cartel Enforcement on Corporate Disclosure*

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Abstract

We empirically study how collusion in the product markets affects firms' financial disclosure strategies. By exploiting exogenous variations to the costs of illegal price-fixing, we find that U.S. firms start sharing more detailed information in their financial disclosure about their customers, contracts, and products, potentially benefiting peers and helping to tacitly coordinate actions in product markets. At the same time, the disclosure on firms' competitive environment, which might benefit antitrust regulators, becomes more murky. Our findings suggest that transparency in financial statements can come at the expense of consumer welfare.

Keywords: Voluntary Disclosure, Antitrust Enforcement, Collusion, Tacit Coordination

JEL Classification: D43, G38, M41, L15, L41

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1 Introduction

Financial market regulation has been strengthening over time. Following Regulation FD and the Sarbannes-Oxley Act, publicly-listed firms are being mandated to increase transparency by disclosing more information in their financial statements. Such disclosure should reduce the cost of capital, level the information playing field for different investors, and allow them to monitor managers more efficiently. Academic research has so far focused on the extent to which regulations have successfully accomplished these goals (Leuz and Wysocki, 2016). However, some regulators have recently started to express concerns about unintended consequences of increasing transparency in financial markets. In particular, firms' unilateral disclosure of financial information can have potential adverse effects on the welfare of consumers in the product markets.

In its recent report on how firms' unilateral disclosure of information can have potential anticompetitive effects, the Organisation for Economic Co-operation and Development (OECD) states that "*greater transparency in the market is generally efficiency enhancing and, as such, welcome by competition agencies. However, it can also produce anticompetitive effects by facilitating collusion or providing firms with focal points around which to align their behaviour* (OECD, 2012)." Indeed, through their financial disclosure firms communicate with multiple audiences. While the primary targets of the publicly available information are likely to be financial market participants, other parties with whom firms interact such as their collusion peers might also benefit from it.

Despite these hypotheses raised by the authorities and recent legal cases[1], no rigorous academic analysis confirms that firms use financial disclosure in their considerations about product market collusion. In this paper, we study this question by investigating a setting

[1]For instance, in Valassis Communications (FTC File No 051 0008), and Matter of U-Haul Int and AMERCO (FTC File No 081-0157), Federal Trade Commission (FTC) presented evidence that firms unilaterally signaled to their competitors the willingness to increase prices in their public conference call with stock analysts. Such invitations to collude may violate Section 5 of the FTC Act. In July 2015, Department of Justice started the investigation on the collusion between airlines regarding flight capacity and among other documents requested relevant communication between airlines and stock analysts.

where antitrust authorities gain more powers to detect price-fixing activities. We argue that this leads to higher explicit collusion costs.[2] Such increased explicit collusion costs affect the disclosure with respect to product market activities since firms now have relatively stronger incentives to unilaterally provide information on product market strategies in order to make it easier to tacitly coordinate actions in product markets.

Given that both product market and disclosure choices are likely to be endogenously determined, discerning causality between incentives to collude and financial disclosure might be challenging. We consider a sample of U.S. listed companies over the 1994-2012 time period and develop a measure meant to capture exogenous increase in collusion costs at the industry level. Specifically, given the rise in the prominence of international cartels and the focus of U.S. antitrust authorities on the investigations involving non-U.S. conspirators (Ghosal and Sokol, 2014), we rely on the passages of antitrust laws in the countries with which the firm's industry trades. The particular antitrust law that we study is the leniency law that since 1993 has been passed or strengthened in a staggered manner around the world. The leniency law allows the cartel member, who provides crucial evidence to the cartel prosecutors, to obtain amnesty and thus reduce legal exposure. Using a cross-country setting, Dong et al. (2014) establish that leniency laws led to more cartel convictions and a decrease in firms' operating performance. To generate variation across U.S. industries, we take a weighted average of such law passage in other countries, where weights are determined by the share of U.S. industry trade links with that particular country. We argue that when more countries with which U.S. industry trades pass the laws antitrust authorities find it easier to cooperate and convict members of international cartels, increasing the costs of collusion for the industry. To ascertain the validity of our identification strategy, we start

[2]Throughout the paper, we refer to explicit collusion as situations where firms communicate directly with each other, which represents a *per se* violation of competition law. Meanwhile, tacit coordination reflects situations where firms do not communicate privately to exchange information. From a legal perspective, while collusion and price-fixing activities are illegal, tacit collusion cases are much harder to prosecute. For instance, in the decision *Text Messaging Antitrust Litigation* (No 14-2301, 7^th Circuit, April 9, 2015), Judge Richard Posner stated that it is "difficult to prove illegal collusion without witnesses to an agreement". He further noted that circumstantial evidence "consistent with an inference of collusion, but [...] equally consistent with independent parallel behavior" is not sufficient to survive a summary judgment motion.

our empirical analyses by documenting that foreign leniency laws predict the dissolution of known cartels involving U.S. firms. We also show that affected U.S. firms' profit margins and sales drop, in line with the theoretical prediction that increased costs of collusion should lead to a stronger product market competition.

We next turn our investigation to how firms communicate their product market strategies in their financial disclosure. While financial disclosure is a unique information exchange mechanism in that it is mandatory, managers have enough flexibility in the depth and details of the information that they choose to make public (Verrecchia and Weber, 2006). We look at how managers use flexibility in their financial statements to credibly and unilaterally signal information about their product market strategies to industry members in order to sustain a tacit coordination equilibrium. We primarily focus on the material contracts with customers where firms face strong disclosure requirements. In particular, we look at whether firms request confidential treatment in filing material contracts with customers (Verrecchia and Weber, 2006).[3] To the extent that such contracts contain substantial amount of proprietary information, including transaction prices, transaction volumes, geographical location, product quality, it might be used by rivals to form their product strategies.

We find robust evidence that after foreign leniency laws are passed and thus the costs of collusion rise, firms are less likely to redact information from their publicly disclosed customer contracts. To understand the magnitude of our estimate, we select the industry that is the most exposed to each foreign law in our sample. Focusing on these most exposed industries, each adoption of leniency law explains, on average, 19% of within-firm variance.

We also study two additional sources of potentially valuable source of information to firm's peers in the product markets. First, disclosure regulations require firms to disclose customer's identity if it accounts for more than 10% of a firm's annual sales. However, it is not uncommon for firms to redact the identity of their major customers (Ellis et al., 2012). We find that following the increase of collusion costs firms are less likely to redact

[3]Our Appendix A provides two excerpts from such contracts. In one case, the firm redacts product prices while in the other case the firm does not redact and thus it shares its product prices publicly.

the identity of their major customers from their financial statements. Again, focusing on the most exposed industries, we find that each foreign law explains, on average, 1.92% of within-firm variance in the decision to redact information about customers. Finally, we study earnings' conference calls and find that managers reveal more about their product market strategies during the calls with equity analysts. Each foreign law explains, on average, 3.97% of within-firm variance in the discussion about the products in conference calls.

These results are robust to controlling for a number of industry and firm characteristics, including import penetration, industry concentration ratios, firm size, operating performance, and headquarter state trends. In all our models, we control for time-invariant unobservable factors using firm fixed effects and for time-varying unobservable aggregate economic effects using year fixed effects.

We also study whether these disclosure changes have real economic consequences. We find that firms which adapt their disclosure strategies do not experience a negative drop in profitability following the passage of foreign leniency laws while the profitability of the firms which do not change their disclosure in fact suffers.

Our results might be seen consistent with firms switching to stronger competition and increasing disclosure to raise more capital that would help compete in the product markets. However, we also find that firms do not increase all types of disclosure on competition. In particular, we look at the disclosure from which potential tacit coordination peers are unlikely to benefit but which could be useful for antitrust authorities to understand which industries are more likely to show signs of collusive behavior. SEC recommends that the management discussion and analysis (MD&A) section of the firm's 10-K filing includes a discussion of the firm's competitive position. Such information is meant to help investors gauge the firm's competitive position and ultimately assess future cash flows more accurately. We find that as explicit collusion costs rise the firms reduce the extent by how much they communicate about their competitive position in their regulatory filings and provide such disclosure in a more dispersed fashion, despite such information potentially benefiting investors.

All in all, our evidence suggests that when illegal price-fixing becomes more difficult, firms adjust their disclosure on multiple margins. They are eager to increase the disclosure of information that potentially benefits cartel peers to sustain tacit coordination in product markets. Similarly, they reduce the disclosure of information that might help antitrust authorities to uncover collusive activities but that contains little marginal new information for industry members.

2 Relation to the Literature

Our paper contributes to a few strands of literature. First, we relate to the literature on product market considerations and voluntary disclosure. A vast set of studies examines how competition from existing or potential rivals affects firms' disclosure choices (see Beyer et al. (2010) for a thorough review). Public financial information disclosure might have proprietary costs of rivals learning firm's demand and/or cost components and adjusting their strategies accordingly. The firms might thus find it optimal to follow partial rather than full disclosure strategies. Our results contrast this literature by recognizing that firms might actually be interested in providing more information to the rivals in order to facilitate tacit coordination.

In particular, most of the empirical literature in this area looks at how firms change their financial disclosure on product markets when competition increases. The identification in these papers comes from the deregulation in certain industries (e.g., Burks et al. (2016)) or an increased import penetration, stemming from trade reforms, tariff changes, or exchange rate changes (e.g., Huang et al. (2016)). These shocks to the competitive environment result in the loss of market power of the local incumbants, coming either from the new entry, or from the increased competition from the existing foreign exporters. In both cases, the incumbent local players have incentives to reduce truthful disclosure. They could either increase the provision of negative or misleading information to deter potential entrants, or decrease overall voluntary provision of information. This latter result, known as the

proprietary cost hypothesis (Jovanovic, 1982; Verrecchia, 1983), suggests that a manager will only disclose information when the increase in firm value from disclosing exceeds the costs of disclosure (e.g., such costs could arise since information can be used by rivals to adjust their behavior at the expense of the disclosing firm). In this paper, we argue that, when explicit collusion costs increase, instead of switching to outright competition and reducing truthful disclosure, incumbents might mitigate the antitrust shock by sharing more information that would permit tacit coordination in product markets. In other words, an increase in explicit collusion costs increases the benefits to disclosing proprietary information to industry peers that are inclined to tacitly coordinate in product markets, thereby reducing the net disclosure costs. As a result, firms switch to another second-best equilibrium where the optimal level of disclosure of proprietary information is higher. This finding refines our understanding of the relationship between competition and disclosure and highlights that the sources of the changes in competition among existing rivals may lead to contrasting predictions.

Next, our results contribute to the literature on information exchange and disclosure with the intention to facilitate collusion (see Kühn and Vives (1995) for an extensive review of the industrial organization literature on this topic). For instance, dynamic models of collusion have looked at how firms exchange information on past prices or production. The observability of the past behavior helps firms realize whether the rivals have deviated from the collusive price and thus contributes to stabilizing the cartels. The literature has explored the mechanisms that facilitate information exchange in order to coordinate the exchange of price and production quantity information but empirically has largely focused on the trade associations and similar organizational arrangements (Kirby, 1988; Doyle and Snyder, 1999; Genesove and Mullin, 2001; Page, 2009; Bertomeu et al., 2015).

In our case, we explore an alternative information exchange mechanism in sustaining product market cooperation between firms: financial disclosure. Financial disclosure differs from the better-studied information exchange mechanisms such as trade associations in a few important respects. First, while generally firms have considerable leeway in what in-

formation to provide and how, financial disclosure is largely mandatory for publicly listed firms.[4] This is contrary to the trade associations where the participation is voluntary. Second, such disclosure is credible since it is regularly verified by external audit teams. Also, managers are legally liable for their statements. Credibility constitutes a necessary condition to sustain tacit coordination, as information has to be perceived as more than "cheap talk" and not discounted by peer firms (Baliga and Morris, 2002). Third, the primary purpose of disclosure is targeted at investors and mandated by the stock exchange regulators, so antitrust authorities have limited mandate and scope in limiting such behavior.[5] Moreover, we study unilateral information announcements rather than quid pro quo agreements. In that respect, any information that firms provide publicly is visible both by their peers and the antitrust authorities. That said, only a subset of the product market participants – publicly listed firms – is providing such information which in the presence of private firms might not capture the full product market. This has an important implication if publicly listed firms have a better sense of privately held firms' reaction curves than the antitrust authorities do. In that case, publicly listed firms can act as coordination leaders without getting the attention of antitrust authorities who do not observe the whole product market. Publicly listed firms could anticipate privately held firms to act rationally to such unilateral coordination and internalize the externalities from the actions taken by the private firms.

We believe that these differences make financial disclosure an important mechanism to study from the antitrust perspective. In a paper related to ours, Goncharov and Peter (2015) find that when firms switch to internationally recognized accounting standards and thus increase the transparency of their segment disclosure, cartel members can more easily identify deviating peers and the cartel duration drops. We reverse the question and ask how

[4] A related example where government-mandated transparency has led to higher product prices is a Danish concrete case, studied in Albaek et al. (1991).

[5] FTC cases, cited in footnote (1), provoked legal discussion on whether SEC regulations that facilitate public disclosure are at odds with antitrust regulation (see, e.g., Steuer et al. (2011) for an extensive discussion). In *Credit Suisse v Billing*, the Supreme Court has ruled that where antitrust and securities laws regulate the same conduct and the application of antitrust law is "clearly incompatible" with the securities laws, the latter dominate and there should be no antitrust liability.

firms change their financial disclosure following exogenous variations in collusion costs.

Further, our paper relates to the literature that looks that the impact of product market collusion on various corporate policies. Dasgupta and Žaldokas (2016) and Dong et al. (2014) find that increases in collusion costs lead to changes in capital structure and acquisition activity. Gilo et al. (2006) study how partial cross-ownership stabilizes collusion while Azar et al. (2016b) and Azar et al. (2016a) document that common ownership of firms by large asset managers increases product prices in the airline and banking industries.

Finally, our results also speak to the literature on the real effects of disclosure. The purpose of the regulation that increases transparency in disclosure is to reduce information acquisition costs (Leuz and Wysocki, 2016). Empirical studies have studied the real effects of increased transparency in various settings, including food hygiene (Jin and Leslie, 2003), corporate investment (Biddle et al., 2009; Shroff et al., 2014), social responsibility in the mining industry (Christensen et al., 2016a), and health sector (Christensen et al., 2016b). In line with the concern raised by the OECD, cited at the beginning of the paper, our results take as step in the other direction and document a source of negative real consequences to more transparent financial statements that contribute to sustaining tacit coordination at the expense of consumer welfare. In terms of policy implications, our results suggest that regulators should take into account the potential adverse effects of financial statement transparency on consumer welfare when setting the level of mandatory disclosure.

3 Identification Strategy

3.1 Background of Leniency Laws

Given the importance of cartels and their anti-welfare implications[6], governments have devoted considerable resources in tackling them. One of the most effective tools has been the

[6] Connor (2014) estimates that worldwide consumer welfare loss due to discovered cartels has amounted to least $797 billion since 1990.

introduction of leniency laws. Leniency laws allow market regulators (or the courts) to grant full or partial amnesty to those firms that, despite being a part of a collusive agreement, cooperate in providing information about it. In particular, a typical leniency law stipulates that the first firm that provides substantial evidence to the regulators (if the latter do not yet have sufficient evidence to prosecute the cartel) gets automatic amnesty. In countries where the firm's managers, employees, and directors face criminal liability for participating in a collusive agreement, amnesty also extends to waiving such criminal liability. As suggested by Hammond (2005), U.S. leniency law, which was strengthened in 1993, proved successful in destabilizing existing cartels and deterring the formation of new ones and has thus inspired other countries to pass similar laws. In a difference-in-differences setting, Dong et al. (2014) show that the global wave of leniency law passage significantly harmed collusion. In particular, leniency laws increased conviction rates and generally lowered gross margins of affected firms. Appendix B reports the list of leniency law passage years around the world.

Although the laws are not passed in a vacuum and are arguably influenced by economic and political conditions in the respective countries, based on our reading of the online discussions and press announcements, countries do not seem to have followed one particular trend and reason for such law passage. Some countries passed the law after prominent collusion cases. For instance, Hungary did so after it faced significant criticism concerning its competition investigation against mobile telephone operators, while Switzerland made its competition law stronger in 2003, including the passage of leniency laws, after it failed to prosecute firms involved in the vitamin cartel. Taiwan passed the law as a response to general concerns about rising consumer prices.

Other countries passed leniency laws after significant pressures from the U.S., the European Union (EU) or supranational organizations (Lipsky, 2009). For instance, Mexico passed the law in 2006 following general recommendations of an OECD Peers Review in 2004 on Competition Law and Policy, which reported that its antitrust authority needs better investigative tools, including the ability to give leniency to a whistleblower revealing secret cartel

conduct. Similarly, the U.S. bargained for strengthening of Singapore's antitrust law in its negotiations for a bilateral free trade agreement. Moreover, the EU has fostered the adoption of leniency laws by its member states[7] and often seeks similar provisions in its bilateral association and trade agreements. The International Monetary Fund and the World Bank regularly ask for the overhaul of antitrust laws as a condition for funding (Bradford, 2012).

Even if not explicitly pressured, some countries passed the law after noticing its success in other countries. As more countries passed leniency laws, firms from non-passing countries could have been left at a disadvantage. For instance, Japanese companies involved in those international cartels that also affected the Japanese market faced a significant risk of causing an investigation in Japan even if they applied for leniency in the foreign jurisdiction. That hampered the Japanese antitrust authority's cooperation with authorities in other countries.

3.2 Increase in Collusion Costs

Against this background, we posit that no single particular trend has led to leniency law passages. We then create a treatment variable based on a U.S. firm's exposure to the passage of leniency laws in those countries from which the U.S. firm's industry gets a significant fraction of its imports. Similarly, as in the above-mentioned example of Japanese firms, the passage of more leniency makes the coordination between the antitrust authorities easier and firms that could consider colluding in multiple foreign markets might find it more difficult to form international cartels with industry peers. As it is easier for foreign rivals to apply for leniency in foreign markets, the passage of leniency law in another country increases the costs of collusion. Indeed, a lot of cartels are international: at least 1,014 suspected cartels, involving members from multiple countries, were either convicted of price fixing or under investigation during 1990-2013 (Connor, 2014). At the same time, U.S. antitrust authorities are also shifting focus on the investigations involving non-U.S. conspirators as these tend to

[7]EU also regulates collusion at a supranational level. Our main results hold if we treat the EU as one region and consider the later of either the adoption of the leniency law by the EU in 2002, or the year of joining the EU, as the relevant year for a particular EU country.

be larger in terms of impact to consumer welfare (Ghosal and Sokol, 2014).

As it is based on the political decisions made outside of the U.S., this continuous variable that we call *Foreign Leniency* should be exogenous to political and economic conditions surrounding U.S. firms. It is estimated as the weighted average of the passage of laws in all other countries, excluding the U.S.:

$$Foreign\ Leniency_{jt} = \sum_{k} w_{kj} L_{kt}$$

where k denotes a certain foreign country, j denotes a two-digit SIC industry, t denotes year. w_{kjt} is the share of two-digit SIC industry j's imports from country k out of all industry j's imports in 1990. L_{kt} is an indicator variable that takes a value of 1 if country k has passed a leniency law by year t, and zero otherwise. To avoid endogeneity of industry structures, we remove the time variation and base the weights on the data in year 1990. The variable ranges from 0 when leniency laws are not passed in any country with any market share in the firm's industry to 1 when all foreign countries with any share in the firm's industry have passed the leniency law. Unless no country from which a firm's industry is importing has passed a leniency law, a firm is considered as *treated*, and the intensity of treatment changes as more of the countries from which this industry imports adopt leniency law.[8]

3.3 Empirical Strategy

We use *Foreign Leniency* to identify a causal impact of increases in collusion costs on firms' disclosure choices. In particular, we estimate the following model, reminiscent of the difference-in-differences specification:

[8] In Section 5.3, we use alternative weighting schemes, for instance, by weighting according to the export shares, adopting a binary treatment based on the foreign country to which the industry is exposed most, or only using the weights based on the imports of final goods. The latter scheme should minimize such concerns that imports might be intermediate goods used for the production of the final goods of U.S. firms in the same two-digit SIC industry, and so there is little scope for horizontal collusion.

$$Disclosure_{ijt} = \beta_0 + \beta_1 Foreign\ Leniency_{jt} + \theta X_{ijt} + \kappa Z_{jt} + \alpha_i + \gamma_t + \epsilon_{ijt} \quad (1)$$

where i indexes the firm, j denotes a two-digit SIC industry, t denotes year. Equation (1) essentially represents a difference-in-differences specification where the estimate on *Foreign Leniency* captures the effect on increased exposure to foreign leniency laws on various firms' disclosure choices relative to a control set of firms that do not have an exposure to these foreign laws since their industries have less trade with these law-passing countries. In this baseline model, α_i denotes firm fixed effects, which deal with firm-level time-invariant omitted variables, and γ_t year fixed effects, which account for unobserved heterogeneity that varies across time (e.g., macroeconomic shocks). X_{ijt} and Z_{jt} correspond to vectors of firm-level and industry-level control variables, respectively, described in the next section. Since our treatment variable that captures plausibly unexpected changes in collusion costs is defined at the industry level, we cluster standard errors by industry (Bertrand et al., 2004).[9]

We now conduct two tests to assess the validity of our identification strategy and specifically to test whether our measure captures the increase in collusion costs. We first examine whether *Foreign Leniency* is associated with more cartel convictions in the future years. We obtain information on convicted cartels from the Private International Cartel database on cartel sanctions (Connor, 2014), which covers all major international cartels discovered, disclosed and sanctioned by regulators since 1986.

We conduct our tests based on the two-digit SIC industry-year panel data, where the industry is defined according to the cartel market specified by the antitrust authorities. In performing the analysis at the industry level we also capture privately held firms. Specifically, we calculate the number of cartels or firms that are convicted in each industry-year, and estimate the relationship of the number of convictions with the increase in the collusion costs, controlling for year- and industry-fixed effects. The control variables are based on

[9]Our results remain unaffected if we cluster standard errors by firm instead.

the sample average of the publicly-listed firms for each industry-year. Results, reported in Panel A of Table 2, show that *Foreign Leniency* is positively associated with the conviction and dissolution of cartels, in line with the expectation that the leniency laws help antitrust authorities uncover the cartel.

We further motivate our identification strategy by investigating the impact on firms' operating performance of the increase in collusion costs caused by the passage of leniency laws in other countries. We estimate our empirical model, Equation (1), on the U.S. Compustat universe firm-year panel data over the 1994-2012 period and report results in Panel B of Table 2. We use gross profit margins as the dependent variable in columns (1) to (3) and sales in columns (4) to (6). Similar to Dong et al. (2014), we document that both profit margins and sales figures drop, suggesting that increased cost of collusion led to an increase in competition and thus adversely affected firm performance.

4 Sample Selection and Main Measures

4.1 Sample Selection

Our sample on firm disclosure strategies is based on all Compustat firms incorporated in the U.S. from 1994 to 2012. We exclude financial firms (SIC codes 6000-6999), utilities (SIC codes 4900-4999), and firms with total assets smaller than 0.5 million dollars. We then exclude firm-years that are not covered by EDGAR filings database, from which we construct our measures of disclosure of material contracts.

4.2 Disclosure Measures

Disclosure through material contracts. We start with the type of disclosure that might benefit rivals the most - we look at how firms disclose their material sales contracts. To the extent that such contracts contain substantial amount of proprietary information, including transaction prices, transaction volumes, product quality, we test whether firms communi-

cate with their cartel peers by revealing more information. The material contract is filed as Exhibit 10 and could be identified in a current report or period report by searching for EX-10(.XXX). We extract all the material contracts from SEC filings, and exclude contracts that are identified as contracts not related to product sales (e.g., employment contracts, stock purchase, purchase of accounts receivable, purchase of assets). We then search for "confidential treatment", "confidential request" and "confidential... redacted" in the file to identify the confidential request by the firm (Verrecchia and Weber, 2006; Boone et al., 2016). We could identify 414 unique firm-year filing material sales contracts with required information over 2000-2012. *Redacted Contracts* is then defined as a binary variable capturing whether requests for confidential treatment of at least one material sales contract in the particular year. We also provide results for *%Redacted Contracts* which is the ratio of the number of requests for confidential treatment in the particular year over the total number of filed material sales contracts. In both cases, we exclude the firms that do not disclose material contracts from the analysis.

Information about major customers. Firms are required to disclose the customer's identity as well as the amount of sales to the customer if a customer is responsible for more than 10% of the firms' annual revenues. Compustat Segment database gathers information on the sales to and identities of customers from the firms' original filings to SEC. However, it is not uncommon that firms redact the identities of their major customers, even though they explicitly claim that there are indeed major customers responsible for a large proportion of the firms' revenues (Ellis et al., 2012). For instance, firms sometimes announce that there are several major customers without disclosing the name of their customers. We manually check whether the customer's name is redacted, and construct a variable, *%Redacted Customers*, as the proportion of the records where the customer's name is redacted and the sale to the customer is positive for each firm-year.[10]

[10]There are 155 cases where a firm is not covered by Compustat Segment data in a particular year but discloses its major customers in the prior ten consecutive years. We set the value of *%Redacted Customers* as one for the cases by assuming that the firm is supposed to reveal information about its customers but redacts both the identity of and the sales to its customers. Our results continue to hold if we exclude such

Conference calls. We also examine firm's earnings conference calls with the analysts. Specifically, we focus on the presentation by CEO and CFO during earnings conference calls and require the script to contain at least 150 words. Our measure, *%Product Conference Calls*, then counts the frequency of product-market-related words in the script and scales them by the total number of words in the script times 1000. Such list of product-market-related-words is same as used in constructing *%Product* and includes: "price", "pricing", "prices", "priced", "discount", "product", "products", "service", "offering", "offer", "customer", "customers", "client" and "clients". In the case of "price" and "prices", we exclude the instances where either "share" or "stock" are mentioned in the same sentence, in order to avoid capturing the instances where the discussion revolves around firm's share price. In the cases when there are multiple conference calls for a firm in a given year, we take the average value of the measure over the year.

Description of competition. In order to rule out some alternative explanations, we explore two measures of competition disclosure. Our main measure in this context, *%Competition*, hinges on the management's reference to competition in the MD&A section of the 10-K filing. Inspired by Li et al. (2013) and Bushman et al. (2016), we count the frequency of occurrences of the competition-related words, including those words with an "s" appended, and scale them by the total number of words in the 10-K filing. We assume that the number of mentions of the competition-related words is positively correlated with the overall discussion about the competitive environment in firms' 10-K filings.[11] Unlike Li et al. (2013), we consider all instances of competition-related words and do not restrict our count to positive instances. We do so because we consider that it is the overall discussion related to competition, regardless of its sentiment, that matters to antitrust agencies.

Concentration of competition words. Our second measure on competition disclosure, *Competition Noise* is the concentration of the reference to competition words in the MD&A section

observations, or if we vary the threshold of ten years.

[11] Indeed, Li et al. (2013) find that the disclosed amount of competition in financial statements is related to firms' market structure. In line with our results, they also suggest that in certain industries managers might strategically distort the disclosure about competition.

of the 10-K filing. In some cases, management discusses their competitive environment predominantly in separate subsections (e.g. "Section X. Competition"), while in other cases the competition related words are dispersed across the text. We posit that a separate subsection on competitive environment can help outsiders better to understand the competitive environment that the firm faces, as compared to when the same number of words is dispersed across the text. For each paragraph of the 10-K filing's MD&A section, we calculate the proportion of competition-related words over the total number of words in the paragraph. Next, across all paragraphs, we pick the maximum value of such proportion of competition-related words. We require that the MD&A section has at least 150 words, and also require that the paragraph itself has at least 15 words, in order to exclude the cases that correspond to the titles (e.g. "Section X. Competition") as this would inflate the value substantially. We then define a binary variable, *Competition Noise*, which equals to one if this maximum value of the proportion of competition related words is larger than 2.7%, which corresponds to 80% in the sample distribution. Our results are robust if we use 5% as the cutoff.

4.3 Additional Variables

In our specifications, we control for time-varying firm characteristics. We use the returns on assets (ROA) to proxy for profitability and the size of assets to proxy for firm size. We next include the industry concentration ratio, as proxied by Herfindahl-Hirschman Index of the two-digit SIC industry, as prior studies have shown that it drives voluntary disclosure (e.g., Ali et al., 2014). In untabulated results, available on request, we show that our main conclusions are robust if we measure the industry concentration ratio based on U.S. Census data (Ali et al., 2009). We also control for the import penetration at the industry level to address the potential issue that the results are driven by the trade policy changes rather than the passage of leniency laws (Dasgupta and Žaldokas, 2016).

In some robustness tests we also control for the actual change in the product market strategies. We proxy for this by counting the instances of firm's new client announcements

in public news sources, based on the CapitalIQ Key Development database, which gathers information on from more than 20,000 public news sources, company press releases, regulatory filings, call transcripts, and investor presentations. Appendix C lists all variable definitions.

5 Empirical Findings

5.1 Main Results

We now turn to our main research question on how firms change their disclosure choices when costs of collusion rise. The passage of leniency laws makes explicit collusion more costly, and, as we have just demonstrated, leads to the dissolution of cartels. One could argue that firms now face a more fiercely competitive environment and they are less likely to disclose proprietary information. Alternatively, as we argue in this paper, they might shift from costly explicit collusion to tacit coordination in product markets. Under this scenario, firms then have incentive to disclose more proprietary information to communicate with their cartel peers and facilitate tacit coordination.[12]

Our first and main measure on how firms share information about the customers in their financial disclosure documents is based on how firms redact their material sales contracts with customers. These contracts contain substantial information on firm relationships with customers, including the price, quality, and quantity of products to be provided, as well as the identity of the customers. Such information can be helpful for rivals in coordinating product market strategies. While firms are required to file their *material* sales contracts with the SEC, they have considerable discretionary power in determining the threshold of what constitutes to be treated as a material contract, and this makes the disclosure of these

[12]Thus, our estimates are identified on the subpopulation of firms for which explicit collusion strategy dominates tacit coordination which dominates outright competition. The presence of such firms is based on two assumptions. First, we assume that if explicit collusion was legal, because of direct information exchange it would be easier to implement and monitor relative to tacit coordination without direct information exchange (Fonseca and Normann, 2012; Awaya and Krishna, 2016). Second, if firms could previously sustain explicit collusion, it is likely that they would prefer tacit coordination over switching to outright competition.

contracts somewhat voluntary. We follow Verrecchia and Weber (2006) and examine how often firms request for confidential treatment in filing material sales contracts.

We check whether *Foreign Leniency* is associated with fewer requests for the confidential treatment. Our findings are tabulated in Table 3. Columns (1)-(3) use *Redacted Contracts*, which is a binary variable capturing a firm requesting confidential treatment in any sales contract in the year, and columns (4)-(6) use *%Redacted Contracts*, the proportion of contracts that request confidential treatment in the year, as the dependent variable.

Column (1) and column (4) present the tests where we only control for year- and firm-fixed effects. We find that firms conceal less information about the product market through sales contracts. Columns (2) and (5) further include a set of covariates to control for firm and industry characteristics. Our results are robust. They are also qualitatively similar if we control for headquarter state-year-fixed effects, as displayed in columns (3) and (6). To understand the magnitude of our estimate, we select the industry that is the most exposed to each foreign law in our sample. Focusing on these most exposed industries, each adoption of leniency law explains, on average, 19% of within-firm variance.

Overall, these results of increased information exchange following increased costs of explicit collusion can also be explained by the firms moving from explicit collusion to tacit coordination. That said, this increased communication about the customers might also be the continuation of the previously entered explicit collusion arrangements. Since the firms do not want to risk conducting explicit meetings, they could continue communicating via the public disclosure. We cannot rule out this alternative explanation but this is consistent with firms increasing public information exchange to coordinate their actions.[13]

[13] Also, we do not necessarily claim that firms collude around the product prices revealed in these particular contracts. In fact, they do not even need to collude in this product market for this information to be helpful in coordinating product actions. The firms might compete in multiple market segments. For instance, one segment could deal with large customers and the other with atomistic small customers. If the firm wants to collude with the rival in the atomistic customer market, it could signal this intent by revealing contracts with the large customer. This signalling is costly as rival can now undercut the firm on the large customer segment if the firm deviates from the collusive price. The tacit collusion in the atomistic customer market is then sustained by the firm knowing that it will be undercut in the large customer market and this costly additional punishment in large customer market stabilizes collusion in the atomistic customer market.

5.2 Heterogeneity

If our hypotheses are correct, we should observe that the impact of the passage of leniency laws differs across affected firms in predictable ways (Angrist and Krueger, 2001). We expect our results to be stronger when a firm finds it easier to coordinate product prices or quantities with its peers. We develop three proxies to measure the difficulty to collude.

Our first cross-sectional characteristic is the stability of an industry. We posit that firms in stable industries are more ready to collude with their peers. For instance, collusion is harder to sustain in periods of high demand because in such periods firms are more tempted to deviate as the deviation gain is the highest (e.g., Rotemberg and Saloner, 1986; Kandori, 1991). We use the industry average of sales growth as the proxy for maturity of an industry, and define a binary variable, *Maturity*, equaling to one if the industry sales growth falls in the lowest quartile of the sample distribution. The results are presented in Table 4, column (1). As predicted, the impact of increase in collusion costs on firms' decisions to redact information in their sales contracts are more pronounced in stable industries.

Second, we look at whether our results vary by the homogeneity of a firm's products. The ability of firms to collude in restricting output or raising prices in repeated games is significantly impacted by the differentiability of the firms' product (e.g., Singh and Vives, 1984) and thus we should find a stronger result for the firms that have peers with more similar products. We obtain the information about product similarity score between each firm pair from Hoberg and Phillips (2010). We define a binary variable, *Differentiation*, which equals to one if the number the firm's peers with similar products falls in the lowest quartile of the sample distribution. A peer is defined as having similar products with the firm if the product similarity score between the peer and the firm is larger than 0.046, which is the median product similarity score between each firm pair in the sample. As shown in column (2), the results are weaker for firms with differentiated products.

Finally, we examine whether our results vary by the market structure. We posit that concentration facilitates either explicit collusion or tacit coordination. We use the four-digit

NAICS industry concentration measure calculated by U.S. census as the proxy for industry concentration level. As shown in column (3), the results are stronger for firms in concentrated industries, consistent with the claim that it is easier to collude in concentrated markets.

5.3 Robustness of Foreign Leniency Measure

We further provide additional robustness tests, pertaining to our main measure of the foreign leniency law passage. *Foreign Leniency* was so far constructed as the weighted average of the passage of the leniency laws in other countries with weights equal to the share of a two-digit SIC industry's imports from the other countries. We now re-construct our measure of collusion costs based on different weighting schemes. Then, we provide the analysis based on the binary assignment of the treatment to different industries.

5.3.1 Weighting Schemes

In Table 5, Panel A, column (1) we reestimate the measure at the three-digit SIC industry level by setting the weight as the share of the *three-digit* SIC industry's imports from other countries in 1990. Second, in column (2) and (3), we report the results based on the *export-based Foreign Leniency* by using as the weight the share of exports of each two-digit or three-digit SIC industry from U.S. to any other countries. If a firm's industry exports a lot to a certain country, it is likely that this country is an important product market for firm's industry. Lastly, one could be concerned that our default weighting scheme is capturing vertical rather than horizontal collusion[14] since imports might be intermediate goods while U.S. products in the same two-digit SIC industry might be final goods. In column (4), we present the results on *Foreign Leniency* recalculated according to the weights based on the imports of only the *final* goods.[15] Our results are consistent using various weighting schemes.

[14]While our arguments equally hold for vertical collusion cases, we would like to check whether our results are consistent if we limit the analysis to the potential horizontal collusion with rivals.

[15]We gather the information about the imports of final goods from World Input-Output Database, available at http://www.wiod.org/database/int_suts13. Because of data availability, we use the import data in 1995 to compute the weight. We convert the International SIC to U.S. SIC using the concordance table provided

In Table 5, Panel B, columns (1) and (3), we further abstract from the industry effects by constructing our measure of collusion costs at the three-digit SIC industry level, adjusted by the two-digit SIC industry level. Specifically, we construct the measure *Adj. Foreign Leniency*, which is the difference between the measure based on the weights of industry's imports (exports) from (to) other countries defined at the three-digit SIC level and the respective measure based on the weights at the two-digit SIC level. In columns (2) and (4), we further construct the measure $\sum_k (w_{SIC3} - w_{SIC2}) L_{kt}$ by setting the weight as the share of the three-digit SIC industry's imports (exports) from a country minus the share of the two-digit SIC industry's imports (exports) from (to) the country. We provide results separately based on export and import based measures. Our conclusion that firms redact less information in their contracts after the increase in collusion costs continues to hold using these alternative measures of increased collusion costs.

5.3.2 Binary Treatment

We further perform the robustness tests by assigning a binary treatment instead of the continuous measure. This allows us to implement a more standard difference-in-difference estimation of staggered assignment of treatment. Moreover, a binary treatment would also let us perform a matched sample analysis and show the treatment effect in a graphical form.

We start this analysis based on a matched sample. In particular, for each foreign country passing the law, we look at whether there is a three-digit SIC industry for which this foreign country falls in the top tertile by imports (across all industries and countries). If there is such an industry, which we call *treated industry*, we look for a control group. As a control group, we use other three-digit SIC industries that are within the same two-digit SIC industry group but do not fall into top tertile by imports, i.e. these industries are never considered to be treated by our binary treatment assignment. In cases, where we find multiple matched industries, we keep the one with the closest import volume.

by Jon Haveman. The mapping between ISIC and SIC as well as the lack of data for all foreign countries introduces additional noise in our weights and so we prefer our default weighting scheme based on *all* imports.

We present the results using the matched sample in column (1) of Table 5, Panel C. We find a significant decrease for firms falling in the treated group, as compared to the control group, after the most important country for the firms' industry passes the leniency law.

In columns (2)-(4), we continue with the difference-in-difference estimation. Here, for each three-digit SIC code, we select the country that is the most important in terms of import volume from the country to that industry. In this set of analysis, each industry starts to get treated just once over the sample period. In particular, an industry is categorized as *treated industry* starting with the year when the most important country to that industry adopted the law. We then define a binary variable, *Binary Foreign Leniency*, that is set to one for treated industry after the adoption of the law, and zero otherwise. Our results are tabulated in column (2) of Table 5, Panel C. In line with our previous findings, the coefficient on *Binary Foreign Leniency* is negative and statistically significant at 1% level.

Lastly, we perform two additional falsification tests. We first define a pseudo adoption year as four years before the actual adoption year and re-run our estimation. As expected, the results displayed in column (3) of Table 5, Panel C, show that the pseudo adoption of the foreign leniency law actually has a negative though statistically insignificant effect on the contract redaction. The latter effect might come from a later start of the sample for this data, i.e. 2002. In any event, these results give confidence that our main estimates are not driven by long-term industry trends. Second, we change the definition of *Binary Foreign Leniency* in column (1) by replacing the main country in terms of imports with the least important country in terms of imports when defining our treated industries. Specifically, for each three-digit SIC industry, we select the country that is the least important in terms of volume of imports from the country to the industry. An industry is categorized as treated starting from the year when the least important country to the industry adopted the law. If there is little or no trade between the industry and a country, the passage of a leniency law in this country should have little impact on U.S. firms' collusion costs. As shown in column (4), we again fail to find significant changes in disclosure behavior.

5.4 Other Disclosure

Finally, we study two alternative types of disclosure that could be useful in colluding in the product markets. We look at the redaction of information on key customers as well as the product market discussions in the earnings' conference calls with equity analysts.

These measures complement our redacted contract findings as all three measures have advantages and disadvantages. Conference call data is useful in so far it provides the disclosure of product market strategies and thus validates the evidence on sales contracts on a larger sample. Moreover, they capture different aspects of tacit coordination. While sales contracts include actual price and quantity data that could become focal points in coordination, it might take time to establish trust between the peers. Instead, conference calls might involve invitations to collude, which could facilitate such coordination[16] On the other hand, one could argue that conference call data is harder to interpret as the communication in conference calls could be manipulated to deceive rivals after the increase in competition. Meanwhile, sales contract redaction and redaction of customers do not suffer from possible biases of untruthful disclosure. Customer redaction data also provides a larger sample but has less precise information about product market strategies (i.e., no price or quantity disclosure but just the aggregated sales per customer), compared to redacted contract data.

5.4.1 Redacted Customer Identities

First, we examine whether firms are less likely to redact the identity of their major customers. Firms are required to disclose both the identity and the sales to a customer if such sales represent more than 10% of firm's total revenues. In practice, it is, however, not uncommon that firms redact the identity of their customers. Revealing information about the identity of the major customers of a firm benefits other players in the product market by facilitating approaching these customers, estimating the productive capacity of the disclosing firm, forecasting the customer demand, and inferring price-cost margins (Ellis et al., 2012).

[16] Overt invitations to colude can also be interpreted to violate Section 5 of the FTC Act.

We calculate the proportion of customers that are redacted for each firm-year in the Compustat Customer Segment database, and construct the variable *%Redacted Customers*. We then estimate our baseline model using *%Redacted Customers* as the dependent variable and display results in Panel A of Table 6. We find a significantly positive association between *Foreign Leniency* and *%Redacted Customers*. This implies that firms redact less and thus increase the disclosure about their customers after the costs of explicit collusion rise.

In terms of economic significance, each adoption of foreign leniency law explains, on average, 1.92% of within-firm variance in the decision to redact information about customers in the industries that were most exposed to the foreign country passing the law.

5.4.2 Conference Calls

Second, we examine how managers discuss product market-related topics during earnings' conference calls with the equity analysts. Industry peers can listen to the discussions over conference calls and adjust their product strategies accordingly. Hence, in their statements managers could voluntarily disclose information that would be useful to tacitly coordinate with industry peers. We predict that an increase in collusion costs should lead to an increase in discussion about product markets during conference calls. The results of our estimations are tabulated in Panel B of Table 6. We find evidence that an increase in collusion costs is accompanied by an increase in managers' discussions about customer-related topics during earnings conference calls. Such result, albeit only significant at the 10% level, is in line with recent investigations by the FTC based on conference calls discussions about product prices (i.e., Valassis Communications (FTC File No 051 0008), and Matter of U-Haul Int and AMERCO (FTC File No 081-0157)).

One could argue that one of the reasons firms changed discussion of the customers is that their product market strategies, e.g. towards acquiring new customers, changed beyond what can be captured by *HHI* or *Import Penetration* measures of product market competition in the industry. We try to control for this explicitly by relying on the data on

new customer announcements from Capital IQ Key Development database, which gathers information from more than 20,000 public news sources, company press releases, regulatory filings, call transcripts, and investor presentations. Due to an incomplete match between the two datasets, the sample size is reduced. We report results for the specifications where we control for new customer announcements in Internet Appendix Table $A1$. While we find that a lagged number of new customer announcements is indeed associated with more discussion on customers during the conference calls, *Foreign Leniency* remains statistically significant.

All in all, the results in this section agree to our earlier finding that after explicit collusion costs increase, firms increase their information disclosure about their customers. A larger sample for customer redaction and conference calls lets us perform an additional test that provides supportive evidence for our findings. In Internet Appendix Table $A2$, we show that firms coordinate public disclosure on the product market strategies within industries. We check whether peer average *%Redacted Customers* within industry is correlated with the firm's own measure. While we do not claim the presence of peer effects and indeed unobservable factors might be driving the correlation between the average industry trend and the firm redaction of its customers (Manski, 1993; Gormley and Matsa, 2014), we find that such within-industry correlation is indeed present and becomes stronger when *Foreign Leniency* increases. We find a similarly strong interaction effect for the customer related disclosure during conference calls, again suggesting some implicit coordination of the disclosure. This suggests that not only do firms move together in their disclosure of individual product market data but that such tendencies are facilitated by *Foreign Leniency*, in line with the tacit coordination interpretation.

5.5 Economic Consequences

Finally, we look at whether the changes in disclosure have any economic consequences. First, we look at firm profitability. For the ease of exposition, we again use binary treatment. In Figure 1, we show that firms that redacted fewer customer identities experienced increased

profitability over three years after the foreign leniency law, as compared to the firms that did not redact customer identities. The differences between the two trends are statistically significant. While this figure does not establish causality, it provides important correlation that firms which adjusted disclosure have experienced better outcomes in product markets.

Moreover, the underlying assumption throughout our analysis has been that increased explicit collusion costs lead firms to disclose additional valuable information. If such additional information is useful, it should reduce adverse selection in financial markets (e.g., Leuz and Verecchia, 2000). In line with this prediction, in Internet Appendix Table *A*3, we demonstrate the association between *Foreign Leniency* and common industry-level measures of liquidity, i.e. a drop in bid-ask spread and an increase in the stock turnover.

6 Antitrust Action

The findings that firms increase information provision on their product market strategies following increased costs of explicit collusion can also be explained by them having to raise more equity capital (indeed, shown by Dasgupta and Žaldokas (2016)) and thus aiming to provide more precise information to the investors. Following this argument as well as the result in the previous subsection on stock liquidity, we might be simply identifying higher information provision to investors without any concern of product market strategies.

We provide preliminary evidence on this alternative explanation by looking at whether a firm's profitability depends on its industry peers redacting little information from the customer contracts. If industry peers redact little and this negatively affects firm profitability, it is likely that the effect comes from peers pursuing more aggressive competitive strategies, funded by externally raised capital. Alternatively, if the peers redact little and this positively affects firm profitability, it is likely that the redaction helps to sustain collusion by raising average industry profits. In Internet Appendix Table *A*4, we test this by creating a dummy *Less Redacting*, capturing whether the industry level redaction of customers' identity falls

in the lowest quartile of the sample distribution. We show that while in general the effect of *Less Redacting* is negative, the coefficient of the interaction term with *Foreign Leniency* is positively significant. The joint test suggests that the sum of the coefficient of *Foreign Leniency* and of the interaction term is not different from zero, indicating that when collusion costs increase industry peers' redaction does not have a negative effect on firm profitability.

We further investigate this potential alternative explanation in a more extensive way by looking at whether the firms increase *all* information on competitive environment and their product market strategies after the explicit collusion costs increase. If the increased disclosure is an outcome of the attempts to provide more information to investors, the firms should also provide more information on the competitive environment.

To rule out the explanation that firms increase information on competition on all dimensions, we look for the type of disclosure that is less useful in coordinating product market strategies and could be useful for investors (Li et al., 2013) but could also have an additional cost that it can be used by antitrust authorities to understand which industries are more likely to show signs of collusive behavior. Assuming that the antitrust authorities operate under budgetary constraints and cannot continuously screen all product markets, precise self-reported information on the product markets coming from financial disclosure documents might act as a signal to start investigations. While such information is unlikely to be used as evidence of collusion, more precise disclosure about the industry might bring some firms into the spotlight and contribute to initiating more serious antitrust investigations. So, when antitrust authorities gain better tools to investigate and convict cartels, and thus the costs of explicit collusion increase, firms might start reducing the precision of such information disclosure, which is otherwise valuable to the investors to get a better sense of the firm's operations. On the other hand, if they are not concerned about antitrust authorities and are instead pursuing expansion strategies by raising more capital and thus providing more information to investors, they should rather increase discussion on competition.

We explore management's reference to firm's competition in its 10-K filings. We proceed

as follows. First, we show that antitrust authorities indeed pay attention to the 10-K filings and, second, we show that *Foreign Leniency* is negatively associated with both references to competition in 10-K and how dispersed such discussion on competition is throughout 10-K filings, rebutting the alternative explanation that after the costs of collusion increase firms are not concerned about the collusion in product markets and increase the disclosure primarily to provide more information to investors.

6.1 Antitrust Authorities and 10-K Documents

We start by investigating whether antitrust regulators use firms' publicly disclosed financial information by looking at how frequently they access firms' 10-K filings through EDGAR. We obtain the server request records from the EDGAR Log File Data Set available on SEC Web servers. The EDGAR Log File Data Set is available from 2003 onward and contains information including the client IP address, timestamp of the request, and page request. We focus on the records of requests to HTML file types, as they are more likely to be accessed by users who are viewing the data through a web browser. We then link the log file to the EDGAR Master File and gather the information about the form type and filing date of the files that a user accesses.[17] We then define a binary variable, *Regulator Viewing*, which equals one if the 10-K filing filed during the year is accessed through the IP associated with the Department of Justice or FTC within one year following the filing date. Results are presented Table 7, columns (1)-(3). We find consistent results that internet traffic to 10-K filings that could be associated with antitrust regulators increases following higher antitrust regulatory powers. We further examine regulators' access to other types of filings to SEC, not limiting to 10-K filings, and repeat the analysis. These results, reported in columns (4) to (6), draw similar conclusions.

[17]We exclude years 2005 and 2006, as the daily EDGAR log files from September 24, 2005 to May 10, 2006 are labeled by SEC as "lost or damaged" (Loughran and McDonald, 2017). Our results are not affected materially if we include these two years.

6.2 Competitive Environment

We now show how firms change their disclosure on competition when the explicit collusion costs rise. Columns (1)-(3) in Panel A of Table 8 display results based on our first measure of competition disclosure. We use the same specification as with *Redacted Contracts*, starting with the effect without any controls, then continuing with the specification that controls for firm characteristics and finishing with the specification that also controls for state trends. We find that the *Foreign Leniency* is negatively associated with the reference to competition in 10-K and the effect is statistically significant at 1% level. In order to interpret economic magnitude, for each foreign law we select the industry that is the most exposed in terms of trade. We find that for each foreign law the increase in collusion costs explains, on average, 3.40% of within-firm variance of disclosure for those firms.

These findings suggest that in situations where antitrust authorities might find it helpful to discern the degree of competition when they seek to fight anticompetitive activities, firms adjust the disclosure accordingly to minimize chances of the potential investigation and thus reduce proprietary costs stemming from fines and lower cash flows. This goes against the alternative explanation of our earlier findings that firms increase disclosure on competitive activities primarily to raise more capital.

We provide robustness for these results. Specifically, we provide similar robustness checks as we did for *Redacted Contracts* by re-constructing our measure of collusion costs based on various weighting schemes and providing the analysis based on the binary assignment of the treatment to different industries. We report our results in Internet Appendix Table $A5$, Panels A-C, following the same structure as Table 5.

Moreover, using data on actual convicted cartel activity from Connor (2014), we show that firms' disclosure policies during the cartel period was associated with higher probability that antitrust agencies uncovered these price-fixing activities. In Panel B of Table 8, we show the correlation between firms' past disclosure about their competitive environment and cartel convictions. This result, which is in line with the better identified finding in

Panel A, suggests that antitrust authorities benefit from the disclosure on firms' competitive environment in convicting cartel activities.

On their behalf, firms that reduced their disclosure on competition had a smaller decrease profitability over the period following the increasing costs of collusion. Figure 2 follows the same methodology as Figure 1 and shows that firms that reduced *%Competition* over three years after the foreign leniency law have indeed experienced a lower drop in profitability.

We next investigate whether firms disclose information about competitive environment in a more dispersed fashion. Columns (4) to (6) in Panel A of Table 8 display results based on our second measure of competition disclosure, *Competition Noise*. We find consistent results that the *Foreign Leniency* is significantly negatively related to the concentration of the reference to competition in the MD&A section of 10-K filing, indicating that firms start spreading out the information about their competitive environment.[18]

Taken together, results in this section imply that management responds to increased collusion costs by concealing their true perceived competition position and making the disclosure about their competitive environment more fuzzy. Both of these disclosure components have little new information to the rivals who observe each other in the product markets but can be useful to investors and antitrust regulators.

7 Conclusion

Despite its benefits, greater transparency in the financial markets might also produce anti-competitive effects by facilitating collusion in the product markets. This paper presents empirical evidence that changing incentives to form illegal price-fixing cartels alter how firms talk about their product market strategies in their financial disclosure documents. We suggest that in addition to financial market participants financial disclosure also benefits

[18]One concern of the latter result could be that our results are driven by MD&As without any reference to competition-related words and thus are similar to the results based on %Competition. To mitigate this concern, we limit the sample to MD&As referencing to at least one competition related word, repeat the analysis, and find consistent results.

other audiences and in particular some information helps firms tacitly coordinate product market behavior with their rivals.

Our identification strategy exploits the wave of passages of leniency laws around the world. These laws made it easier for firms to get amnesty if they submit evidence about their complicity in the cartels and thus had a strong effect on cartel convictions and breakups. We study the effect of foreign leniency law passage on the U.S. firms and first confirm that such foreign laws reduced U.S. firms' gross margins, increased cartel convictions, and thus arguably increased costs of explicit collusion.

We find that such higher costs of collusion induced firms communicate differently about their customers and product pricing in their financial disclosure documents. Firms were less inclined to request for confidential treatment in filing material sales contracts they sign with customers. Also, they redacted fewer identities of their major customers in mandatory disclosure documents and discussed more about the product market strategies during their earnings' conference calls with equity analysts. Thus, with higher costs of explicit collusion firms shifted from a more explicit collusion to a more tacit coordination equilibrium, where some coordination among peers is implemented through public information disclosure.

Echoing OECD's concerns that higher transparency might have negative welfare effects, we show that firms adapt their disclosure strategies when they find it harder to form explicit cartels. These results have important policy implications, suggesting that financial disclosure rules should take into account potential externalities to antitrust enforcement, and calling for more regulatory cooperation.

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Table 1: Summary Statistics

This table displays the summary statistics for the variables employed in the main specifications. We report the number of observations, mean, standard deviation, 10th, 25th, 50th, 75th and 90th percentiles for each variable. The variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels.

Variables	N	Mean	SD	P10	P25	P50	P75	P90
Foreign Leniency	26,837	0.075	0.072	0.000	0.020	0.060	0.113	0.212
%Competition	26,837	1.308	0.761	0.508	0.817	1.181	1.643	2.223
Competition Noise	19,688	0.126	0.332	0.000	0.000	0.000	0.000	1.000
Redacted Contracts	414	0.534	0.499	0.000	0.000	1.000	1.000	1.000
%Redacted Contracts	414	0.511	0.489	0.000	0.500	1.000	1.000	1.000
%Redacted Customers	17,677	0.396	0.426	0.000	0.000	0.25	1.000	1.000
%Product Conference Calls	9,249	14.026	7.921	4.396	8.036	13.031	18.937	25.044
Gross Margin	26,095	-0.132	0.468	-0.555	-0.176	0.016	0.083	0.152
Sales	26,095	4.538	2.552	1.293	2.867	4.576	6.296	7.814
ROA	26,837	-0.174	0.579	-0.668	-0.205	0.014	0.084	0.156
Size	26,837	4.732	2.207	1.926	3.152	4.576	6.211	7.742
HHI	26,837	0.060	0.041	0.032	0.035	0.045	0.062	0.113
Import Penetration	26,837	0.309	0.225	0.080	0.150	0.260	0.443	0.593

Table 2: Validating the Measure of Increased Collusion Costs

The table presents the validity tests for *Foreign Leniency* as our measure of increased collusion costs. The sample consists of U.S. Compustat firms over 1994-2012. Panel A investigates the relation between the exposure to foreign leniency laws and the convictions of cartels, based on the two-digit SIC industry-year panel data. The dependent variable in column (1) is the number of convicted cartels in the two-digit SIC industry, and in column (2) it is the number of convicted firms in the two-digit SIC industry. Panel B presents the OLS regression relating firm performance to the exposure to foreign leniency law. The dependent variable in columns (1) to (3) is the gross profit margin, and in columns (4) to (6) it is the net sales. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Columns (1), (2), (4) and (5) report results controlling for firm- and year-fixed effects. Columns (3) and (6) reports results controlling for firm- and headquarter-state*year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel A: Cartel Dissolution

	Convicted Cartels	*Convicted Firms*
	(1)	(2)
Foreign Leniency	1.315**	2.596**
	(0.569)	(1.135)
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	378	378
Adjusted R-squared	0.206	0.159

Panel B: Firm Performance

	Gross Margin			Sales		
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Leniency	-0.535*	-0.503*	-0.549**	-1.587***	-0.843**	-0.947***
	(0.296)	(0.266)	(0.239)	(0.466)	(0.324)	(0.310)
Lagged ROA		0.089***	0.089***		0.253***	0.247***
		(0.006)	(0.007)		(0.005)	(0.009)
Lagged SIZE		0.016	0.014		0.649***	0.647***
		(0.016)	(0.015)		(0.018)	(0.017)
HHI		-0.218	-0.231		0.128	-0.063
		(0.223)	(0.158)		(0.753)	(0.677)
Import Penetration		0.025	0.021		-0.032	-0.029
		(0.017)	(0.013)		(0.024)	(0.024)
Year FE	Yes	Yes	No	Yes	Yes	No
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	No	No	Yes	No	No	Yes
Observations	26,095	26,095	26,095	26,095	26,095	26,095
Adjusted R-squared	0.703	0.709	0.708	0.925	0.949	0.949

Table 3: Foreign Leniency Law and Redacting Information in Contracts

The table presents results from OLS regressions relating redaction of information in material contracts to the exposure to foreign leniency laws. The sample consists of U.S. Compustat firms that ever filed material contracts to SEC over 2002-2012. The dependent variable is *Redacted Contracts* in columns (1) to (3) and it is *%Redacted Contracts* in columns (4) to (6). Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Columns (1), (2), (4) and (5) report results controlling for firm- and year-fixed effects. Columns (3) and (6) reports results controlling for firm- and headquarter-state*year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Redacted Contracts			*%Redacted Contracts*		
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Leniency	-4.876***	-4.888***	-2.661	-4.658***	-4.637***	-1.785
	(1.317)	(1.077)	(2.145)	(1.196)	(0.928)	(1.353)
Lagged ROA		-0.108*	-0.097		-0.117*	-0.118***
		(0.056)	(0.066)		(0.053)	(0.031)
Lagged Size		0.007	0.207***		-0.001	0.202***
		(0.015)	(0.041)		(0.018)	(0.027)
HHI		0.514	-1.907		-0.326	-3.435***
		(4.069)	(1.235)		(4.283)	(0.927)
Import Penetration		-0.335	-3.001		-0.464	-1.916
		(0.581)	(2.514)		(0.489)	(1.689)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
State-Year FE	No	No	Yes	No	No	Yes
Observations	414	414	414	414	414	414
Adjusted R-squared	0.619	0.616	1.143	0.647	0.647	1.141

Table 4: Heterogeneity in Redacting Information in Contracts

The table presents results from the OLS regression relating redaction of information in material contracts to the exposure to foreign leniency laws for Compustat firms incorporated in the U.S. over 1994-2012. The dependent variable is *Redacted Contracts*. *Maturity* is a binary variable that equals one if the sales growth at the industry level falls in the lowest quartile of the sample distribution, and zero otherwise. *Differentiation* is a binary variable that equals one if the number of the firm's peers with similar products falls in the lowest quartile of the sample distribution, and zero otherwise. *HHI Census* is the four-digit census HHI ratio. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Columns (1) and (2) report results controlling for firm- and year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Redacted Contracts		
	(1)	(2)	(3)
Foreign Leniency	-4.223***	-5.923***	-3.206***
	(0.794)	(1.194)	(0.573)
Maturity (A)	0.114		
	(0.099)		
A#Foreign Leniency	-2.450**		
	(1.046)		
Differentiation (B)		-0.258*	
		(0.118)	
B#Foreign Leniency		2.473**	
		(1.051)	
HHI Census (C)			0.001**
			(0.000)
C#Foreign Leniency			-0.002*
			(0.001)
Lagged ROA	-0.136**	-0.210***	-0.066
	(0.061)	(0.050)	(0.040)
Lagged Size	0.008	0.012	0.002
	(0.013)	(0.018)	(0.019)
HHI	2.233	1.650	
	(4.144)	(4.256)	
Import Penetration	-0.505	-0.592	-0.455
	(0.511)	(0.756)	(0.762)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	414	354	402
Adjusted R-squared	0.628	0.602	0.614

Table 5: Robustness Tests

The table presents results from the OLS regressions relating redaction of information in material contracts to the exposure to foreign leniency laws for U.S. Compustat firms. The dependent variable is *Redacted Contracts* across all panels. In Panel A, we repeat the analysis in Table 3 using various alternative weights to estimate industry-level exposures to foreign leniency laws. *Foreign Leniency* in columns (1) to (4) is estimated based on, respectively, the imports of the three-digit SIC industry from any other countries, the exports of the two-digit SIC industry to any other countries, the exports of the three-digit SIC industry to any other countries, and the imports of final goods of the two-digit SIC industry from any other countries. In Panel B, we repeat the analysis in Table 3 using various refinements of *Foreign Leniency* to control for industry-level trends. *Adj. Foreign Leniency* is calculated based on *Foreign Leniency* estimated based on three-digit weights minus *Foreign Leniency* estimated based on two-digit weights. $\sum_k (w_{SIC3} - w_{SIC2})L_{kt}$ is an alternative finer industry adjusted measure, estimated by replacing two-digit SIC industry weights in section 3.2 with three-digit SIC weights minus two-digit SIC weights. The weights are based on the imports from any other countries in columns (1) and (2), and are based on the exports from any other countries in columns (3) and (4). In Panel C, we modify our identification strategy. Column (1) is based on a matched sample. A firm is defined as treatment firm if the leading country from which the three-digit SIC industry imports adopted the law during the sample period and the share of imports from the country falls in the top tertile. As a control group, we use other three-digit SIC industries that are within the same two-digit SIC industry group but do not fall into top tertile by imports. In cases, where we find multiple matched industries, we keep the one with the closest import volume. Columns (2) to (4) are based on the whole sample over 1994-2012. In Column (2), for each three-digit SIC code, we select the country that is the most important in terms of import volume from the country to that industry. For each industry, *Binary Foreign Leniency* is equal to one starting with the year when the most important country for that industry adopted the law. In Column (3), we redefine *Binary Foreign Leniency* where we anticipate adoption year by four years before the actual adoption. In Column (4), *Binary Foreign Leniency* is redefined by replacing the main country in terms of imports with the least important country in terms of the imports. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. All the columns report results controlling for firm- and year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel A: Alternative Weighting Schemes of Foreign Leniency

	Redacted Contracts			
	3-digit SIC, Import	2-digit SIC, Export	3-digit SIC, Export	Final Goods
	(1)	(2)	(3)	(4)
Foreign Leniency	-3.735***	-10.005**	-5.549***	-4.198**
	(0.480)	(3.770)	(0.952)	(1.757)
Lagged ROA	-0.103*	-0.110*	-0.108*	-0.123**
	(0.057)	(0.059)	(0.056)	(0.049)
Lagged Size	0.001	0.014	0.005	-0.012
	(0.027)	(0.019)	(0.026)	(0.032)
HHI	1.718	-0.076	1.338	-0.087
	(3.997)	(4.134)	(4.185)	(3.906)
Import Penetration	-0.071	0.120	0.461	0.065
	(0.496)	(0.577)	(0.513)	(0.816)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	414	414	414	414
Adjusted R-squared	0.622	0.598	0.612	0.612

Panel B: Industry Trends

	Redacted Contracts			
	Import-based Weighting		Export-based Weighting	
	(1)	(2)	(3)	(4)
Adj. Foreign Leniency	-4.992***		-7.706***	
	(0.613)		(1.648)	
$\sum_k (w_{SIC3} - w_{SIC2}) L_{kt}$		-4.992***		-7.706***
		(0.613)		(2.104)
Lagged ROA	-0.106*	-0.106*	-0.108*	-0.108*
	(0.056)	(0.056)	(0.054)	(0.055)
Lagged Size	0.007	0.007	0.004	0.004
	(0.028)	(0.028)	(0.026)	(0.018)
HHI	0.842	0.842	1.400	1.400
	(3.251)	(3.251)	(4.231)	(4.886)
Import Penetration	0.109	0.109	0.471	0.471
	(0.801)	(0.801)	(0.551)	(0.450)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	414	414	414	414
Adjusted R-squared	0.600	0.600	0.610	0.610

Panel C: Alternative Identifications

	Redacted Contracts			
	Matched Sample	Whole Sample		
	(1)	(2)	(3)	(4)
Binary Foreign Leniency	-0.404**	-0.432***		
	(0.156)	(0.130)		
Binary Foreign Leniency (T-4)			-0.086	
			(0.135)	
Binary Foreign Leniency (Least Exposed)				-0.030
				(0.049)
Lagged ROA	-0.139	-0.121**	-0.128**	-0.126**
	(0.112)	(0.052)	(0.053)	(0.053)
Size	0.065	-0.005	0.014	0.016
	(0.112)	(0.030)	(0.025)	(0.025)
HHI	-1.788	-0.448	-0.760	-1.106
	(3.085)	(3.539)	(4.439)	(3.910)
Import Penetration	0.281	-0.071	-0.272	-0.239
	(0.798)	(0.772)	(0.941)	(1.030)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	188	414	414	414
Adjusted R-squared	0.790	0.625	0.592	0.591

Table 6: Alternative Disclosure Measures

The table presents results from OLS regressions redaction of customer names, and customer related disclosure during conference calls to the exposure to foreign leniency laws. In Panel A, the sample consists of U.S. Compustat firms, covered by Compustat Segment database over 1994-2012. The dependent variable is *%Redacted Customers*. In Panel B, the sample consists of U.S. Compustat firms. The dependent variable is *%Product Conference Calls*. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Columns (1) and (2) of both panels report results controlling for firm- and year-fixed effects. Columns (3) of both panels report results controlling for firm- and headquarter-state*year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel A: Redacting Customer Names

	%Redacted Customers		
	(1)	(2)	(3)
Foreign Leniency	-0.250*	-0.300**	-0.384***
	(0.134)	(0.130)	(0.124)
Lagged ROA		-0.015*	-0.014*
		(0.008)	(0.007)
Lagged Size		-0.027***	-0.026***
		(0.005)	(0.005)
HHI		-0.147	-0.288
		(0.212)	(0.283)
Import Penetration		0.052**	0.040
		(0.024)	(0.027)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
State-Year FE	No	No	Yes
Observations	17,677	17,677	17,677
Adjusted R-squared	0.538	0.540	0.542

Panel B: Customer Related Disclosure during Conference Calls

	%Product Conference Calls		
	(1)	(2)	(3)
Foreign Leniency	8.219*	9.588*	10.609*
	(4.696)	(4.647)	(6.104)
Lagged ROA		0.007	-0.004
		(0.113)	(0.106)
Lagged Size		0.063	0.090
		(0.328)	(0.327)
HHI		-10.884*	-12.012*
		(6.163)	(6.602)
Import Penetration		0.187	-0.142
		(0.434)	(0.477)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	No
State-Year FE	No	No	Yes
Observations	9,429	9,429	9,429
Adjusted R-squared	0.687	0.687	0.691

Table 7: Antitrust Regulators' Access to 10-K Filings

The table presents results from the OLS regressions relating access to SEC filing servers by antitrust regulators to the U.S. Compustat firms' exposure to foreign leniency laws over 2003-2012. The dependent variable, *Regulator IP Access*, is a binary variable which equals to one if firm's SEC filing is accessed through the IP address, associated with the Department of Justice or FTC, within one year following the filing date. In columns (1) to (3), we limit our analysis to 10-K filings, while in columns (4) to (6) we also include other types of public filings to SEC. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Columns (1), (2), (4) and (5) report results controlling for firm- and year-fixed effects, and columns (3) and (6) report results controlling for firm- and headquarter-state*year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Regulator IP Access					
	10-K Filings			*All Filing Documents*		
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Leniency	0.155**	0.224***	0.190**	0.200**	0.301**	0.256**
	(0.073)	(0.075)	(0.076)	(0.086)	(0.104)	(0.098)
Lagged ROA		-0.007*	-0.008*		-0.008*	-0.010*
		(0.004)	(0.004)		(0.005)	(0.005)
Lagged Size		0.031***	0.031***		0.032***	0.032***
		(0.004)	(0.004)		(0.005)	(0.006)
HHI		-0.304	-0.130		-0.587***	-0.323
		(0.180)	(0.171)		(0.151)	(0.214)
Import Penetration		-0.285**	-0.281**		-0.343**	-0.318**
		(0.107)	(0.115)		(0.129)	(0.148)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
State-Year FE	No	No	Yes	No	No	Yes
Observations	11,405	11,405	11,405	11,405	11,405	11,405
Adjusted R-squared	0.221	0.224	0.218	0.276	0.279	0.274

Table 8: Foreign Leniency Law and Competition Disclosure

The table presents results from the OLS regressions relating discussion on competition to the exposure to foreign leniency laws and to the probability of being investigated by antitrust authorities for U.S. Compustat firms over 1994-2012. In Panel A, the dependent variable is *%Competition* in columns (1) to (3) and *Competition Noise* in columns (4) to (6). Columns (1), (2), (4) and (5) report results controlling for firm- and year-fixed effects. Columns (3) and (6) report results controlling for firm- and headquarter-state*year-fixed effects. In Panel B, the tests are based on a two-digit SIC industry-year panel data. The dependent variable is *Convicted Cartels* in columns (1) and (2) and is *Convicted Firms* in columns (3) and (4). *Lagged %Competition* is the lagged-one-period of the median of *%Competition* for each industry-year. The control variables include industry-level *Size*, *ROA* and *Leverage*. All the columns report results controlling for firm- and year-fixed effects. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel A: The Effect of Foreign Leniency on Competition Disclosure

	%Competition			*Competition Noise*		
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign Leniency	-0.876***	-0.859***	-0.510*	-0.637**	-0.607**	-0.437***
	(0.233)	(0.239)	(0.291)	(0.230)	(0.235)	(0.130)
Lagged ROA		0.040**	0.042***		-0.006	-0.003
		(0.014)	(0.014)		(0.007)	(0.007)
Lagged Size		0.026**	0.029***		0.021***	0.022***
		(0.009)	(0.009)		(0.005)	(0.004)
HHI		0.641*	0.529		-0.089	-0.063
		(0.304)	(0.341)		(0.469)	(0.343)
Import Penetration		0.082	0.076		-0.034	-0.036
		(0.090)	(0.087)		(0.036)	(0.024)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
State-Year FE	No	No	Yes	No	No	Yes
Observations	26,837	26,837	26,837	19,688	19,688	19,688
Adjusted R-squared	0.454	0.455	0.465	0.307	0.308	0.313

Panel B: Competition Disclosure and Investigation by Antitrust Authorities

	Convicted Cartels		Convicted Firms	
	(1)	(2)	(3)	(4)
Lagged %Competition	0.14*	0.19*	0.36*	0.46*
	(0.08)	(0.09)	(0.21)	(0.25)
Foreign Leniency		2.19***		4.44***
		(0.60)		(1.21)
Controls	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	337	337	337	337
Adjusted R-squared	0.24	0.27	0.18	0.21

Figure 1: Redacting Disclosure and Profit Margins Around Leniency Laws

We plot the average *Profit Margins* for the period of 3 years before to 5 years after the leniency law passed in the country which is a major trading partner of the industry. The solid line presents the firms with decreasing redaction of customers whereas the dash line presents the firms with non-decreasing redaction of customers over the period of three years after the leniency law passed in the country which is a major trading partner of the industry. The 10% confidence interval is presented in the figure.

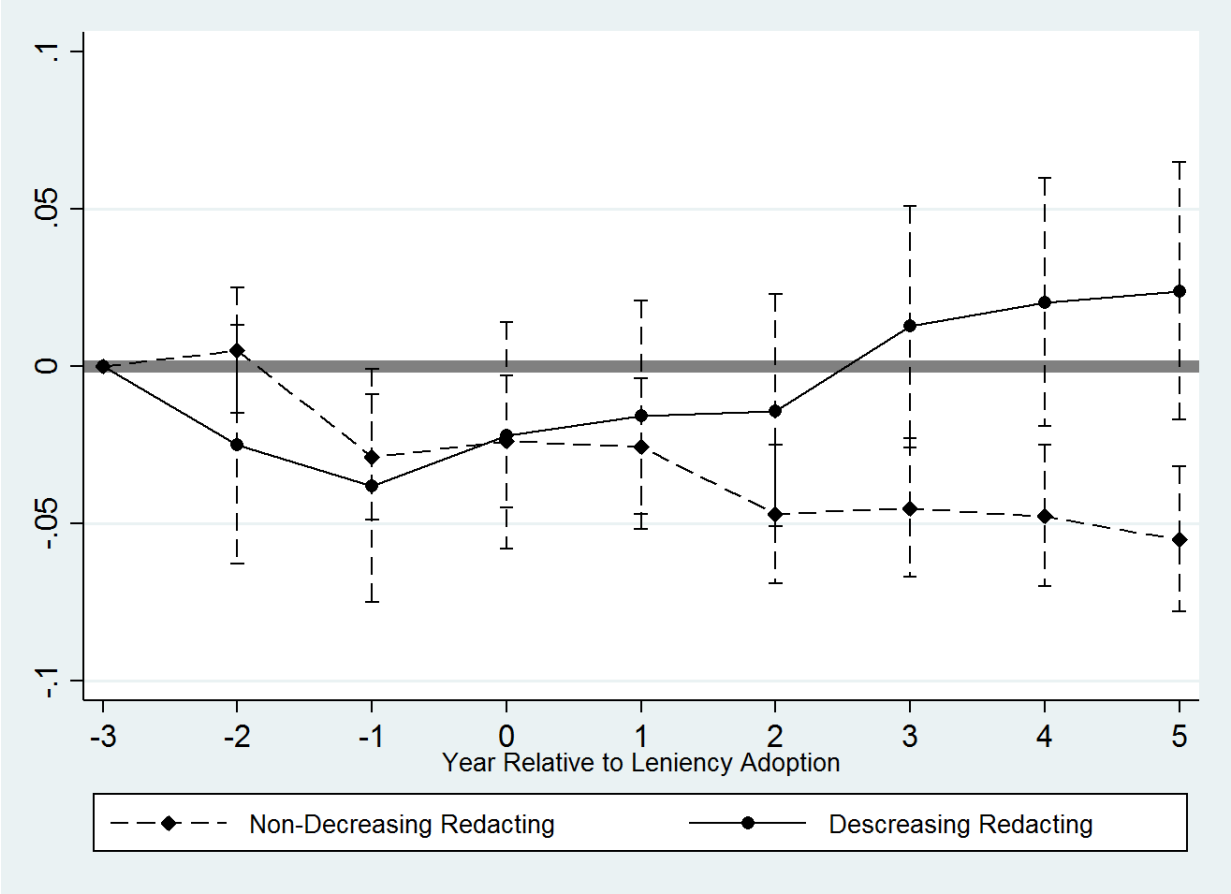
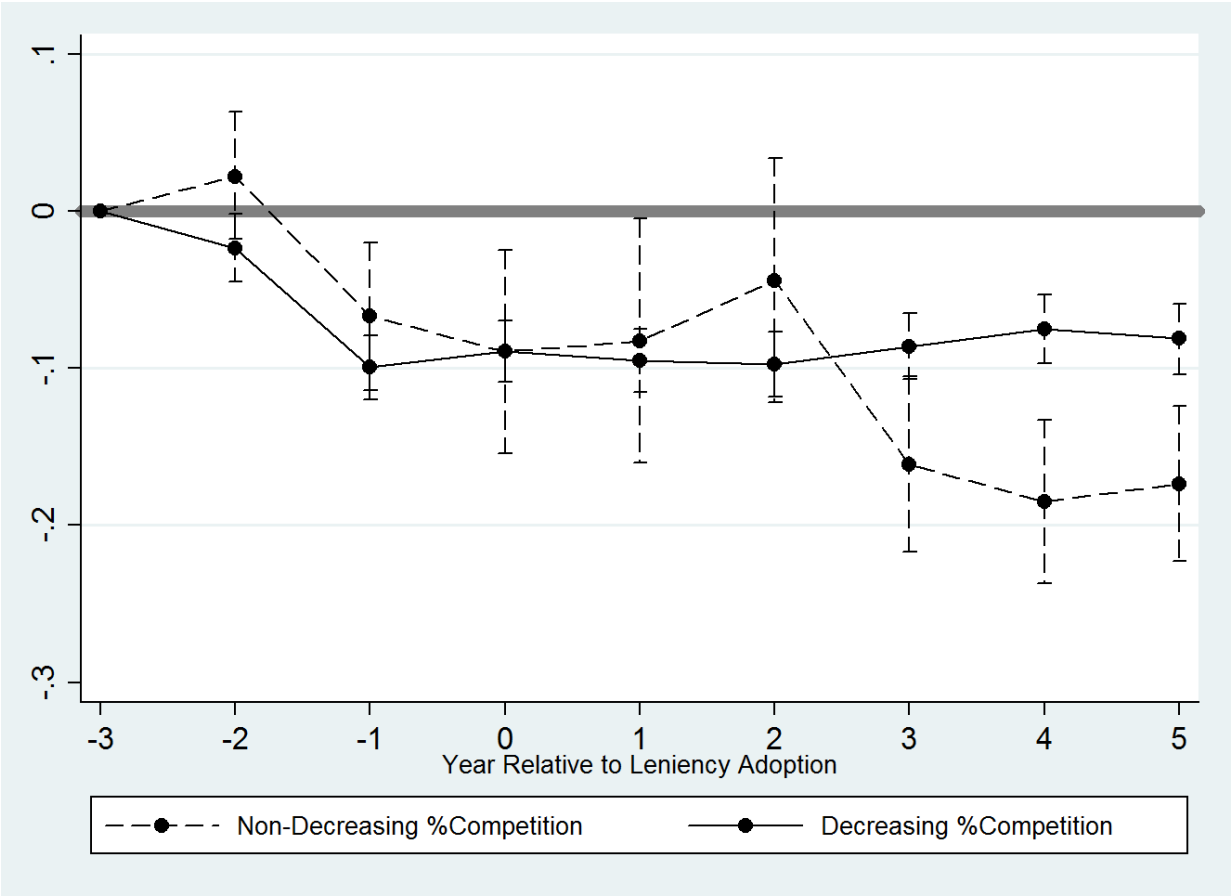


Figure 2: Competition Disclosure and Profit Margins Around Leniency Laws

We plot the average *Profit Margins* for the period of 3 years before to 5 years after the leniency law passed in the country which is a major trading partner of the industry. The solid line presents the firms with decreasing %Competition whereas the dash line presents the firms with non-decreasing %Competition over the period of three years after the leniency law passed in the country which is a major trading partner of the industry. The 10% confidence interval is presented in the figure.



Appendix A: Examples of Sales Contracts with Redacted and Non-redacted Information

Example 1: Redacted Disclosure

The document is from a sales agreement in ***Molecular Insight Pharmaceuticals, Inc.***'s 10-Q filing on 2009-11-06 with redacted information.

EX-10.5 5 dex105.htm SUPPLY AGREEMENT

Exhibit 10.5

SUPPLY AGREEMENT

This supply agreement ("Agreement"), dated this 19th day of October, 2009 (the "Effective Date") is entered into by and between Molecular Insight Pharmaceuticals, Inc. (referred to herein as "MIP"), a corporation organized and existing under the laws of The Commonwealth of Massachusetts and having its principal office at 160 Second Street, Cambridge, MA 02142 USA, and BIOMEDICA Life Sciences S.A., a corporation organized and existing under the laws of Greece, with offices at 4 Papanikoli Str., 15232 Halandri, Athens, Greece (referred to herein as "BIOMEDICA"), with Greek Tax ID of EL 094413470, from the tax office of FAEE Athens; each a "Party" and collectively the "Parties" hereto.

. . .

WHEREAS, MIP agrees to source and/or manufacture the products (defined below) and supply such products to **BIOMEDICA**;

. . .

3.2.1 Pricing ******

- Compound Transfer Price is set at ****** per Dose
- Product for clinical trials is set at ****** per Dose
- Product Transfer Price. The BIOMEDICA price per dose of the Product will be determined by the national competent authority of each country of the Territory in which the Product will be launched. If the price per dose for the Product by the national competent authority is set below ****** then the Parties will renegotiate in good faith the transfer price for Product in that country in the Territory.

Price Per Dose*	Transfer Price	Percentage of Onalta Price Per Dose**
******	******	******
******	******	******
******	******	******
******	******	******
******	******	******
******	******	******
******	******	******

* Confidential Treatment Required *

Example 2: Non-Redacted Disclosure

The document is from a sales agreement in ***MOSAIC CO***'s 10-K filing on 2007-08-09 without redacting information.

EX-10.II.OO 3 dex10iioo.htm SALE CONTRACT

Exhibit 10.ii.oo

SALE CONTRACT

This Sale Contract is made this 1st day of January, 2007 by and between the Salt Business Unit of Cargill, Incorporated with principal offices at 12800 Whitewater Drive #21, Minnetonka, MN 55343 ("Buyer") and Mosaic Crop Nutrition, LLC with its principal offices located at Atria Corporate Center, Suite E490, 3033 Campus Drive, Plymouth, MN 55441 ("Seller").

1. Seller agrees to sell to Buyer Untreated White Muriate of Potash (the "Commodity") at the terms and conditions set forth below and as further set forth in Exhibit A, attached hereto and by this reference made a part hereof.

. . .

Additional terms and conditions are set forth in Exhibit A.

EXHIBIT A

QUANTITY:	Approximately 20,000 short tons. Buyer agrees to purchase 100% of its requirements from Seller during the term of this Agreement.
PRICE:	For the January 1 through June 30, 2007 time period pricing will be as follows:
	$218/st FFR at Buyer's designated facility Timpie, UT.
	$203/st FFR at Buyer's designated facility Savage, MN.
	$204/st FFR at Buyer's designated facility Buffalo, IA.
	$230/st FFR at Buyer's designated facility White Marsh, MD.
	$234/st FFR at Buyer's designated facility Tampa, FL.
	Pricing after July 1st, 2007 will be done for 6 month time periods with final pricing determined 15 days prior to the start of the period. For example, July 1 through December 31, 2007 pricing will be finalized by June 15, 2007.
PAYMENT TERMS:	Net 30 cash from date of invoice.
SHIPMENT PERIOD:	01/01/07 to 12/31/08
RAIL DEMURRAGE:	Buyer is exempt from demurrage on actual placement date plus two free days succeeding actual placement date, after which Seller will charge $40 per day per railcar for private cars. If product shipped in railroad owned equipment, then demurrage will be charged per the railroads going rate.
STATE TONNAGE TAX:	For the account of Buyer

Appendix B: The Passages of Foreign Leniency Laws

The table presents leniency law passages by country. The original source of the information is Cartel Regulation 2013, published by Getting the Deal Through. We complement the dataset using press releases and news articles.

Country	Year	Country	Year
Argentina	None	Latvia	2004
Australia	2003	Lithuania	2008
Austria	2006	Luxembourg	2004
Belgium	2004	Malaysia	2010
Brazil	2000	Mexico	2006
Bulgaria	2003	Netherlands	2002
Canada	2000	New Zealand	2004
Chile	2009	Nigeria	None
China	2008	Norway	2005
Colombia	2009	Oman	None
Croatia	2010	Pakistan	2007
Cyprus	2011	Peru	2005
Czech Republic	2001	Philippines	2009
Denmark	2007	Poland	2004
Ecuador	2011	Portugal	2006
Estonia	2002	Romania	2004
Finland	2004	Russia	2007
France	2001	Singapore	2006
Germany	2000	Slovakia	2001
Greece	2006	Slovenia	2010
Hong Kong	None	South Africa	2004
Hungary	2003	Spain	2008
Iceland	2005	Sweden	2002
India	2009	Switzerland	2004
Indonesia	None	Taiwan	2012
Ireland	2001	Thailand	None
Israel	2005	Turkey	2009
Italy	2007	Ukraine	2012
Japan	2005	United Kingdom	1998
Jordan	None	Venezuela	None
Korea	1997	Zambia	None

Appendix C: Variable Definitions

Variable	Definition	Data Source
Foreign Leniency	The weighted average of the passage of laws in all other countries, where the weight is equal to the share of two-digit SIC industry's imports from a particular country	*Cartel Regulation 2013, Schott's Data Library*
Adj. Foreign Leniency	The weighted average of the passage of laws in all other countries, where the weight is equal to the share of three-digit SIC industry's imports from a particular country minus the weighted average of the passage of laws in all other countries, where the weight is equal to the share of two-digit SIC industry's imports from a particular country	*Cartel Regulation 2013, Schott's Data Library*
$\sum_k (w_{SIC3} - w_{SIC2}) L_{kt}$	The weighted average of the passage of laws in all other countries, where the weight is equal to the share of the three-digit SIC industry's imports (exports) from a country minus the share of the two-digit SIC industry's imports (exports) from (to) the country	*Cartel Regulation 2013, Schott's Data Library*
Binary Foreign Leniency	A binary variable which is equal to one starting with the year when the most important country for that industry adopted the law. We define the most important country for each three-digit SIC code based on the import volume from the country to that industry	*Cartel Regulation 2013, Schott's Data Library*
Convicted Cartels	The logarithm of one plus the number of cartels in the industry that were convicted during the year	*Connor (2014)*
Convicted Firms	The logarithm of one plus the number of cartel firms in the industry that were convicted during the year	*Connor (2014)*
Conviction	A binary variable which equals to one if the firm is convicted in a price-fixing cartel case during the year	*Connor (2014)*
Antitrust	A binary variable which equals to one if the firm is mentioned as having violated antitrust laws with regards to price-fixing cartels during the year	*KLD Rankings*

Variable	Definition	Data Source
%Competition	The ratio of competition related words (competition, competitor, competitive, compete, competing) to the total number of words in 10-K	*SEC Edgar, Li et al. (2013)*
Competition Noise	A binary variable which equals to one if the maximum value of the proportion of competition related words in each paragraph of the MD&A section of 10-K filing is more than 3%	*SEC Edgar*
%Redacted Customers	The ratio of material customer names that are redacted in the segment reports in the year	*SEC Edgar*
Redacted Contract	A binary variable which equals to one if the firm files material sales contracts during the year and requests for confidential treatment in the contract. We search for "confidential treatment", "confidential request" and "confidential... redacted" in the file to identify the confidential request by the firm	*Compustat Segment*
%Redacted Contracts	The ratio of sales contracts that redact information to the total number of sales contracts the firm files to SEC during the year	*SEC Edgar*
%Product Conference Calls	The ratio of product market related words divided to the total number of words in the CEO / CFO presenting during earnings conference calls. The list of words includes: "price", "pricing", "priced", "discount", "product", "service", "offering", "offer", "customers" and "client"	*StreetEvents*
Regulator IP Access	A binary variable which equals to one if firm's SEC filing is accessed through the IP address, associated with the Department of Justice or FTC, within one year following the filing date.	*SEC Edgar*

Variable	Definition	Data Source
New Clients	The logarithm of one plus the number of new customer announcements in corporate press releases during the year.	*CapitalIQ Key Development Data*
HHI	Herfindahl-Hirschman Index of the two-digit industry.	*Compustat*
Import Penetration	Four-digit SIC industry level import penetration, which is defined as the value of imports scaled by the sum of the value of imports and the shipment value minus value of exports	*Schott's Data Library*
Sales	Net sales	*Compustat*
Gross Margin	Gross profit scaled by net sales	*Compustat*
ROA	Operating earnings before extraordinary items scaled by lagged total assets.	*Compustat*
Size	The logarithm of total assets	*Compustat*
Maturity	A binary variable that equals to one if the sales growth at the industry level falls in the lowest quartile of the sample distribution	*Compustat*
Differentiation	A binary variable that equals to one if the number of the firm's peers with similar products falls in the lowest quartile of the sample distribution	Hoberg and Phillips (2010)
HHI Census	The four-digit NAICS census HHI ratio.	U.S. Census Bureau

Supplementary Appendix (Not for Publication)

Table A1: Customer Related Disclosure During Conference Calls

The table presents results from the OLS regressions relating customer related disclosure during conference calls to the exposure to foreign leniency laws over 2002-2012. The dependent variables is *%Product Conference Calls*. *New Clients* is the logarithm of the number of clients announced by the firm during the year, and *Lagged New Clients* is the logarithm of the number of clients announced by the firm during the previous year. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Columns (1) and (3) report results controlling for firm- and year-fixed effects, and columns (2) and (4) report results controlling for firm- and headquarter-state*year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

	%Product Conference Calls			
	(1)	(2)	(3)	(4)
Foreign Leniency	9.242*	10.579*	8.981*	10.599*
	(4.413)	(5.711)	(4.579)	(6.004)
Number of Announced Clients	0.105	0.054		
	(0.147)	(0.159)		
Lagged Number of Announced Clients			0.145**	0.118**
			(0.063)	(0.053)
Lagged ROA	0.070	0.061	0.001	-0.017
	(0.129)	(0.123)	(0.128)	(0.100)
Lagged Size	0.054	0.079	0.005	0.031
	(0.313)	(0.306)	(0.325)	(0.316)
HHI	-13.383**	-13.932*	-13.145*	-14.309*
	(6.314)	(6.797)	(6.458)	(7.261)
Import Penetration	0.138	-0.240	0.001	-0.329
	(0.433)	(0.474)	(0.324)	(0.492)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
State-Year FE	No	Yes	No	Yes
Observations	9,195	9,195	9,069	9,069
Adjusted R-squared	0.692	0.697	0.691	0.696

Table A2: Peer Effects of Competition Disclosure

The table presents results from OLS regressions relating peer effects of public disclosure to the exposure to foreign leniency law for U.S. Compustat firms over 1994-2012. The dependent variable is *%Redacted Customers* in columns (1) and (2) and is *%Product Conference Calls* in columns (3) and (4). *Peer Average* is the industry-year average of the variable as indicated on the first row of the table excluding the firm in question. *High Exposure to Foreign Leniency* is a binary variale which equals one if the collusion costs is higher than the sample median. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. All the columns report results controlling for firm- and year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

	%Redacted Customers		*%Product Conference Calls*	
	(1)	(2)	(3)	(4)
Peer Average (A)	0.196	-0.009	0.070	-0.015
	(0.119)	(0.168)	(0.126)	(0.139)
High Exposure to Foreign Leniency (B)		-0.145**		-1.883
		(0.054)		(1.091)
A×B		0.234*		0.116*
		(0.134)		(0.061)
Industry Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	17,521	17,521	8,485	9,425
Adjusted R-squared	0.548	0.549	0.683	0.686

Table A3: Stock Liquidity

The table presents results from the OLS regressions relating industry-level stock market liquidity measures to the exposure to foreign leniency laws over 1994-2012. The tests are based on a two-digit SIC industry-year panel data. The dependent variable is industry-level *Bid-Ask Spread* or *Turnover* as indicated on the first row of the table. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. All the columns report results controlling for industry- and year-fixed effects. Robust standard errors are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Bid-Ask Spread	Turnover	Bid-Ask Spread	Turnover
	(*At time t*)		(*At time t+1*)	
	(1)	(2)	(3)	(4)
Foreign Leniency	-1.21***	0.09**	-1.07***	0.04
	(0.38)	(0.04)	(0.40)	(0.05)
Industry Fixed	Yes	Yes	Yes	Yes
Year Fixed	Yes	Yes	Yes	Yes
Observations	380	380	360	360
Adjusted R-squared	0.86	0.87	0.86	0.86

Table A4: Public Disclosure and Firm Profitability

The table presents results from the OLS regression relating profitability to the exposure to foreign leniency laws for Compustat firms incorporated in the U.S. over 1994-2012. The dependent variable is firms' gross profit margin. *Less Redacting* is a binary variable that equals to one if the industry-level redaction of customers' identity falls in the lowest quartile of the sample distribution, and zero otherwise. Industry-level redaction of customers' identity refers to the median of *Redacting Customer* excluding the firm itself. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. Columns (1) and (2) report results controlling for firm- and year-fixed effects. Column (3) reports results controlling for firm- and headquarter-state*year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

	Gross Margin		
	(1)	(2)	(3)
Foreign Leniency	-0.492	-0.454*	-0.485**
	(0.305)	(0.255)	(0.229)
Less Redacting (A)	-0.036*	-0.036**	-0.038**
	(0.017)	(0.017)	(0.016)
A×Foreign Leniency	0.740**	0.741**	0.755**
	(0.337)	(0.320)	(0.322)
Lagged ROA		0.092***	0.089***
		(0.012)	(0.010)
Lagged Size		0.007	0.006
		(0.017)	(0.016)
HHI		-0.190	-0.197
		(0.258)	(0.196)
Import Penetration		0.023	0.034
		(0.021)	(0.024)
Firm FE	Yes	Yes	No
Year FE	Yes	Yes	Yes
State-Year FE	No	No	Yes
Observations	17,648	17,648	17,648
Adjusted R-squared	0.684	0.691	0.687

Appendix A5: Robustness Tests on the Competition Disclosure Measure

The table presents results from the OLS regressions relating redaction of information in material contracts to the exposure to foreign leniency laws for U.S. Compustat firms. The dependent variable is *Redacted Contracts* across all panels. In Panel A, we repeat the analysis in Table 8 Panel A using various alternative weights to estimate industry-level exposures to foreign leniency laws. *Foreign Leniency* in columns (1) to (3) is estimated based on, respectively, the imports of the three-digit SIC industry from any other countries, the exports of the two-digit SIC industry to any other countries, the exports of the three-digit SIC industry to any other countries, and the imports of final goods of the two-digit SIC industry from any other countries. In Panel B, we repeat the analysis in Table Table 8 Panel A using various refinements of *Foreign Leniency* to control for industry-level trends. *Adj. Foreign Leniency* is calculated based on *Foreign Leniency* estimated based on three-digit weights minus *Foreign Leniency* estimated based on two-digit weights. $\sum_k (w_{SIC3} - w_{SIC2})L_{kt}$ is an alternative finer industry adjusted measure, estimated by replacing two-digit SIC industry weights in section 3.2 with three-digit SIC weights minus two-digit SIC weights. The weights are based on the imports from any other countries in columns (1) and (2), and are based on the exports from any other countries in columns (3) and (4). In Panel C, we modify our identification strategy. Column (1) is based on a matched sample. A firm is defined as treatment firm if the leading country from which the three-digit SIC industry imports adopted the law during the sample period and the share of imports from the country falls in the top tertile. As a control group, we use other three-digit SIC industries that are within the same two-digit SIC industry group but do not fall into top tertile by imports. In cases, where we find multiple matched industries, we keep the one with the closest import volume. Columns (2) to (4) are based on the whole sample over 1994-2012. In Column (2), for each three-digit SIC code, we select the country that is the most important in terms of import volume from the country to that industry. For each industry, *Binary Foreign Leniency* is equal to one starting with the year when the most important country for that industry adopted the law. In Column (3), we redefine *Binary Foreign Leniency* where we anticipate adoption year by four years before the actual adoption. In Column (4), *Binary Foreign Leniency* is redefined by replacing the main country in terms of imports with the least important country in terms of the imports. Variable definitions appear in Appendix C. All continuous variables are winsorized at the 1% and 99% levels. All the columns report results controlling for firm- and year-fixed effects. Standard errors are clustered at the two-digit SIC industry level and are displayed in parentheses. *, ** and *** indicate significance levels of 10%, 5%, and 1%, respectively.

Panel A: Alternative Weighting Schemes of Foreign Leniency

	%Competition			
	3-digit SIC, Import	2-digit SIC, Export	3-digit SIC, Export	Final Goods
	(1)	(2)	(3)	(4)
Foreign Leniency	-0.767***	-1.320**	-0.834**	-0.669**
	(0.179)	(0.531)	(0.322)	(0.307)
Lagged ROA	0.040***	0.040**	0.039***	0.039***
	(0.014)	(0.014)	(0.014)	(0.014)
Lagged Size	0.026**	0.028***	0.029***	0.027***
	(0.010)	(0.009)	(0.010)	(0.010)
HHI	0.686**	0.457	0.459	0.676*
	(0.339)	(0.358)	(0.471)	(0.391)
Import Penetration	0.080	0.097	0.094	0.082
	(0.092)	(0.088)	(0.090)	(0.095)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	26,837	26,837	26,837	26,837
Adjusted R-squared	0.456	0.455	0.455	0.455

Panel B: Industry Trends

	%Competition			
	Import-based Weighting		Export-based Weighting	
	(1)	(2)	(3)	(4)
Adj. Foreign Leniency	-0.799***		-0.879*	
	(0.249)		(0.446)	
$\sum_k (w_{SIC3} - w_{SIC2}) L_{kt}$		-0.786***		-0.876*
		(0.249)		(0.477)
Lagged ROA	0.040***	0.040***	0.040**	0.039***
	(0.014)	(0.014)	(0.014)	(0.014)
Lagged Size	0.026**	0.027***	0.028***	0.029***
	(0.010)	(0.010)	(0.009)	(0.010)
HHI	0.686**	0.689**	0.457	0.572
	(0.339)	(0.341)	(0.358)	(0.462)
Import Penetration	0.080	0.070	0.097	0.077
	(0.092)	(0.102)	(0.088)	(0.095)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	26,837	26,837	26,837	26,837
Adjusted R-squared	0.455	0.455	0.455	0.455

Panel C: Alternative Identification

	%Competition			
	Matched Sample	Whole Sample		
	(1)	(2)	(3)	(4)
Binary Foreign Leniency	-0.201***	-0.055***		
	(0.053)	(0.019)		
Binary Foreign Leniency (T-4)			-0.071	
			(0.044)	
Binary Foreign Leniency (Least Exposed)				-0.006
				(0.036)
Lagged ROA	0.101***	0.041***	0.041***	0.040***
	(0.024)	(0.015)	(0.014)	(0.014)
Size	0.013	0.027***	0.027***	0.028***
	(0.019)	(0.010)	(0.010)	(0.010)
HHI	0.062	0.571	0.558	0.585
	(0.780)	(0.374)	(0.351)	(0.377)
Import Penetration	0.112	0.070	0.090	0.075
	(0.072)	(0.099)	(0.094)	(0.102)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	15,733	26,837	26,837	26,837
Adjusted R-squared	0.469	0.456	0.456	0.455