The (Un)intended Consequences of M&A Regulatory Enforcements

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Abstract: Economic and policy uncertainty affect merger and acquisition (M&A) activity. In this paper, we use Department of Justice (DOJ) and Federal Trade Commission (FTC) interventions in the M&A market to investigate whether uncertainty around regulatory enforcements also matters. Our results support this conjecture. Using the Hoberg and Phillips (2010) similarity scores to identify product market competitors, we confirm a clear and significant DOJ/FTC regulatory enforcements' deterrence effect on future M&A transaction attempts, a result robust to many alternative specifications and confirmed in additional tests. This deterrence effect is (at least partly) driven by the length of the regulatory process, a factor that exacerbates enforcement uncertainty. Our results identify an (un)intended channel through which M&A regulation hampers efficient resources allocation.

Keywords: Regulatory uncertainty, Merger and acquisition, Deterrence

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Introduction

A growing literature highlights the importance of economic, political, and public policies as sources of uncertainty for participants in mergers and acquisitions (M&As). In this paper, we investigate whether regulatory enforcements represent another potentially significant source of uncertainty that affects activity in the M&A market . Specifically, we test whether antitrust-motivated regulatory enforcements by the Department of Justice (DOJ) or the Federal Trade Commission (FTC) have lasting deterrence effects on proposed M&A deals in the U.S.

The DOJ and FTC are the principal U.S. regulatory agencies that conduct antitrust-motivated interventions in the U.S. M&A market, with the express purpose of protecting consumers (or firms closer to the consumer in the supply chain) by maintaining competition among producers. The FTC website is particularly explicit: "The Bureau of Competition is committed to preventing mergers and acquisitions that are likely to reduce competition and lead to higher prices, lower quality goods or services, or less innovation."[1] DOJ/FTC interventions follow strict procedures described in the Horizontal Merger Guidelines, updated in 2010.[2] Intervention by these agencies takes many factors into account, such as the definition of the relevant market, actual and potential competition, barriers to entry, degree of product substitutability, and so on.

There are potentially substantial direct and indirect effects from these regulatory enforcements on *future* activity in the M&A market. Specifically, current antitrust-focused regulatory activity in a particular industry may directly discourage other potential acquirers from announcing deals in that industry for fear that they too will be subjected to scrutiny and constraints imposed by U.S. federal regulators. Furthermore, the process by which federal regulators intervene in the M&A market is subject to significant information asymmetry with respect to the merging parties, as well as seemingly substantial political bias, factors that contribute to unpredictable outcomes and enforcement uncertainty (the mechanism for regulatory deterrence formalized in Clougherty and Seldeslachts, 2013). As a typical example,

[1] https://www.ftc.gov/enforcement/merger-review.
[2] Available at https://www.ftc.gov/enforcement/merger-review.

the Sprint-T-Mobile merger was discouraged by regulators under one Presidential administration in 2014 but then allowed by regulators under a different Presidential administration in 2018 (i.e., just four years later). This uncertainty may indirectly discourage future M&A deals as industry participants choose to defer or delay deals (potentially permanently) until this policy uncertainty is reduced.

We refer to these potential effects of regulatory enforcement uncertainty on future M&A activity as *deterrence effects*. Only a limited number of papers in the M&A literature directly test whether these effects exist and are significant, and the reported results are contradictory. Eckbo (1992) compares the U.S. and the Canadian evidence and concludes that "Judging from the Canadian evidence, there simply isn't much to deter." Clougherty and Seldeslachts (2013) collect information from DOJ/FTC annual reports over the period 1986 to 1999 and study the frequency of future transactions conditional on regulatory interventions in a given two-digit SIC (Standard Industry Classification) industry. The authors report significant deterrence effects from the rate at which DOJ/FTC agencies challenge transactions.

The data used in these studies are now more than 20 years old, however, and the U.S. economy has changed substantially since then, especially increases in industry concentration (Grullon, Larkin, and Michaely, 2019). Moreover, two substantial revisions to the DOJ/FTC Horizontal Merger Guidelines (1997 and 2010) may also have altered the M&A regulatory supervision landscape. Barros, Clougherty, and Seldeslachts (2009) report results at the international level consistent with the presence of a deterrence effect, using data from 28 antitrust jurisdictions from 1992 to 2005 collected from OECD annual reports, but these results are not specific to the U.S. context.

Wollmann (2019) studies the impact of the dramatic change in DOJ/FTC reporting threshold (a five-fold increase in deal value) in December 2000 on M&A activity using a difference-in-differences approach over the period 1994 to 2011. The author reports an increase in mergers between competitors that are newly exempt from regulation, a result again consistent with the presence of a deterrence effect. The December 2000 reporting threshold change is, however, a one-time shock, and is concomitant with the peak of the internet bubble. The post-event period in that study corresponds to a period of radical changes in the M&A market featuring a drastic lowering of interest rates, an increase in the activities of private buyers, and abolishment of the pooling of interest (de Bodt, Cousin, Roll, 2018) and does not cover the more recent period that corresponds to the 2010 DOJ/FTC

Horizon Merger Guidelines revision. Recently, Clougherty and Zhang (2022) posit that foreign acquirers should be more affected by the policy risk and uncertainty of a merger review. Their results are consistent with this prediction, a result potentially driven by protectionist considerations.

Our first objective is to ascertain whether a deterrence effect is effectively at work in the U.S. M&A market in the recent period. We follow the conditional probability approach used in Clougherty and Seldeslachts (2013) studying the probability that firms will be subjected to future acquisition attempts in an "industry" that witnesses an antitrust-focused regulatory enforcement. The notion of industry plays a critical role here. A key ingredient of competitive effects analysis is the identification of the relevant market(s), as emphasized by the DOJ/FTC guidelines themselves. The Horizontal Merger Guidelines dedicate a full section to market definition (Section 4).[3] In this step the DOJ/FTC is required to investigate whether a proposed merger may lessen competition and to identify market participants in order to compute market shares and market concentration (see Horizontal Merger Guidelines, Section 4, p. 10). Thus, the definition of what constitutes an "industry" is vitally important to our investigation.

Our tests use the Hoberg and Phillips (2010) (H&Ph, hereafter) text-based similarity scores to define industry clusters. H&Ph start by collecting firm-specific product descriptions in Security Exchange Commission (SEC) 10-K filings (Item 101). These product description texts are then cleaned of irrelevant words and converted in vectors of binary variables, indicating the use of specific words. Similarity scores between pairs of firms are finally obtained using the cosine-distance between these vectors.

Our main tests use 10 nearest-neighbors clusters (10NN clusters, as in H&Ph) based on the target firm in an acquisition. These clusters capture the 10 firms most similar to a proposed target in terms of H&Ph similarity scores. The identification of similarity score-based firm clusters is particularly relevant for our tests (compared to using, for example, SIC-based industry groupings as in prior studies in this literature) because similarity scores focus on distances in the product market space and are likely to identify the most relevant competitors from the perspective of antitrust-focused regulatory agencies. Another benefit of this H&Ph product market-based approach over traditional industry classifications is that similarity

[3] Available at https://www.ftc.gov/enforcement/merger-review.

scores are recomputed each year, tracking the transformation of firm activities dynamically, while classic industry classifications (e.g. SIC and NAICS) are rarely updated (see Bhojra, Lee and Derek, 2003 for the merits and shortcomings of traditional industry classifications). These benefits should help us to uncover the presence of deterrence effects (if any).

Our results are based on a sample of 6,285 M&A deals over years 1996 to 2017. In this sample, we observe substantially fewer future M&A deals in 10NN clusters that have witnessed antitrust-focused regulatory enforcements around M&A transactions in the recent past relative to those clusters that have not (i.e., difference-in-differences tests). We observe this effect after controlling for a wide array of cluster characteristics. Our results highlight the presence of a statistically and economically significant deterrence effect of DOJ/FTC enforcements. Across all enforcement outcomes, the economic magnitude of this deterrence effect is large: the unconditional probability of observing a future acquisition attempt in the cluster is reduced by close to 21%.

Focusing on the subset of DOJ/FTC enforcements that involved a request made to a Federal court to block the offending transaction, the future deterrence effect is even stronger, reaching 60%, a result that confirms the dependence of the deterrence effect on the specificity of policy instruments (as reported in Barros et al., 2009). Furthermore, this deterrence effect is persistent, remaining significant over the three years following a DOJ/FTC intervention in an industry cluster.

Our results are highly robust. We investigate potential sources of statistical biases and econometric misspecifications in the following ways. We use clustered standard-errors at both the 10NN cluster and year levels to assess whether our inferences are affected by firms belonging to several clusters, and we obtain similar results as in our baseline tests. Furthermore, we implement the stacked regression in event time approach advocated in Baker, Larcker, and Wang (2021) to combat the Goodman-Bacon (2021) decomposition bias in difference-in-differences tests for event staggered through time. The results are again consistent with our baseline approach. Controlling for autocorrelation in the frequency of M&A transactions due to M&A waves by adopting a dynamic panel specification strengthens our empirical results. We also implement a placebo test, shuffling the matching between DOJ/FTC enforcements and M&A transactions: as expected, all our results lose statistical significance.

We next investigate the importance of the choice of industry classifications in our tests. We start by replacing our 10 nearest-neighbor approach (using similarity scores from Hoberg and Phillips, 2010) with the text-based network industry classification (TNIC) from Hoberg and Phillips (2016). TNIC industries are industry groupings also based on similarity scores, but with granularity comparable to three-digit SIC codes.[4] This results in a significant increase in the size of "industry" clusters (the average number of firms in a TNIC industry is roughly 150, compared to 10 firms in our nearest-neighbor approach). We obtain qualitatively similar results.

Next, we replace our 10 nearest-neighbor approach (using similarity scores from Hoberg and Phillips, 2010) with valuation peers from the hand-gathered sample employed in Eaton, Guo, Liu and Officer (2021): this sample is based on SEC filings by merging firms. The results are again mostly comparable (with some loss of statistical significance, likely due to the decrease in sample size). However, when we attempt to replicate our difference-in-differences tests using three-digit SIC industry classifications to identify "industries," most of our empirical results disappear. Therefore, one possible culprit for the existence of conflicting results in tests of deterrence effects in the existing literature is the intrinsic limitations of defining industries using (largely static) SIC codes.

To further evaluate the robustness of our results, we examine our results in several subsamples. First, we limit our analysis to a subsample that contains only horizontal transactions (where the merging parties share the same three-digit SIC codes), as these are the deals that *a priori* are more likely to attract regulatory attention. Or results are mostly similar in this subsample of our data compared results from the main sample. Our results also hold in the subsample containing only 10NN clusters that witness a DOJ/FTC enforcements during our sample period (i.e., at the intensive margin) and are therefore not driven by 10NN clusters free of regulatory scrutiny.

Finally, we present additional evidence consistent with the presence of a DOJ/FTC deterrence effect. We first turn to examining a channel that exacerbates this deterrence effect: the length of the antitrust-focused procedure that prompts the deterrence to begin with. There is much evidence in the existing M&A literature that both acquirers and targets in M&A deals appear to favor completion speed (Betton, Eckbo, and Thorburn, 2008;

[4] Available at http://hobergphillips.tuck.dartmouth.edu/industryclass.htm.

Golubov, Petmezas, and Travlos, 2012; Offenberg and Pirinsky, 2015). From these contributions, it is clear that negotiation time (between deal announcement and closing/withdrawal) is costly to the merging parties, in particular to acquirers because it opens the door to entry of rivals and provide a window of opportunity for targets to release new information that may force the acquirer to revise their initial bid. Lengthy DOJ/FTC antitrust-focused deal procedures have the potential to create significant enforcement uncertainty, and (as discussed earlier) this source of uncertainty may deter future M&A deals in an industry.

We therefore use the duration of DOJ/FTC enforcement procedure as proxy for the amount of regulatory uncertainty created by a given intervention. This intervention-specific measure has several attractive features: it is unlikely to be correlated with general economy-wide factors but is likely to indicate something about antitrust enforcement uncertainty to the industry participants, and it is hand-collectable (from the DOJ/FTC annual report to the Congress[5]). Our results are unambiguous: longer DOJ/FTC investigations are associated with significantly stronger deterrence effects, even after controlling for the transaction size. Regulatory enforcement uncertainty appears therefore to be a factor driving deterrence. We also provide additional evidence (with more indirect proxies of enforcement uncertainty) that produces consistent results.

Next, we investigate whether regulatory enforcements in the target's 10NN cluster affect pending transactions (transactions announced but not yet completed). More specifically, we study if the time to resolution (the time to completion or withdrawal announcement) of these pending transactions is affected by DOJ/FTC enforcements. We find that the time to resolution for pending transactions is significantly longer following regulatory inventions in the cluster, even after controlling for a long list of covariates. This result is further consistent with enforcement uncertainty affecting the behavior of the merging parties. Finally, we examine the size of future acquisitions in these industries impacted by DOJ/FTC enforcements. Under the deterrence hypothesis, we anticipate that acquirers will strategically select smaller targets to increase the likelihood that they evade DOJ/FTC investigations, as one of the triggers for regulatory enforcement depends on a transaction size threshold (see Section 1). we find evidence consistent with this conjecture, and the effect

[5] Available at https://www.ftc.gov/policy/reports/policy-reports/ftc-annual-reports.

is economically sizeable: the average future deal size observed in industries subject to a DOF/FTC enforcement is almost cut in half. In addition, we report evidence that the probability of observing transactions with deal value *below* the DOJ/FTC reporting threshold is higher in 10NN clusters experiencing a DOJ/FTC enforcement in the last three years, one more observation consistent with the presence of deterrence effect.

The existing literature examines the relation between various forms of uncertainty and M&A activity. Bhagwat, Dam and Harford (2016) investigate whether market volatility, which generates economic uncertainty about target and acquirer firm value, affects M&A activity and confirm that this is the case. Cao, Li and Liu (2019) study the relation between political uncertainty and (cross-border) M&A activity using evidence around national elections in 47 countries, while Nam and Hieu (2017) and Bonaime, Guelen and Ion (2018) examine other public policy sources of uncertainty (such as unpredictable changes in fiscal rules, government spending cuts, or changes in monetary policy). Both those papers consistently report that uncertainty hampers M&A activity. Endogenous omitted variables remain, however, a potential confounding factor in this area of the literature, especially with the use of economy-wide measures of uncertainty. Our use of DOJ/FTC enforcements in the M&A market offers the opportunity to examine sources of uncertainty that are target- or industry-specific.

In addition, confirming that regulatory enforcement uncertainty imposes a significant deterrence effect on the M&A market in the recent period extends the results reported in Clougherty and Seldeslachts (2013), the paper most similar to ours in the existing literature. The Clougherty and Seldeslachts results pertain to the nineties and since then the DOJ/FTC Horizontal Merger Guidelines have undergone two substantial revisions. Analyzing whether these results hold after two revisions during the last two decades was, in our opinion, necessary.

For the last forty years, the academic literature has struggled to provide economic justification for DOJ/FTC interference in the M&A market. Repetitive direct tests of the market power hypothesis have failed to uncover conclusive empirical evidence (Eckbo, 1983; Stillman, 1983; Eckbo, 1985; Eckbo and Wier, 1985; Shahrur, 2003; Fee and Thomas, 2004). Establishing a deterrence effect amounts to testing whether the DOJ/FTC are credible actors in the eyes of M&A market participants, and our results clearly confirm that this is the case.

Our results suggest that the DOJ/FTC intervention deterrence effect is (at least partly) driven by regulatory enforcement uncertainty.

More broadly, the results in our paper emphasize that deterrence, as an *ex ante* self-selection mechanism, is an important channel through which regulation impacts the behavior of economic agents and thus contributes to our understanding of interactions between law and finance.

The remainder of this paper proceeds as follows. In Section 1, we review the main U.S. regulations that govern regulatory agencies' interventions in the M&A market. We focus in Section 2 on method, presenting our data, variables, and econometric specifications. Section 3 is dedicated to our results, robustness checks and additional investigations, and Section 4 concludes.

Section 1: U.S. M&A regulation

This section details activities of the DOJ and FTC, the two main regulatory agencies in charge of supervising M&A transactions in the U.S. An important takeaway from this discussion is that the inherent complexity of the regulatory process in the U.S. lends credence to a conclusion that uncertainty about antitrust enforcement could be a deterrent for potential acquirers.

Other U.S. government agencies sometimes investigate whether M&A transactions comply with U.S. legislation, particularly in industries such as financial services (Federal Reserve Board, Federal Deposit Insurance Corporation), energy production (Federal Energy Regulation Commission, Nuclear Regulatory Commission), and communication (Federal Communications Committee). But the DOJ and FTC are clearly the most active interveners in the M&A market and must legally be involved in overseeing many M&A transaction of even intermediate size.[6]

The review process is summarized in Figure 1. The process starts with filing a notice of a proposal deal. Not all deals are required to file and the filing threshold, based on the

[6] Under the Hart-Scott-Rodino Antitrust Improvements Act of 1976 (which amended the Clayton Antitrust Act of 1914), the DOJ and FTC are in charge of preventing M&As that "are likely to reduce competition and lead to higher prices, lower quality goods or services, or less innovation." The FTC provides on its internet site a set of documents that describe in depth the review process, the best practices advised to merging parties in order to efficiently go through this process, and the horizontal merger guidelines that explains the work of the two agencies: https://www.ftc.gov/enforcement/merger-review.

transaction size, is updated annually, as mandated by the 2000 amendment to the Hart-Scott-Rodino act.[7] The premerger filing starts a period of 30 days[8] during which the DOJ and FTC staff consult each other and an initial review of the transaction is assigned to one of the agencies. During that period, the merging parties can voluntarily submit additional documents to facilitate the review process. This premerger filing ends with one of three outcomes: (i) early termination, the agencies confirming that the transaction does not raise competitive concerns and thus approving it; (ii) expiration of the 30 days without request for additional of information, in which case the transaction is also approved; or (iii) a second request from the agencies for additional information. In that last case, a new review period opens during which the merging parties must provide the requested information.

This part of the review process usually involves direct interactions between the merging parties and the DOJ/FTC to discuss the requests, giving the merging parties the opportunity to directly defend to regulators their point of view about the proposed deal. In case of disagreement between the merging parties and the agencies, the merging parties may petition the General Counsel of the FTC to hear an appeal on the unresolved issue.[9] Once the merging parties have substantially complied with this second request, a new 30 day[10] delay starts to let the agencies review the additional information transmitted by the parties. The agencies can then: (i) end the investigation, clearing the transaction; (ii) negotiate a consent agreement with parties that determines the conditions under which the transaction will be cleared (mostly divestitures of assets); or (iii) seek to stop the transaction entirely by filing a preliminary injunction in Federal district court.

The DOJ/FTC suggests a set of best practices to ease the review process for all parties involved. These include early voluntary submission of information and effective use of "withdraw and refile," amongst other practices. In particular, providing information

[7] See https://www.ftc.gov/system/files/documents/federal_register_notices/2018/01/revised_jurisdiction_7a_1-29-18.pdf for the 2018 thresholds, which are all well less than $1 billion. The annual update procedure keeps the thresholds constant in real terms and relative to the size of the economy. However, as noted in Wollmann (2019), these annual changes decrease the number of mergers referred to regulators and may cause some time-series predictability in our independent variables. Since our regressions all include year fixed effects, however, the coefficients on our independent variables of interest measure the deterrence effect orthogonal to any time-series in those independent variables. As such, this shouldn't affect our tests.

[8] Reduced to 15 days for cash tender offers and bankruptcy sales.

[9] The appeal process itself follows a strict procedure (see https://www.ftc.gov/enforcement/premerger-notification-program/hsr-resources/requests-additional-information-appeal).

[10] Reduced to 10 days for cash tender offers and bankruptcy sales.

complementary to the Hart-Scott-Rodino Antitrust Improvements Act (HSR) filing to the agencies may obviate the need for a second request and significantly shorten the review process. Key helpful information always includes strategic and marketing plans for the previous two years, a list of all currently manufactured, marketed, or sold products as well as products in development, a list of top ten customers and of top competitors, market share information, and a list of the types of reports that the company prepares on a regular basis. The agencies note finally that, in case of second request, negotiations between the agencies' staff and the merging parties are important to reduce the burden of the review process on both sides.

Central to the review process is the investigation undertaken by the staff at the DOJ/FTC designed to determine whether the proposed transaction displays adverse competitive effects. This is a complex process because it requires taking into account many dimensions and is by nature predictive, the issue being to compare a given market structure with and without the proposed merger. The horizontal merger guidelines provide a depiction of evidence of adverse competitive effects, the determination of the relevant market, the identification of market participants, the computation of market shares and concentration, the nature of unilateral and coordinated anti-competitive effects, and entries, efficiencies and failures as factors limiting the risk of adverse competitive effects.

The definition of the relevant market is a key step of the analysis. This step helps specify the lines of commerce and geographic areas of the country which are susceptible to potential competitive concerns. This step also allows the DOJ/FTC to identify market participants and measure market shares and market concentration. Product market definition focuses on "… demand substitution factors: the customers (or consumers) ability and willingness to substitute away from one product to another in response to a price increase or a corresponding non-price change as reduction in product quality or service."[11] As noted above, market definition has a geographic dimension: distance may limit the willingness or ability of customers (or consumers) to substitute alternative products due to transportation costs (and also to many other factors such as language, regulation, tariff trade barriers, familiarity, reputation, service availability, etc.).

[11] FTC Horizontal Merger Guidelines, p. 7.

Once a relevant market is established, market participants can be identified. The DOJ/FTC consider as market participants all firms that currently earn revenues in the relevant market, including vertically integrated firms. Viable potential entrants (firms in position to quickly supply the products under consideration in case of a price increase) are also taken into account. The definition of the relevant market also includes a calculation of market shares and market concentration. Market shares are based on historical information but take into account the dynamic transformation of the industry under focus and, in this sense, are predictive.

Quantitative estimates of market concentration are typically calculated by the DOJ/FTC using the Herfindahl-Hirschman Index (HHI), obtained by summing the squares of the individual firms' market shares. Using HHI, the agencies classify markets into three mutually exclusive categories: (i) Unconcentrated markets, HHI below 1500; (ii) Moderately concentrated markets, HHI between 1500 and 2500; or (iii) Highly concentrated markets, HHI above 2500. Using these categories, and the change in HHI implied by the merger under investigation, the agencies obtain indications of the potential presence of adverse competitive effect. For example, if the merger takes place in a unconcentrated market it is unlikely to have adverse competitive effects, while if it takes place in a moderately concentrated market and generates an HHI increase of more than 100 points, significant competitive concerns are potentially raised. These rules are not applied rigidly, but help to discriminate transactions that are clearly without concerns from those that should be seriously investigated.

If a transaction warrants more in-depth consideration after the preliminary screen, the regulators examine other issues, such as the nature of the products in question (differentiated products versus homogenous products), the selling procedures typical in the market (are products sold through direct negotiations between buyers and sellers or by auctions), whether there is any evidence of collusion in the recent past, and whether rivals are in a position to retaliate in case of deviation from explicit or tacit agreements. At this stage, the DOJ/FTC investigation must also take into account (i) the likelihood of entries (or potential entries) in the industry in case of price increase, along with their timeliness and sufficiency, (ii) efficiencies (does the merger produce efficiencies large enough to compensate for adverse competitive effects in such a way that customers or consumers will benefit from this transformation of the industry?) and (iii) failures (is one of the merging party likely to exit

the industry absent the merger?). These additional considerations add a significant layer of complexity to the analysis work.

Determining whether a given proposed merger transaction is potentially anticompetitive is clearly highly complex. The many dimensions taken into account, the predictive nature of the work, and the extent of information asymmetry between the merging parties and the regulatory agencies suggest a highly ambiguous procedure, leaving room for substantial subjectivity and possibly for motives other than consumer protection.[12]

Section 2: Data and empirical approach

2.1. Data

We employ the cohort of firms from H&P from 1996 to 2017.[13] Those authors collect business descriptions from 10-K filings (Item 101) on the SEC's Edgar website using web crawling software. Firm business descriptions are then merged with the Compustat universe. We then concatenate these data with the CRSP/Compustat merged data.

Table 1 displays summary statistics for the entire H&Ph sample. Column 1 reports the number of firms by year. The U.S. listing gap (Doidge, Karolyi and Stulz, 2017) is clearly apparent, with a regular decline in the number of publicly listed firms starting at the beginning of the new century: in 1997, the peak year in the sample, 6,883 firms are included in the sample. This figure drops monotonically to 3,783 by 2012, stabilizing at around 3,800 publicly listed firms for the remaining years in the sample.

Column 2 displays the number of firms in the average Text-Based Network Industry Classification (TNIC) industry designed by H&Ph to offer a granularity level comparable to three-digit SIC codes. We observe also a steady decline, from a peak of 173 firms in the average TNIC industry at the end of the nineties to less than 130 by the end of the sample period. Columns 3 to 5 display the first quartile, median, and third quartiles of the number of firms in a TNIC industry. While the median also exhibits a declining trend, this is not the case for the first and third quartiles: small and large TNIC industries remain comparable throughout the whole period. Column 6 reports the H&Ph similarity score averaged by year.

[12] For example, see Aktas, de Bodt, and Roll (2007) for evidence on the European experience with antitrust regulation.

[13] Available at http://hobergphillips.tuck.dartmouth.edu/industryclass.htm.

We observe a positive trend, with the average similarity score increasing by more than 10% over the sample period.

We hand-collect information on DOJ/FTC enforcements those agencies annual report to the Congress.[14] Enforcements encompass all cases in which some constraints are imposed on the merging parties, firms decide to withdraw transactions, or the DOJ/FTC seek an injunction to block the merger in a Federal district court (see Figure 1). This results in a sample of 570 enforcements. Our M&A sample is obtained by selecting, from the database maintained by the Securities Data Company (SDC), all mergers and acquisitions from 1996 to 2017, undertaken by U.S. and foreign acquirers (whether listed or not), and targeting U.S. listed firms. We impose no criteria on deal value but focus on control transactions (the acquirer holds less than 50 percent before announcement and seeks to own 100 percent after). Like Clougherty and Seldeslachts (2013), we do not limit the sample to horizontal transactions identified using acquirer and target SIC codes because a significant fraction of M&A transactions falling under DOJ/FTC investigations would thereby be excluded.[15, 16] These requirements lead to a sample of 6,285 transactions.

We next manually match our data on DOJ/FTC enforcements to this sample of M&A deals from the SDC database: this procedure enables us to match 204 DOJ/FTC cases with U.S. M&A transactions reported in SDC. The unmatched enforcements mostly concern private targets, excluded because we require targets to be listed firms, a necessary condition for matching with the H&Ph database. Out of 204 enforcements, 162 targets firms are present in the H&Ph universe.

Table 2 describes the set of variables that we use in our empirical analyses. Variable definitions and data sources are provided in Appendix 1. The variables in Table 2 are organized into four groups: DOJ/FTC enforcements, H&Ph similarity score, 10 nearest neighbors cluster (10NN) characteristics, and M&A activity. Statistics are reported using 10NN clusters for comparability with H&Ph and because most of our investigations will rely on these close competitors clusters. On average, we observe 0.031 DOJ/FTC enforcements[17] per 10NN

[14] Available at https://www.ftc.gov/policy/reports/policy-reports/ftc-annual-reports.
[15] Using three-digit SIC codes, forty-two percent of the transactions subject to DOJ/FTC enforcements in our sample are classified as non-horizontal transactions.
[16] We do, however, report a replication of our baseline results using a sub-sample of M&A transactions in which the acquirer and target have the same three-digit SIC code.
[17] Note that some enforcement procedures take more than one year to be completed. These appear each year during which the procedure is under progress in the statistics reported here.

cluster-year, of which about 10% (= 0.003 / 0.031) lead to a voluntary withdrawal of the proposed deal by the merging parties and 6.5% (0.002 / 0.031) to a DOJ/FTC injunction to a Federal court to block the transaction. These figures are low, but hardly surprising since many industries display levels of concentration such that the DOJ/FTC can mechanically and swiftly approve the transactions (i.e., HHI levels are below 1,500: see Section 1).

Turning to H&Ph similarity scores, the average similarity score by 10 NN cluster (0.194) is significantly higher than the average by TNIC industry reported in Table 1 Column 6 (around 0.04) by construction (10NN clusters focus on closest rivals in the product market space). A set of indicators and financial ratios allows us to characterize our similarity-score based 10NN clusters. We report *Total assets*, *Total sales*, and *Total market value* as measures of industry size, and *Sales growth*, *Tangibility*, *Leverage*, *Tobin's Q*, *Liquidity*, Return on assets (*ROA*), and *HHI.* All financial ratios are winsorized at the 1% level. The average annual *Sales growth* for these clusters is 59%, but the corresponding median is just 8.5% (revealing the presence of significant outliers, as can be seen in the maximum sales growth of 1,397% even after winsorization).

The average *Tobin's Q* is 1.98 with a corresponding median of 1.59. The average *ROA* is around 1.5%, but the median ROA is 2.7%. *Leverage*, *Tobins' Q* and *Liquidity* figures are comparable to the ones reported Karpoff, Schonlan and Wehrly (2017), while *Tangibility* and *ROA* are close to numbers reported in Godsell et al. (2018). The variable *# M&As* is the average number of M&A transactions per 10NN clusters. There is an unconditional probability of acquisition attempt in a 10NN clusters in any given year of 5.5%, comparable with statistics provided in Hoberg and Phillips (2010, Table 3).

Table 3 describes our M&A sample by year and provides the corresponding DOJ/FTC enforcements. We report the number of deals per year (Column 1), percentage of completed transactions (Column 2), and the aggregate, average, and median value of transactions (Columns 3, 4, and 5). The well-known M&A waves of the end of the nineties and in the mid-2000s are observable in number of transactions and in aggregate value, as well as the recent resurgence of the M&A market after the 2008 financial crisis (see Alexandridis, Antypas, and Travlos, 2017, Figure 1). The average and median deal values are also clearly correlated with volume-based M&A waves. The aggregate deal value in 2015 ($855 billion) remains at distance of the all-time aggregate deal value record in 1999 of close to $1,199 billion.

On average, 84.07 percent of the transactions are completed, a figure that is quite stable through time (except in the 2008 financial crisis). The number of DOJ/FTC enforcements and the voluntary acquisition-proposals withdrawals and DOJ/FTC applications to a Federal court for an injunction (to stall the deal) subsets are provided in Columns 9, 11 and 13 respectively (with corresponding percentages in Columns 10, 12 and 14). Over the whole sample period, on average 2.58% of transactions are subject to DOJ/FTC enforcements (162 cases), of which 19 cases are voluntarily withdrawn by the proposing parties and six lead to an injunction being issued by a Federal court in favor a request by the DOJ/FTC to block the deal.

2.2. Econometric specification

A first-best test of a deterrence effect would ascertain which firms are contemplating M&A transactions and whether those transactions become less likely after a DOJ/FTC enforcement. This is obviously not possible because we cannot observe potential acquirers' intentions. Our empirical strategy is to come as close as possible to this ideal test.

In our baseline specification, the principal unit of analysis in our empirical tests is the 10NN cluster based on H&Ph similarity scores, although we also use TNIC, valuation peers and three-digit SIC industries for robustness checks in additional analyses. We use the following procedure: for each firm-year (i, t) in our sample (see Table 1), we have a corresponding 10NN cluster-year (c, t). This 10NN cluster is comprised of the 10 nearest neighbors (by similarity score) of firm i in the firm's TNIC industry and firm i itself.[18] These 10NN clusters compose our panel data set. Note that any given firm may belong to several 10NN clusters (in other words, the clusters potentially overlap).

For each 10NN cluster, we observe every cluster/year (c, t) acquisition attempt and/or antitrust enforcement. Our main dependent variable is the probability of an M&A transaction in the cluster/year, $\Pr\left(M\&A_{c,t}\right)$, and computed as:

$$\Pr\left(M\&A_{c,t}\right) = \frac{\#\ M\&As_{c,t}}{\#\ Firms_{c,t}} \tag{1}$$

[18] We use the "Complete 10-K TNIC Industry" data file (http://hobergphillips.tuck.dartmouth.edu/tnic_poweruser.htm) to ensure that all 10NN clusters contain exactly 10 firms.

where $\#\ M\&As_{c,t}$ is the number of M&A transactions in the 10NN cluster c and year t and $\#\ Firms_{c,t}$ is the corresponding number of firms. If an acquisition of target firm is not completed by the end of the year t, the target firm is replaced in the 10NN cluster in year *t+1* by the next closest firm in the product market space. This procedure avoids any mechanical decrease in the number of attempted transactions in a cluster due to the completion of a prior acquisition attempt.

The main independent variable is the number of DOJ/FTC enforcements in the 10NN cluster c in prior years: we include three lags in our main empirical specifications (i.e., $t-1, t-2$, and $t-3$).[19] In an alternative specification, we include an indicator variable equal to one if there is a DOJ/FTC investigation in the 10NN cluster in <u>any</u> of a three previous years; $\#\ Enforcements_{t-1}$ (or $\#\ Enforcements_{t-2}$ or $\#\ Enforcements_{t-3}$) denotes the number of enforcements. $Enforcement_{t-1/t-3}$ denotes the indicator variable. In additional analyses, we restrict our attention to the number of voluntary withdrawals of deals due to antitrust enforcements (denoted $\#\ Withdrawal$) or to the number of DOJ/FTC injunctions (from a Federal court) to block a transaction (denoted $\#\ Rejected$). We scale the number of enforcements, withdrawals, and injunctions to block a transaction by the number of firms in the corresponding industry-year because the number of firms in each industry varies when using TNIC, valuation peers or SIC three-digit industries.

Our baseline specification benefits greatly from: (i) the time-varying nature of similarity scores used to form 10NN clusters, which controls for the dynamic evolution of firms in the product market space, and (ii) the asymmetric nature of industry clusters obtained using similarity scores, as firms potentially belong to several clusters which greatly increases the number of observations (boosting the statistical power of our tests).[20]

Using these variables, we study the probability of observing an M&A transaction in a 10NN cluster c in year t conditional on past DOJ/FTC enforcements by running the following difference-in-differences regressions:

[19] Multiple-year DOJ/FTC enforcement procedures are taken into account each year during which the transaction under investigation is pending.

[20] This might induce some correlation across clusters. However, as noted earlier, our results are unaffected if we restrict our analysis to 10NN clusters that contain exactly the same firms over the three-year window in which we test for the deterrence effect.

$$\Pr(M\&A_{c,t}) = \alpha_c + \beta_t + \gamma \,\#\, Enforcement_{c,t-1} + \boldsymbol{Controls'_{c,t-1}}\,\boldsymbol{\delta} + \eta_{c,t} \quad (1)$$

$$\Pr(M\&A_{c,t}) = \alpha_c + \beta_t + \gamma_1 \,\#\, Enforcement_{c,t-1} + \gamma_2 \,\#\, Enforcement_{c,t-2} + \gamma_3 \,\#\, Enforcement_{c,t-3} + \boldsymbol{Controls'_{c,t-1}}\,\boldsymbol{\delta} + \eta_{c,t} \quad (2)$$

$$\Pr(M\&A_{c,t}) = \alpha_c + \beta_t + \gamma\, Enforcement_{c,t-1/t-3} + \boldsymbol{Controls'_{c,t-1}}\,\boldsymbol{\delta} + \eta_{c,t} \quad (3)$$

where α_c are 10NN cluster fixed effects, β_t are year fixed effects, $\boldsymbol{Controls_{c,t-1}}$ are our set of time-varying control variables computed at the 10NN cluster level (with coefficients denoted by the vector $\boldsymbol{\delta}$), and $\eta_{c,t}$ is the error term. In the additional analyses, we replace $\#\, Enforcement$ by $\#\, Withdrawal$ or $\#\, Rejected$. This specification is a linear probability model that allows us to implement a difference-in-differences test for events spread throughout time, consistent with the recommendations in Angrist and Pischke (2009). This also parallels the conditional probability approach implemented in Clougherty and Seldeslachts (2013) (although these authors also resort to dynamic panel and alternative non-linear specifications).

The treated group is composed of 10NN cluster-years that witnessed a DOJ/FTC enforcement and the control group is composed of all others 10NN cluster-years. Standard errors are clustered at the 10NN cluster level, to account for correlation of clusters through time and, in a robustness check, at the cluster-year level, another way to control for correlation across clusters due to the 10NN cluster overlap discussed earlier.

In Equations (1) to (3), the coefficient of interest is denoted by γ. Under the deterrence hypothesis, we expect γ to be negative: past DOJ/FTC enforcements in a 10NN cluster (which potentially lead to the withdrawal or cancelation of a transaction) deter firms in the (industry-like) cluster from attempting future acquisitions and the probability decreases that a given firm will become a target in that cluster in the future.

We expand Equation (3) to investigate the role of potential factors driving the deterrence effect. Specifically, as discussed above the duration of a DOJ/FTC enforcement may significantly exacerbate the chilling effect on M&A in an industry cluster. We therefore measure the duration of all DOJ/FTC enforcements procedure in our sample. Next, we define

a dummy variable denoted $dDUR$ equal to one for enforcement procedures longer than the median enforcement duration in our sample. Finally, we estimate:

$$\Pr(M\&A_{c,t}) = \alpha_c + \beta_t + \gamma_1\ Enforcement_{c,t-1/t-3} + \gamma_2\ (Enforcement_{c,t-1/t-3} \times dDUR_{c,t})\ + \boldsymbol{Controls'_{c,t-1}}\ \boldsymbol{\delta} + \eta_{c,t} \quad (4)$$

where γ_2 is an estimate of the incremental impact of investigation duration on the DOJ/FTC deterrence effect. A similar specification is used to explore the effect of alternative proxies for regulatory enforcement uncertainty.

Section 3: Results

3.1. The deterrence effect of DOJ/FTC enforcements

Do DOJ/FTC antitrust enforcements deter future acquisitions attempts? We focus in Panel A of Table 4 on DOJ/FTC enforcements and report the results of Equations (1) (Columns (1) and (2)) and (2) (Columns (3) and (4)), both with and without control variables. 10NN clusters and year fixed effects are included in each specification. The variable $\#\ Enforcement$ has a negative coefficient in its first lag in Columns (1) – (4) and is highly statistically significant with and without control variables (and with and without additional lags). The two additional lags of $\#\ Enforcement$ also display negative and highly significant coefficients, without and with controls variables (Columns (3) and (4)). The point estimate of the coefficient on the first lag of $\#\ Investigation$, around -0.008, also implies an economically large effect. With an unconditional probability of an acquisition attempt in a cluster/year of 5.5%, a DOJ/FTC enforcement in year $t-1$ in a 10NN cluster reduces the probability of acquisition in the next year in that cluster by close to 15%. DOJ/FTC investigations are clearly economically relevant events for M&A market participants. These findings confirm that the results in Barros et al. (2019) and Clougherty and Seldeslachts (2013), observed (respectively) in an international context and during the 1990s in the U.S., still hold in the recent period after the revisions to the Horizontal Merger Guidelines in 1997 and 2010.

The results in Columns (3) and (4), furthermore, show that this deterrence effect is long lasting: the coefficients on the two- and three-year lags of $\#\ Enforcement$ are negative, statistically significant, and have sizeable point estimates (after three years, a DOJ/FTC

enforcement continues to reduce the probability of acquisition in a cluster by 16%). This long-lasting effect is consistent with the DOJ/FTC deterrence effect being fundamentally related to industry structural characteristics, such as the number of producers, the degree of concentration, the presence of barriers to entry and exit, and potential substitute products.

Turning attention to the control variables in Columns (2) and (4), (log) *Total Assets*, *Tangibility, Tobin's Q* and *Liquidity* negatively affect the probability that we observe a M&A attempt in the cluster under consideration, while *Sales Growth* and *ROA* and *Avg Score* increases this probability.[21] These results are intuitive: large and richly (or highly) valued firms are incrementally more difficult to acquire as are firms more difficult to value, and growing, profitable and more competitive industries are more attractive to potential acquirers.

We next investigate whether the DOJ/FTC deterrence effect is exacerbated by certain outcomes from the investigation in question. In about 85% of the deals that are subject to DOJ/FTC enforcements (see Table 2), the merging parties negotiate an acceptable solution with regulators (usually involving the divestment of some contentious assets) and the deals are allowed to proceed (albeit modified). In almost 15% of cases, however, the DOJ/FTC enforcement procedure results in the termination of the proposed deal, either because the merging parties voluntarily withdraw it (12% of our sample) or because a Federal court issues an injunction requested by the DOJ/FTC (3.7%).

In Panel B of Table 4 reports on firm voluntary withdrawals, while in Panel C focuses on DOJ/FTC-requested injunctions from a Federal court to block the transaction. Voluntary deal withdrawals (following DOJ/FTC scrutiny) are also associated with a significant deterrence effect at the first lag in all specifications (see Table 4, Panel B Columns (1) to (4)). This deterrence effect vanishes however at the second and third lag. Notably, the point estimates of the deterrence effect at the first lag are higher than in Panel A (which mixes all forms of DOJ/FTC investigation outcomes). With coefficients around -0.017, the decrease in the probability that we observe an M&A transaction in the cluster in the next period following a voluntary withdrawal of deal is close to 30%.

Furthermore, DOJ/FTC enforcement that result in injunctions from a Federal court to block the transaction (see Panel C) generate an even stronger deterrence effect at the first lag (with associated point estimates around -0.026, translating into a 47% decrease in

[21] The firm characteristic variables in all regressions are the value-weighted average over the firms in the cluster.

probability of observing an M&A in the next period). Like for voluntary withdrawals, this deterrence effect seems, however, to be more short-lived, as it disappears mostly at the second lag (but survive at the third). The choice of policy instruments used by regulators matter, as discussed in Barros et al. (2009).

In summary, these results demonstrate a strong deterrence effect following DOJ/FTC antitrust enforcements in an "industry" cluster, and this effect appears to last at least three years. Arguably, the more serious of these enforcements, from the perspective of firms in the industry, are ones that derail the proposed deals entirely. In those cases, the government's concerns were clearly so fundamental that no amount of bargaining by the merging parties could resolve those issues, or the government felt forced to apply to a Federal court for an injunction blocking the deal. Consistent with these cases likely being considered more alarming by industry participants, these DOJ/FTC enforcements appear to have substantially and statistically larger chilling effects on the industry in terms of deterring future M&A activity (although such effects have shorter lives).

Lastly, we check whether our results are sensitive to the coding of the independent variable. Table 4, Panel D contains results obtained by estimating Equation (3). In that equation, the independent variable is an indicator variable taking value one if the 10NN cluster witnessed a DOJ/FTC enforcement within the last three years. Columns (1) and (2) report results for all enforcement outcomes, Columns (3) and (4) for voluntary withdrawals only, and Columns (5) and (6) for DOJ/FTC investigations resulting in an injunction from a Federal court. In all specifications, without and with control variables, these alternative independent variables display negative, highly significant and sizeable coefficients, confirming results reported in Panels A to C. Using coefficient point estimates in Column 2, DOJ/FTC enforcement(s) reduce(s) the probability of acquisition in a cluster by 21%

3.2. Sources of Statistical Bias or Econometric Misspecification

Correlation in Cross-Industry Clusters

We first turn our attention to the computation of standard errors. Because any given 10NN cluster can overlap with other clusters (i.e., a firm may be a member of more than one cluster), one may worry about cross-cluster correlations. This concern is somewhat limited thanks to the number of 10NN clusters in any year (which is equal to the number of firms in the sample in each year, see column 1 of Table 1 (above 3,600 in any given year)).

Nonetheless, we go one step further than the results reported in Table 4, Panel A and use standard errors clustered at both the 10NN cluster and year levels in Table 5, Panel A. By clustering standard errors by year, we also account for any contemporaneous correlation across 10NN clusters. The organization of Table 5 Panel A matches Table 4, Panel A (all forms of DOJ/FTC enforcement outcomes). The results are practically identical to those reported in Panel A of Table 4.

Difference-in-differences Estimators with Events Staggered Through Time

Goodman-Bacon (2021) shows that the difference-in-differences estimator for events staggered through time is a weighted average of two-way difference-in-differences estimators of (i) treated and untreated observations, (ii) early to late treated estimators, and (iii) late to early treated estimators. The presence of early to late and late to early treated comparisons and the weighting scheme itself can seriously bias the difference-in-differences estimator. Baker et al. (2021) show that this bias can be serious enough to generate average treated effect estimates with the wrong sign. The authors study different solutions proposed in the literature to fix this source of bias. Their results suggest that switching to event time and adopting a so-called stacked regression approach is an adequate solution. We follow this recommendation and run the following regression in event time:

$$\Pr\left(M\&A_{sct}\right) = \alpha + \sum_{\tau=-4}^{+3} \gamma_{\tau}\, dYearToEnf_{\tau sct} + \mu_{sct} + \nu_{sc} + \epsilon_{sct} \qquad (5)$$

where s is the event stack, c is the industry cluster, and t is the year. We assemble one stack per DOJ/FTC enforcement event that contains the industry cluster witnessing the enforcement (the treated observations) and all industry clusters that are never subject to an enforcement but have had at least one M&A transaction the year of DOJ/FTC enforcement (the control group). Requiring that clusters belonging to the control group experience at least one M&A transaction in the year of enforcement is important in our case because DOJ/FTC enforcements require that an M&A transaction attempt happens. Valid control industry clusters therefore also must experience an M&A deal in year t. Our event window starts four years before the enforcement year and ends three years after.

The variables $dYearToEnf_{\tau sct}$ in equation (5) are indicators taking value one for treated observations if the current year t is τ years from the enforcement year. Year (μ_{sct})

and industry cluster (ν_{sc}) fixed effects are saturated at the event stack level. Standard-errors are themselves clustered at the event-cluster stack level. We omit $dYearToEnf_{-4sct}$ and $dYearToEnf_{-1sct}$ to avoid perfect multicollinearity. The exclusion of the initial and before the event indicator variables is the standard practice when implementing these tests (see Baker et al., 2021).

Estimated γ_τ coefficients are reported in Figure 2, with corresponding 90% confidence intervals. Before the event, these coefficients are statistically indistinguishable from zero, a result consistent with the identifying assumption of a parallel trend in treated and control clusters. The probability of observing a transaction in the enforcement industry cluster jumps at the enforcement year. Even when we impose the condition that control industry clusters also display at least one M&A transaction in that year, apparently, industry clusters that witness an enforcement exhibit more M&A activity the year of the enforcement. Finally, we observe at steady decline in the probability of M&A transactions after the enforcement year, a result consistent with our baseline results. We conclude from this analysis that the source of bias identified in Goodman-Bacon (2021) is not driving our results.

M&A waves

M&A transactions happen in waves, both at the aggregate level and at the industry level (Harford, 2005). This generates autocorrelation in merger activity and motivates the use of dynamic panel specifications in Clougherty and Seldeslachts (2013), which include two lags of their dependent variable (the frequency of horizontal mergers, the frequency of non-horizontal mergers, or the relative frequency of horizontal mergers) as independent variables. The authors use generalized method of moment estimators to account for the mechanical autocorrelation of the residuals generated by such a specification. We replicate this approach for our linear specification by employing the Arellano-Bond (1991) estimator. The results are presented in Panel B of Table 5, the composition of which is identical to Table 4 Panel A. If anything, the coefficient estimates on our regulatory enforcement indicators are greater in magnitude and statistical significance is stronger in these tests using the Arellano-Bond estimator. Controlling for autocorrelation in the frequency of M&A transactions, therefore, appears to strengthen our empirical results.

Placebo test

We report the results of a placebo test in Panel C of Table 5. To do so, we simply shuffle the matches between DOJ/FTC enforcements and M&A transactions. Specifically, DOJ/FTC investigations are randomly assigned to 10NN clusters and, therefore, any detection of a deterrence effect would be spurious, signaling that our empirical strategy is flawed if it detects a deterrence effect when none exists. Table 5, Panel C is organized in a similar way to Panel A of Table 4. The results indicate clearly that our methodology does not identify a spurious deterrence effect in this placebo test: All coefficients lose their statistical significance in this placebo test, with coefficient estimates switching from positive to negative signs without any discernible pattern.

3.3. The Role of Industry Classifications

TNIC Industries

The 10NN clusters that we use in our main tests are, by definition, composed of 11 firms (the focal firm and its 10 nearest neighbors in the H&Ph product market space). To investigate the robustness of our results to different measures of industry classification, we start by replicating our analyses using instead the H&Ph TNIC industries. These industries, designed to achieve the same level of granularity as three-digit SIC code-based industry classifications, are far broader, with an average number of firms by cluster around 150, and display significant cluster-size heterogeneity (with a standard deviation of the number of firms in each "industry" of 191, untabulated). Table 6, Panel A reports results organized as in Panel A of Table 4, but with "industry" defined using the H&Ph TNIC measure. In all cases, the estimated coefficients of $\#\,Enforcement$ are negative and, in Columns (3) and (4), statistically significant. Switching from 10NN clusters to TNIC industries (with both based on H&Ph similarity scores) does not appear to fundamentally impact our main results.[22]

Industries Based on Valuation Peers

Eaton et al. (2021) investigate advising banks' choice of peers in comparable companies analysis in M&A transactions. The authors' analyses rest on a unique hand-

[22] The point estimates in Table 6 are not directly comparable to those in Table 4, Panel A because, to control for heterogeneity in industry cluster size, we scale the number of enforcements by the number of firms in the corresponding industry cluster.

gathered data set of valuation peers collected in Security Exchange Commission filings DEFM 14A for cash offers, SC 14D9 for tender offers, and S-4 for stock offers. The authors collect information on comparable companies (for valuation purposes) from the "Opinion of financial advisors" section of the final merger proxy (see Eaton et al., 2021, Appendix B and C for an example of comparable company disclosures[23]). The authors are able to identify comparable compagnies for 3,907 M&A transactions over the period 1995 to 2017 (Eaton et al., 2021, Table 1). The average number of comparable compagnies per transaction is around 9 in their sample.

Using this data source, we replicate our baseline analyses substituting valuation peers in place of our 10 nearest-neighbors approach (which uses H&Ph similarity scores). We are able to identify valuation peers for 2,908 of the 6,285 M&A transactions in our sample. While this leads to a significant sample size reduction, the hand-gathering procedure followed by Eaton et al. (2021) results in a high level of data consistency and precision. We expect therefore that the loss of statistical power due to sample size reduction will be (at least partially) compensated by more precise data.

Panel B of Table 6 displays results obtained using valuation peers to identify industry clusters. These are consistent with Table 4, Panel A : DOJ/FTC enforcements negatively affect the probability that firms will be targeted in future acquisition attempts. The reported coefficients are highly statistically significant at a one-year lag, without and with control variables, and remain statistically significant at the two-year lag. The confirmation of our baseline results using one more alternative data source for industry rivals (or comparables) is reassuring. [24]

Three-digit SIC code industry clusters

The obvious alternative to the use of H&Ph similarity score-based clusters (either 10NN or TNIC) is clusters based on SIC-code based industries, widely available to the research community thanks to the CRSP and Compustat databases. The results presented in Table 4 appear so clear and significant that one may legitimately wonder why such evidence did not emerge in prior studies of deterrence in the M&A context. One possibility is the shortcomings

[23] We are grateful to Eaton, Guo, and Liu for granting us access to their hand-gathered data set.
[24] Point estimates are again not directly comparable to Table 4 Panel A because, as with TNIC industries, we scale the number of enforcements by the number of firms in the corresponding industry cluster.

of classic industry classifications (e.g., those based on SIC codes), in particular their stickiness (see Bhojra et al., 2003). It is possible that these shortcomings are such that the deterrence of DOJ/FTC enforcements escapes econometric tests. To investigate whether this is the case, we reproduce the analyses in Panel A of Table 4 replacing 10NN clusters with three-digit SIC code based clusters (or "industries"). The results are displayed in Table 6, Panel C. Except for DOJ/FTC enforcements at the third lag in Column 4, all coefficients lose statistical significance. This leads us to conclude that the shortcomings of classic SIC code based industry classifications strongly affects the power of tests to detect the deterrence effect, a potential explanation for the limited evidence supporting the deterrence hypothesis in the existing academic literature. Our work greatly benefits from the use of H&Ph similarity score-based industries (or clusters).

3.4. Alternative M&A and industry samples

Horizontal Transactions

Under the Hart-Scott-Rodino Act of 1976, DOJ/FTC regulatory interventions are typically focused on *horizontal* mergers, but our main analysis is done using deals that include non-horizontal transactions. This choice is almost a necessity because 42% of M&A transactions that triggered DOJ/FTC interventions are classified as non-horizontal using the merging parties' three-digit SIC codes (and even more so using four-digit SIC codes). This is to be expected from the definition of a relevant market in the eyes of the regulatory agencies (see Section 1). Nevertheless, we conduct a robustness test limiting the M&A sample to deals in which the merging parties have the same three-digit SIC code (which is a typical definition of a horizontal transaction). The results are reported in Table 7, Panel A that again replicates Panel A of Table 4. If anything, the coefficient estimates for enforcements and rejections are higher and statistically more significant in this sample.

Intensive Margin Analysis

We also replicate our results at the intensive margin, keeping in the sample only those 10NN clusters that witness at least one DOJ/FTC enforcement. The results are reported in Table 7, Panel B (corresponding to Table 4, Panel A). Coefficient estimates for the variables of interest are very close to the estimates reported in Table 4, maintaining statistical significance in the majority of cases.

3.5. Additional Evidence on the DOJ/FTC Intervention Deterrence Effect

The role of uncertainty

Economic, political, and public policy uncertainty significantly impacts M&A market activity (Bhagwat et al, 2016, Nam and Hieu, 2017; Bonaime et al., 2018; Cao et al., 2019). Is this also the case for enforcement uncertainty? Simply put, is the DOJ/FTC deterrence effect uncovered in Table 4 driven by a fear of being subject to long and uncertain DOJ/FTC enforcement procedures?

Designing unambiguous empirical tests of such conjecture is by nature challenging. Potential acquirers are not directly observable and factors driving their willingness to undertake transactions are therefore hard to identify. But we know that the DOJ/FTC regulatory procedure is complex, predictive by nature, and takes into account many dimensions in a context of strong information asymmetry between the agencies and the merging parties (see Section 1). These factors make DOJ/FTC outcomes difficult to anticipate. If regulatory enforcement uncertainty drives (at least partially) the DOJ/FTC deterrence effect, we conjecture that the deterrence effect should be stronger the longer that DOJ/FTC investigations last. Long regulatory procedures are indeed costly to the merging parties, generate significant outcome uncertainty, and should therefore restrain potential acquirers from undertaking acquisition attempts.

For each DOJ/FTC investigation, we hand-collect the duration of the enforcement procedure from the DOJ/FTC Annual Report to the Congress and use as measure of regulatory uncertainty the variable $dDUR$, equal to one if the duration is above the median of the duration distribution (139 days). Panel A of Table 8 provides the results. In Columns 1 and 2, we introduce an interaction term between $dDUR$ and our $Enforcement$ dummy variable (see Equation 4). In Columns 3 and 4, we introduce controls for transaction size (the natural logarithm of deal value). Columns 1 and 3 report results without control variables and Columns 2 and 4 with control variables.

Coefficients on the interaction terms between the dummy variable $Enforcement$and the duration of the DOJ/FTC enforcement are negative, highly statistically significant, and sizeable, in each specification. The economic effect of the length of DOJ/FTC enforcement procedure on deterrence in the M&A market is substantial. For example, in Column 2 that reports results for a specification using $dDUR$ and including our set of control variables, the

deterrence effect from an above-median-length investigation is increased by more than 50% (from -0.0098 to close to -0.015) relative to a below-median-length investigation. Regulatory enforcement uncertainty appears therefore to be a significant factor driving deterrence in the M&A market.

In Panel B of Table 8 we use alternative, albeit more indirect, proxies for regulatory uncertainty. These proxies are built on the degree of heterogeneity in investor expectations about the outcome of the regulatory process. The first is abnormal trading volume ($Abnormal\ Volume$) observed during a three-day window centered around the DOJ/FTC enforcement announcement. The more investors disagree about the final outcome of the regulatory procedure, the more we should observe trading in the target's shares. Abnormal trading volume should therefore be positively correlated with the degree of regulatory enforcement uncertainty.

We also use the standard deviation of the arbitrage spread ($Std\ Arbitrage\ Spread$) as a proxy for regulatory enforcement uncertainty. This variable is computed over a window from day +1 to day +50 relative to the transaction announcement date. The more volatile the arbitrage spread is after the transaction announcement, the more variable is investor perception of the deal completion probability, which should also correlate positively with enforcement uncertainty. Columns 1 and 2 of Table 8, Panel B report results using abnormal volume as the proxy for regulatory enforcement uncertainty (without and with control variables, respectively), while Columns 3 and 4 use the standard deviation of the arbitrage spread. The interaction terms between the $Enforcement$ dummy variable and our proxies of uncertainty are significantly negative when control variables are included in the regressions (Columns 2 and 4), results that are again consistent with enforcement uncertainty increasing the deterrence of DOJ/FTC investigations.

Pending Transactions

DOJ/FTC enforcement procedure announcements often occur while other deals in the industry (10NN) cluster have been announced but not yet completed. Do these events impact the outcomes of pending transactions in the cluster? Under the enforcement uncertainty hypothesis, we expect this to be the case: parties in negotiation observing that regulatory agencies actively monitor their industry should worry about the outcome of the enforcement

and whether such scrutiny will be applied to their deal[25]. The more this outcome is uncertain, the more should they delay deal completion, or even cancel the proposed transaction. We test these predictions by studying whether enforcement procedure announcements affect the time to resolution (whether resolution is completion or cancellation).

Table 9 reports results of a linear model where the dependent variable is the natural logarithm of one plus the number of days between the announcement date and either the deal completion date or the date of deal withdrawal (the time to resolution). In addition to year fixed effects, we add a long list of control variables: the natural logarithm of the deal value (*ln(DealValue)*), indicators variables identifying listed acquirers (*AcqPub*), U.S. acquirers (*AcqUS*), all-cash and all-stock transactions (*AllCash* and *AllStock*), target poison pills (*dPoison*), tender offers (*TenderOffer*), toeholds (*dToehold*), transactions by parties belonging to the same 2-digit SIC code (*dHoriz*), and unsolicited transactions (*dHostile*). We also include the 4-week transaction premium as reported by SDC (*Premium*) and the target run-up (*TargRunUp*) (although this latter variable is included only in even columns because limiting the sample to public targets imposes data availability constraints that significantly affect the sample size). The first two columns report results obtained using all enforcement types, the next two are voluntary withdrawals, and the last two are for DOJ/FTC injunctions to a Federal court to block the transaction. The results clearly support our conjecture: the time to resolution significantly increases in all cases.

Transaction Size

Under the deterrence hypothesis, one possible strategy that acquirers could follow to escape from DOJ/FTC scrutiny is selecting targets small enough to either avoid the thresholds for compulsory advanced disclosure under the Hart-Scott-Rodino Act or avoid the perception of market dominance. As explained in Section 1, not all deals are required to file forms with the DOJ/FTC and the filing threshold is based on transaction size in nominal US dollar terms. The threshold is itself updated annually, as mandated by the 2000 amendment to the Hart-Scott-Rodino Act. This implies that there may be strategic target selection by acquirers, based

[25] After the announcement of the acquisitions of Quaker oats co by Pepsico the 12/04/2000 and the acquisition of Keebler foods by Kellog the 10/26/2000 and before their completion, an enforcement on the acquisition of Nabisco by Philip Morris was launched by FTC. At this time, Nabisco was in the 10NN of Quaker and Keebler. The first both deals had a time to completion of resp. 241 and 151 days, well above the sample mean and median of 134 and 109 days.

on target size. Under the deterrence hypothesis, we should observe a decrease in transaction size in the wake of DOJ/FTC enforcements.

To investigate whether this is the case, we replicate the analyses in Table 4, substituting acquisition size (measured by the natural logarithm of one plus the deal value reported in the SDC database) in place of the probability of observing an acquisition attempt in the industry cluster subject to enforcement. The results are reported in Table 10, Panels A to D, organized in a similar way to Table 4, Panels A to D. These results strongly support the presence of strategic target selection by acquirers. In Table 10 Panel A, the coefficients associated with one-lag to three-lags of DOJ/FTC enforcements are all negative and highly significant. These are confirmed at one-lag in Panel B when limiting the analysis to deals with M&A withdrawals, in Panel C with DOJ/FTC court injunctions to block the transaction, and in Panel D when we cumulate enforcements of the last three years. The economic effect is moreover sizeable: the average future deal value observed in industries subject to a DOF/FTC enforcement is almost cut in half (comparing average deal values before and immediately after regulatory interventions).

In addition to this difference-in-differences test of the effect on acquisition size, we investigate whether the probability of observing a transaction with deal value below the DOJ/FTC reporting threshold appears to be affected by DOJ/FTC enforcement. To this end, we collect historical DOJ/FTC reporting thresholds[26] and focus on the sub-sample M&A transactions that escape DOJ/FTC scrutiny due to their deal value being below the corresponding reporting threshold. Being a descriptive analysis, we report the results graphically in Figure 3. The upper (lower) graph displays the frequency distribution of M&A transactions in case of absence (presence) of DOJ/FTC enforcement during the last three years. The frequency distribution clearly shifts to the right as a result of regulatory enforcement, indicating an increase in the probability of observing an M&A transaction escaping DOJ/FTC filling obligations (this graphical evidence is confirmed by a test of difference of means). While limited to a simple comparison of frequency distributions, this

[26] The Hart-Scott-Rodino Antitrust Improvements Act of 1976 (HSR) created minimum dollar thresholds for deals obligated to report to antitrust authorities, to limit the burden of premerger reporting. In 2000, it amended the HSR statute to require the annual adjustment of these thresholds based on the change in gross national product. As a result, reportability under the Act changes from year to year as the statutory thresholds adjust. We collect the reporting threshold from 2005 to 2017 from the FTC blog (https://www.ftc.gov/news-events/blogs).

last analysis is again consistent with the deterrence hypothesis of DOJ/FTC regulatory interventions.

Section 4: Conclusion

Regulatory agencies regularly intervene in the M&A market. In the U.S., the Department of Justice and the Federal Trade Commission (DOJ/FTC) actively monitor M&A transactions, and are in charge of "preventing mergers and acquisitions that are likely to reduce competition and lead to higher prices, lower quality goods or services, or less innovation." (DOJ/FTC Horizontal Mergers Guidelines). Do these regulatory enforcements generate significant uncertainty, causing potential acquirers to refrain from engaging in acquisition attempts?

Using the Hoberg and Phillips (2010) product market similarity scores, a fundamental improvement with respect to industry classifications (e.g., using SIC codes), and working at the firm cluster level, we confirm a strong and long-lasting deterrence effect from DOJ/FTC investigations. The probability that we observe M&A transactions in firm clusters targeted by regulatory interventions decreases by more than 15% (a lower bound estimate) in the one-to-three years following the intervention. This result is robust to many alternative empirical specifications. We also show that more serious DOJ/FTC enforcements have larger deterrence effects (albeit less long-lived), as do longer DOJ/FTC investigations. Our results pertain to the recent two decades that witnessed two important revisions of the DOJ/FTC Horizontal Merger Guidelines (in 1997 and 2010) and are consistent with Barros et al. (2009) in the international context and Clougherty and Seldeslachts (2010) (a study focused on the 1990s).

We interpret these results as clear support for the notion that regulatory enforcement uncertainty creates substantive effects in the real economy, in this case by depressing M&A transactions (see also: Bhagwat et al, 2016, Nam and Hieu, 2017; Bonaime et al., 2018; and Cao et al., 2019). Impeding efficient resource allocation is, perhaps, an unintended consequence of M&A regulation.

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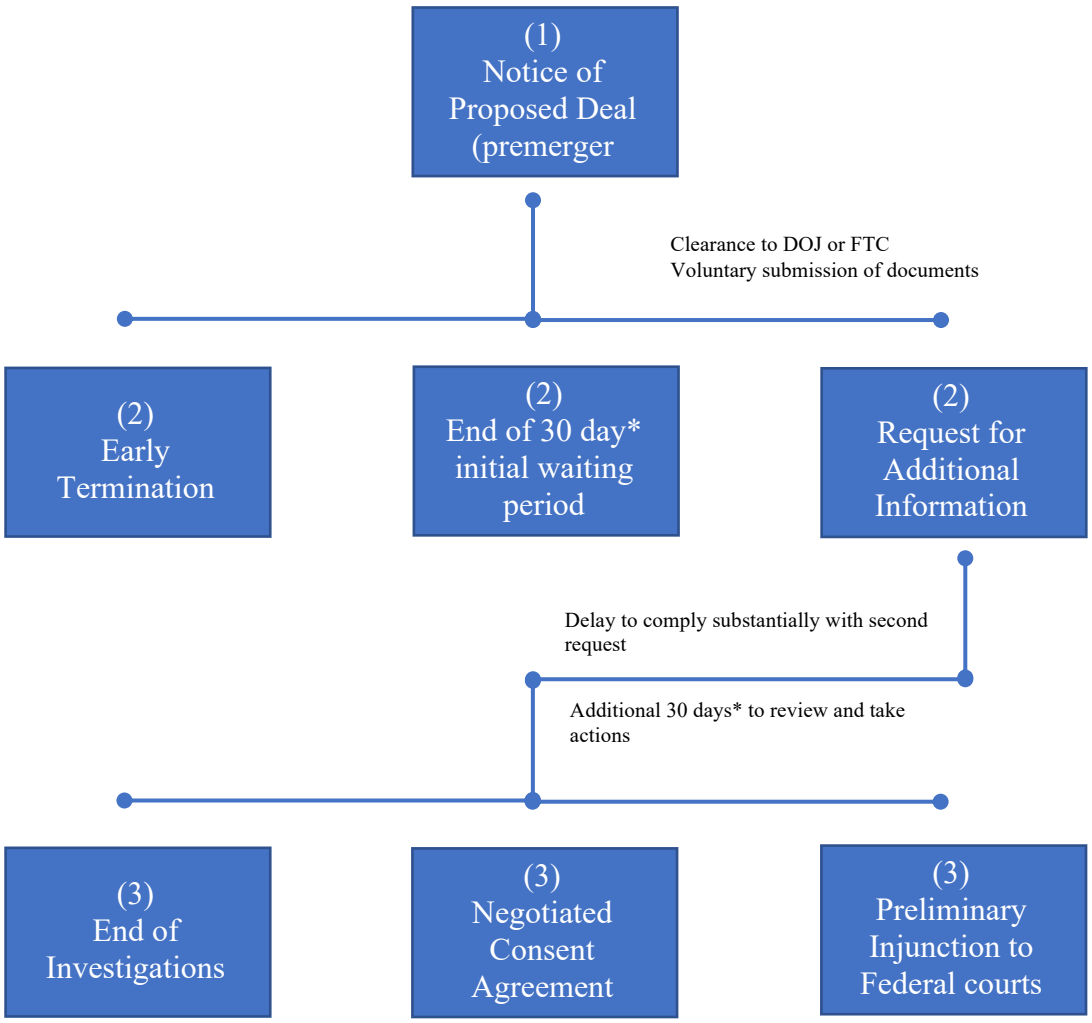
Figure 1 – U.S. Department of Justice and Federal Trade Commission M&A Review Process



* Delays are reduced to 15 days and 10 days for cash tender offers and bankruptcy sale for respectively the premerger filing and the second request.

Figure 2 – Stacked Regression in Event Time

Figure 2 displays Estimated coefficients γ_τ and corresponding confidence intervals obtained running the stacked regression in equation (5) in event time as advocated in Baker, Larker, and Wang (2021). The analysis is performed at the 10 nearest-neighbors similarity score cluster (10NN cluster) using a differences-in-differences specification. The dependent variable is the number of M&A transactions in a given 10NN cluster-year divided by the number of firms in this 10NN cluster-year. The independent variables of interest are the year to event indicator variables that identify the number of years between the observation year and the enforcement year, if any (negative values indicate years before the enforcement and positive values indicate years after the enforcement). The specification includes cluster and year fixed effects saturated at the enforcement-event level. Standard errors are clustered at the enforcement-cluster level. For each enforcement event, the control clusters include only clusters that never underwent any enforcement but exhibit at least one M&A transaction the year of the enforcement. The firm universe is described in Table 1 and the M&A sample in Table 3, with corresponding enforcement statistics. Confidence interval bounds are computed at the 10% significance level.

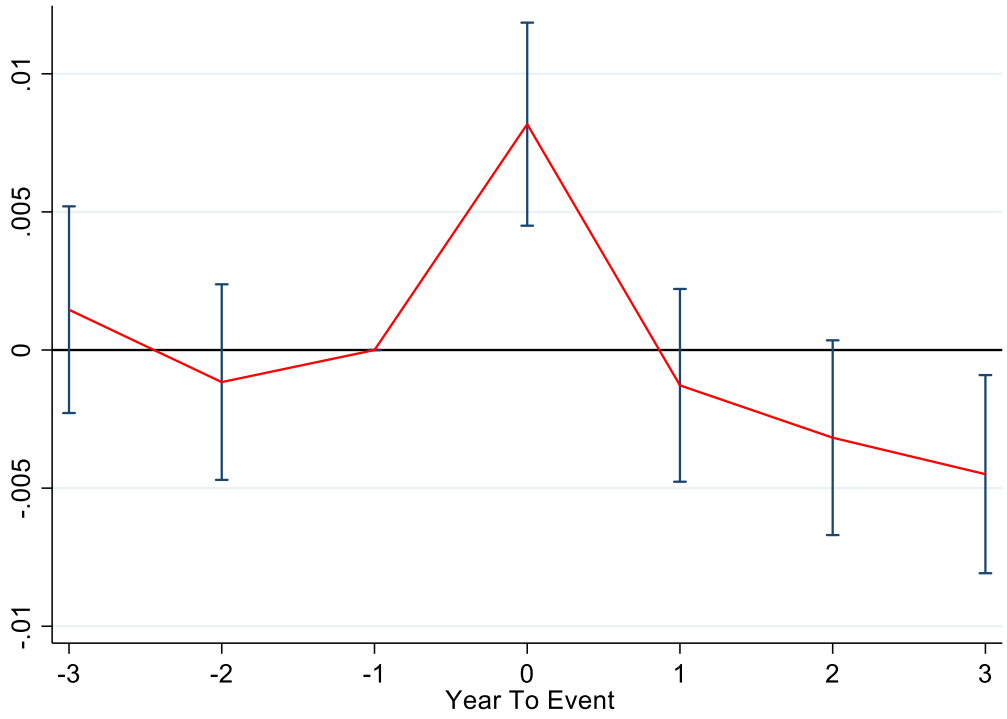


Figure 3 – Frequency Distribution of M&A Transactions with Deal Value Below DOJ/FTC Reporting Threshold

Figure 3 display the frequency distribution of M&A transactions with deal value below the DOJ/FTC reporting threshold in case of absence of DOJ/FTC enforcement during the last three years (upper graph – 101 observations) and in case of DOJ/FTC enforcement during the last three years (lower graph – 110 observations). The horizontal axis is the number of M&A transactions in a given 10NN clusters with deal value below the DOJ/FTC reporting threshold divided by the 10NN cluster size (11 firms including the firm under focus). The vertical axis reports the corresponding percentage.

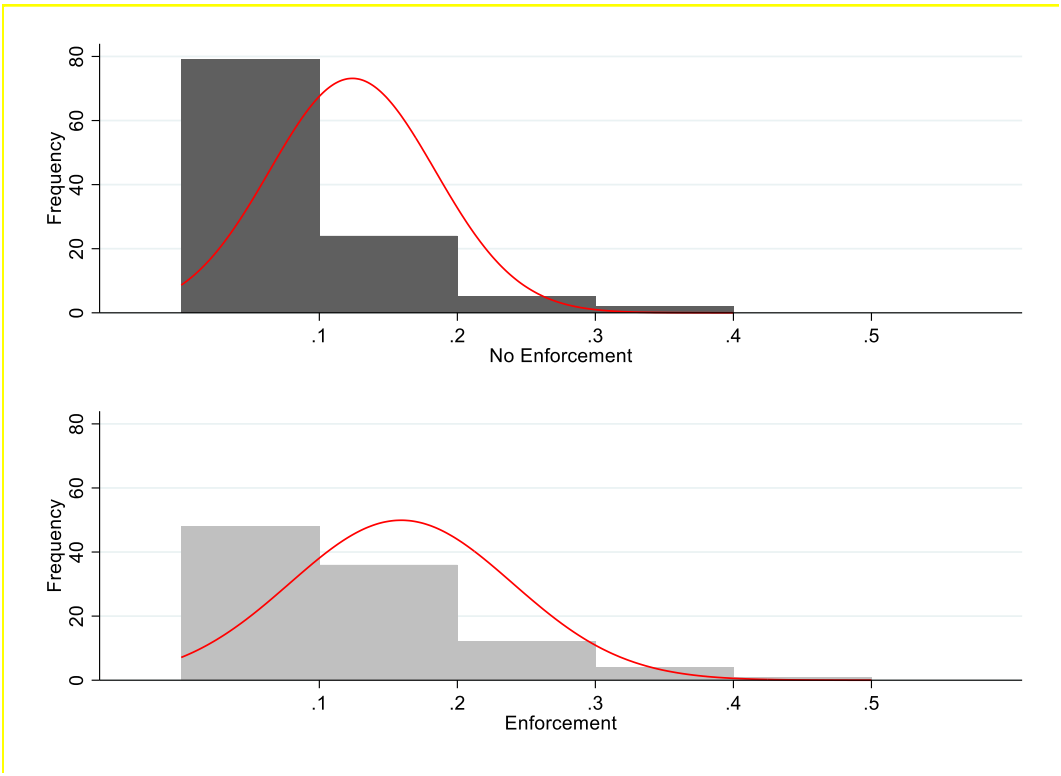


Table 1 – Firm Universe

Table 1 reports sample statistics on our cohort of firms, obtained starting from the Hoberg and Phillips firm universe (available at http://hobergphillips.tuck.dartmouth.edu/industryclass.htm) and after collecting corresponding PERMNO identifiers in the CRSP/Compustat merged database. In this order, Columns (1) to (6) provide: the number of firms (*# firms*), the average number of firms by TNIC (Text-based Network Industry Classification) industry (*average cluster size*), the corresponding first, second and third quartiles (*1st quartile cluster size, median cluster size* and *3rd quartile cluster size*), and the average of TNIC industry similarity score (SS) average (*average score*).

Year	# firms	average cluster size	1st quartile cluster size	median cluster size	3rd quartile cluster size	average score
	(1)	(2)	(3)	(4)	(5)	(6)
1996	6,621	154.78	11	61	204	0.0393
1997	6,883	157.54	13	63	212	0.0383
1998	6,589	154.20	12	58	197	0.0374
1999	6,347	173.61	12	64	221	0.0385
2000	6,138	173.04	13	66	236	0.0387
2001	5,534	164.64	13	65	223	0.0388
2002	5,131	154.00	12	60	191	0.0387
2003	4,833	154.07	12	60	187	0.0395
2004	4,774	146.18	12	58	179	0.0391
2005	4,703	141.27	12	50	163	0.0394
2006	4,654	144.42	11	47	176	0.0403
2007	4,579	140.66	11	47	186	0.0416
2008	4,328	133.52	10	44	173	0.0417
2009	4,081	123.14	10	40	158	0.0407
2010	3,961	122.85	10	39	161	0.0424
2011	3,863	122.94	10	40	174	0.0422
2012	3,783	115.26	10	39	164	0.0414
2013	3,866	127.48	10	44	213	0.0447
2014	4,028	140.40	11	49	249	0.0453
2015	3,969	137.71	10	45	226	0.0446
2016	3,832	133.35	10	41	222	0.0443
2017	3,651	128.57	10	39	211	0.0446
Total	106,148	145.80	11	52	197	0.0406

Table 2 – Descriptive Statistics

Table 2 provides descriptive statistics (mean, standard deviation, minimum, median, maximum and number of observations in Columns 1 to 6). Variables are organized in four groups: DOJ/FTC enforcements, Hoberg and Phillips similarity score, 10 nearest neighbors' (10NN) clusters characteristics and M&A activity. For DOJ/FTC enforcements, we report, by 10NN clusters, the average number of DOJ/FTC enforcements (*# Enforcements*), of transaction withdrawals (*# Withdrawals*) and of injunctions to a Federal court to block the transaction (*# Rejections*). For Hoberg and Phillips similarity score, the average for the 10 nearest neighbors in the product market space (*Avg 10NN score*) and the corresponding average maximum similarity score (*Max Score*) are reported. Provided 10 nearest neighbors cluster average characteristics are the number of firms (*# Firms)*, total assets, total sales, total market value, sales growth, the ratio of property, plants and equipment to total assets (*Tangibility*), the ratio of total debts to total assets (*Leverage*), the Tobin's Q, the ratio of the difference between current assets and current liabilities to total assets (*Liquidity*), the return on assets (*ROA*) and the sales based Herfindahl-Hirschman Index (HHI). M&A activity is described by the average number of M&A transactions by 10NN cluster-year (*# M&As*). Financial ratios are winsorized at 1% and 99%. All variable definitions are provided in Appendix 1.

	mean	sd	min	median	max	N
	(1)	(2)	(3)	(4)	(5)	(6)
DOJ/FTC enforcements						
# Enforcements	0.031	0.180	0.000	0.000	3.000	88,391
# Withdrawals	0.003	0.060	0.000	0.000	2.000	88,391
# Rejected	0.002	0.045	0.000	0.000	2.000	88,391
Hoberg and Phillips similarity score						
Avg 10NN score	0.194	0.090	0.033	0.173	0.663	88,391
Max Score	0.249	0.132	0.047	0.218	0.982	88,391
10NN cluster characteristics						
# Firms	11.000	0.000	11.000	11.000	11.000	88,389
Total Assets	89,890	314,936	98.47	18,383	8,450,144	88,340
Total Sales	32,116	61,127	2	11,527	1,498,470	88,296
Total Market Value	45,460	82,220	125	16,913	1,619,879	88,294
Sales growth	0.590	2.038	-0.911	0.085	13.973	76,600
Tangibility	0.227	0.216	0.003	0.156	0.851	87,546
Leverage	0.240	0.143	0.007	0.225	0.666	87,959
Tobin's Q	1.981	1.205	0.971	1.594	7.786	88,265
Liquidity	0.380	0.224	-0.151	0.382	0.854	70,575
ROA	0.015	0.085	-0.386	0.027	0.144	88,289
HHI	0.304	0.171	0.094	0.250	0.998	88,296
M&A activity						
# M&As/# Firms	0.055	0.075	0.000	0.000	0.636	88,391
# M&As	0.604	0.823	0.000	0.000	7.000	88,391

Table 3 – M&A Sample

Table 3 describe the M&A sample collected in the Refinitiv (ex Thomson Reuters Financial) SDC Platinum database. The sample contains M&A control transactions between any kind of (listed/unlisted and foreign/domestic) acquirers and listed U.S. targets matched to Hoberg and Phillips firm universe. For the period 1996 to 2017, Column 1 reports the number of M&A transactions (*# deals*), Column 2 the percentage of transactions completed (*% completed*), Columns 3 to 5 the aggregate, average and median deal value respectively, Columns 9 and 10 the number of DOJ/FTC enforcements (*# Enforc.*) and the corresponding percentage, Columns 11 and 12 the number of transactions withdrawn (*# withdraw*) and the corresponding percentage, and Columns 13 and 14 the number of injunctions to a Federal court to block the transaction (*# reject.*) and the corresponding percentage.

Year	# deals	% completed	Agg. deal value	Avg. deal value	Med. deal value	#Enforc.	%	#withdraw	%	#reject.	%
	(1)	(2)	(3)	(4)	(5)	(9)	(10)	(11)	(12)	(13)	(14)
1996	379	82.59%	325,481	859	115	8	2.11%	1	0.26%	0	0.00%
1997	497	85.71%	367,497	739	188	9	1.81%	3	0.60%	0	0.00%
1998	574	84.84%	1,037,995	1,808	178	15	2.61%	0	0.00%	0	0.00%
1999	652	81.60%	1,199,299	1,839	202	18	2.61%	1	0.15%	1	0.15%
2000	551	82.76%	1,074,914	1,951	178	13	2.36%	0	0.00%	0	0.00%
2001	374	85.83%	311,214	832	84	5	1.34%	2	0.53%	0	0.00%
2002	264	82.58%	158,877	602	90	5	1.89%	1	0.38%	0	0.00%
2003	290	84.83%	241,350	832	109	3	1.03%	1	0.34%	1	0.34%
2004	237	86.08%	460,229	1,942	242	6	2.53%	1	0.42%	0	0.00%
2005	238	85.71%	496,864	2,088	333	8	2.94%	0	0.00%	0	0.00%
2006	283	84.81%	562,695	1,988	436	3	1.06%	1	0.35%	1	0.35%
2007	295	83.39%	614,366	2,083	568	10	3.39%	2	0.68%	1	0.34%
2008	213	70.89%	392,020	1,840	190	4	1.88%	0	0.00%	0	0.00%
2009	172	81.98%	292,855	1,703	106	7	4.07%	1	0.58%	0	0.00%
2010	190	87.89%	237,746	1,251	289	7	3.68%	0	0.00%	0	0.00%
2011	166	82.53%	354,553	2,136	481	5	3.01%	1	0.60%	0	0.00%
2012	165	89.09%	185,900	1,127	360	6	3.64%	1	0.61%	0	0.00%
2013	145	86.90%	275,800	1,902	400	5	3.45%	0	0.00%	0	0.00%
2014	139	90.65%	414,057	2,979	645	8	5.04%	0	0.00%	0	0.00%
2015	162	83.33%	854,777	5,276	826	9	4.94%	3	1.85%	2	1.23%
2016	163	88.96%	617,646	3,789	1001	7	4.29%	0	0.00%	0	0.00%
2017	136	85.29%	567,910	4,176	695	1	0.74%	0	0.00%	0	0.00%
Total	6,285	84.07%	11,044,043	1,757	225	162	2.58%	19	0.30%	6	0.10%

Table 4 – The Deterrence Effect of U.S. Department of Justice and Federal Trade Commission Enforcements – Ten Nearest Neighbors in the Product Market Space

Table 4 reports results of linear models studying the determinants of the probability of observing M&A in the firm 10 nearest neighbors similarity score cluster (10NN cluster) using a differences-in-differences specification (see Section 2 Equations 1 to 3). In all cases, the dependent variable is the number of M&A transactions in a given 10NN cluster-year divided by the number of firms in this 10NN cluster-year. In Panel A, the independent variable of interest is the number of DOJ/FTC enforcements in the 10NN cluster lagged by one year, denoted *# Enforcement$_{t-1}$* (Columns 1 and 2) or lagged by one to three years, denoted *# Enforcement$_{t-1}$* to *# Enforcement$_{t-3}$* (Columns 3 and 4). In Panel B, the independent variable of interest is the number of firm withdrawals and in Panel C, the number of DOJ/FTC injunctions from a Federal court. Panels B and C are organized as Panel A. In Panel D, the independent variable is a binary treatment variable that takes value one if the corresponding 10NN cluster witnessed at least one DOJ/FTC enforcements (Columns 1 and 2), one firm withdrawal (Columns 3 and 4) or one DOJ/FTC injunction to a Federal court (Columns 5 and 6), each time within the three last years. Control variables include the log of Total Assets, Sales Growth, Tangibility, Tobin's Q, ROA, Liquidity, Leverage, HHI and Avg Score and are all defined in Appendix 1. All specifications include 10NN cluster fixed effects (*Cluster FE*) and year fixed effects (*Year FE*). *N* stands for the number of observations and standard-errors are clustered at the 10NN cluster level. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level.

Panel A - Year by Year Treatment Effect – DOJ/FTC Enforcements

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.0088***	-0.0085***	-0.0077***	-0.0074***
	(-5.49)	(-5.13)	(-4.45)	(-4.20)
# Enforcement$_{t-2}$			-0.0065***	-0.0065***
			(-3.83)	(-3.74)
# Enforcement$_{t-3}$			-0.0097***	-0.0090***
			(-5.75)	(-5.21)
ln Total Assets		-0.0041***		-0.0035***
		(-6.69)		(-4.97)
Sales growth		0.0004**		0.0003
		(2.10)		(1.25)
Tangibility		-0.0105**		-0.0060
		(-2.54)		(-1.30)
Tobin's Q		-0.0036***		-0.0047***
		(-7.52)		(-8.19)
ROA		0.0328***		0.0400***
		(5.81)		(6.05)
Liquidity		-0.0186***		-0.0145***
		(-4.84)		(-3.31)
Leverage		-0.0072*		-0.0089**
		(-1.89)		(-2.03)
HHI		-0.0015		0.0001
		(-0.54)		(0.04)
Avg Score		0.0627***		0.0413**
		(3.77)		(2.22)
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1580	0.1690	0.1240	0.1320
N	74,329	58,619	54,034	42,269

Panel B - Year by Year Treatment Effect - Firm Withdrawal

	(1)	(2)	(3)	(4)
# Withdrawal$_{t-1}$	-0.0161***	-0.0163***	-0.0176***	-0.0189***
	(-3.76)	(-3.80)	(-3.72)	(-4.00)
# Withdrawal$_{t-2}$			-0.0023	-0.0021
			(-0.32)	(-0.29)
# Withdrawal$_{t-3}$			-0.0075	-0.0075
			(-1.17)	(-1.16)
ln Total Assets		-0.0051***		-0.0048***
		(-6.98)		(-5.75)
Sales growth		0.0004*		0.0003
		(1.77)		(1.09)
Tangibility		-0.0125**		-0.0094*
		(-2.54)		(-1.72)
Tobin's Q		-0.0034***		-0.0046***
		(-6.31)		(-7.18)
ROA		0.0306***		0.0413***
		(4.84)		(5.57)
Liquidity		-0.0219***		-0.0176***
		(-4.87)		(-3.42)
Leverage		-0.0079*		-0.0077
		(-1.81)		(-1.53)
HHI		(0.00)		(0.00)
		(0.16)		(0.26)
Avg Score		0.0498***		0.0284
		(2.62)		(1.29)
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1630	0.1790	0.1250	0.1360
N	58,865	44,046	41,602	30,555

Panel C - Year by year treatment effect - DOJ/FTC Injunction to a Federal Court

	(1)	(2)	(3)	(4)
# Rejection$_{t-1}$	-0.0258***	-0.0228***	-0.0303***	-0.0264***
	(-5.47)	(-4.44)	(-5.59)	(-5.21)
# Rejection$_{t-2}$			0.0084	0.0096
			(1.28)	(1.31)
# Rejection$_{t-3}$			-0.0181***	-0.0218***
			(-2.79)	(-3.30)
ln Total Assets		-0.0049***		-0.0047***
		(-6.67)		(-5.63)
Sales growth		0.0005*		0.0003
		(1.95)		(1.20)
Tangibility		-0.0139***		-0.0116**
		(-2.77)		(-2.05)
Tobin's Q		-0.0033***		-0.0043***
		(-6.20)		(-6.67)
ROA		0.0279***		0.0378***
		(4.38)		(5.09)
Liquidity		-0.0202***		-0.0175***
		(-4.48)		(-3.38)
Leverage		-0.0087**		-0.0088*
		(-1.96)		(-1.73)
HHI		(0.00)		(0.00)
		(0.11)		(0.29)
Avg Score		0.0597***		0.0374
		(3.05)		(1.63)
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1650	0.1830	0.1280	0.1400
N	57,397	42,536	40,411	29,326

Panel D - Treatment Effect over Three Years

	(1)	(2)	(3)	(4)	(5)	(6)
Enforcement	-0.0132***	-0.0118***				
	(-10.70)	(-9.05)				
Withdrawal			-0.0114***	-0.0107***		
			(-3.24)	(-2.96)		
Rejection					-0.0250***	-0.0228***
					(-4.67)	(-3.91)
ln Total Assets		-0.0040***		-0.0048***		-0.0046***
		(-6.53)		(-6.83)		(-6.52)
Sales growth		0.0004**		0.0004*		0.0005**
		(2.13)		(1.91)		(2.13)
Tangibility		-0.0106***		-0.0118**		-0.0127***
		(-2.62)		(-2.48)		(-2.62)
Tobin's Q		-0.0036***		-0.0033***		-0.0032***
		(-7.79)		(-6.35)		(-6.22)
ROA		0.0326***		0.0304***		0.0272***
		(5.95)		(4.96)		(4.42)
Liquidity		-0.0180***		-0.0207***		-0.0193***
		(-4.79)		(-4.77)		(-4.41)
Leverage		-0.0073**		-0.0086**		-0.0096**
		(-1.98)		(-2.07)		(-2.26)
HHI		-0.0021		-0.0004		-0.0006
		(-0.80)		(-0.15)		(-0.21)
Avg Score		0.0571***		0.0437**		0.0534***
		(3.58)		(2.41)		(2.86)
Cluster FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
adjusted R^2	0.1630	0.1670	0.1680	0.1760	0.1700	0.1790
N	88,391	60,724	71,164	45,800	69,523	44,239

Table 5 – Sources of Statistical Bias or Econometric Misspecification

Table 5 presents a replication of Panel A in Table 4, except that in Panel A of this table standard-errors are clustered at both the firm 10 nearest-neighbors similarity score clusters (10NN cluster) and year levels to account for potential correlation across 10NN clusters in a given year in Panel A. In Panel B of this table, auto-correlation in M&A activity due to M&A waves is controlled for in Panel B using the Arenallo-Bond estimator. In Panel C of this table a placebo test is implemented. All specifications include 10NN cluster fixed effects (*Cluster FE*) and year fixed effects (*Year FE*). *N* stands for the number of observations. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. All variables are defined in Appendix 1.

Panel A – Cross Industry Correlation in Clusters

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.0088***	-0.0085***	-0.0077**	-0.0074**
	(-3.09)	(-3.07)	(-2.62)	(-2.62)
# Enforcement$_{t-2}$			-0.0065**	-0.0065**
			(-2.67)	(-2.57)
# Enforcement$_{t-3}$			-0.0097***	-0.0090***
			(-3.88)	(-3.39)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1300	0.1410	0.1050	0.1120
N	72,681	57,207	52,904	41,318

Panel B – M&A Waves

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.0344***	-0.0349***	-0.0453***	-0.0451***
	(-16,32)	(-15,94)	(-19,88)	(-19,14)
# Enforcement$_{t-2}$			-0.0257***	-0.0249***
			(-12,70)	(-11,98)
# Enforcement$_{t-3}$			-0.0214***	-0.0208***
			(-10,07)	(-9,57)
Controls	no	yes	no	yes
Year FE	yes	yes	yes	yes
N	54.034	42.144	46.624	36.292

Panel C – Placebo Test

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.0009	-0.0020	-0.0011	-0.0027
	(-0.60)	(-1.18)	(-0.64)	(-1.49)
# Enforcement$_{t-2}$			0.0004	-0.0019
			(0.22)	(-0.99)
# Enforcement$_{t-3}$			0.0011	0.0014
			(0.64)	(0.70)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1570	0.1680	0.1230	0.1310
N	74,329	58,619	54,034	42,269

Table 6 – The Deterrence Effect of U.S. Department of Justice and Federal Trade Commission Enforcements – Alternative Industry Classifications

Table 6 presents a replication of the results in Table 4 except that firm 10 nearest neighbors similarity score clusters are replaced by clusters based on TNIC (Text-based Network Industry Classification) industries in Panel A, clusters based on valuation peers from Eaton, Guo, Liu, and Officer (2021) in Panel B, and industry clusters based on three-digit SIC codes in Panel C. Control variable coefficients are not reported (*Controls* indicates whether they are included in the corresponding specification). All specifications include industry fixed effects (*Cluster FE*) and year fixed effects (*Year FE*). *N* stands for the number of observations and standard-errors are clustered at the TNIC industry level. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. All variables are defined in Appendix 1.

Panel A – TNIC industry clusters

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.0174	-0.0177	-0.0509*	-0.0513*
	(-0.69)	(-0.67)	(-1.93)	(-1.87)
# Enforcement$_{t-2}$			-0.0605**	-0.0580**
			(-2.37)	(-2.21)
# Enforcement$_{t-3}$			-0.0784***	-0.0721***
			(-3.25)	(-2.86)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.2210	0.1970	0.1820	0.1630
N	87,947	66,467	64,342	47,970

Panel B – Eaton et al. (2021) valuation peers clusters

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.1014***	-0.0877***	-0.0780**	-0.0693*
	(-3.32)	(-2.71)	(-2.05)	(-1.72)
# Enforcement$_{t-2}$			-0.0791**	-0.0731*
			(-2.10)	(-1.82)
# Enforcement$_{t-3}$			0.0663	0.0687
			(1.60)	(1.54)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.2650	0.2730	0.2430	0.2450
N	41,412	31,270	29,297	21,826

Panel C – Three-digit SIC code industry clusters

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	0.0006	0.0002	-0.0009	-0.0010
	(0.15)	(0.04)	(-0.19)	(-0.23)
# Enforcement$_{t-2}$			-0.0013	-0.0015
			(-0.32)	(-0.38)
# Enforcement$_{t-3}$			-0.0077**	-0.0077***
			(-2.58)	(-2.66)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.0870	0.0910	0.0910	0.0940
N	5,739	5,739	4,881	4,881

Table 7 – Alternative M&A and Industry Samples

Table 7 presents a replication of the results in Panel A of Table 4 except that we limit the sample of M&A transactions to horizontal transactions in Panel A (acquirer and target have the same three-digit SIC code: 2,587 transactions) and to 100NN clusters that witness at least one DOJ/FTC enforcement (i.e., intensive margin analyses) in Panel B. Control variable coefficients are not reported (*Controls* indicates whether they are included in the corresponding specification). All specifications include 10NN cluster fixed effects (*Cluster FE*) and year fixed effects (*Year FE*). *N* stands for the number of observations and standard-errors are clustered at the 10NN cluster level. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. All variables are defined in Appendix 1.

Panel A – Horizontal Transactions

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.0081***	-0.0077***	-0.0072***	-0.0070***
	(-5,41)	(-4,97)	(-4,22)	(-3,93)
# Enforcement$_{t-2}$			-0.0053***	-0.0048**
			(-2,94)	(-2,54)
# Enforcement$_{t-3}$			-0.0086***	-0.0081***
			(-4,64)	(-4,20)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0,1340	0,1490	0,1000	0,1100
N	74.999	59.144	54.646	42.771

Panel B – Intensive Margin Analyses

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.0088***	-0.0082***	-0.0077***	-0.0072***
	(-5.66)	(-5.08)	(-4.59)	(-4.15)
# Enforcement$_{t-2}$			-0.0068***	-0.0066***
			(-4.08)	(-3.87)
# Enforcement$_{t-3}$			-0.0092***	-0.0088***
			(-5.58)	(-5.19)
Controls	Yes	Yes	Yes	Yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1340	0.1340	0.1220	0.1230
N	17,993	17,016	14,498	13,710

Table 8 – The Role of Uncertainty

Table 8 displays results of additional investigations designed to identify factors driving the deterrence effect highlighted in Table 4. We expand the differences-in-differences specification estimated in Table 4 with added terms that captures the interaction between the DOJ/FTC enforcements and proxies of regulatory uncertainty (see Section 2 Equation 4). Panel A focuses on the duration of the regulatory procedure (in Columns 1 and 2, without controlling for the deal value and in Columns 3 and 4, controlling for it). The variable *dDUR* is equal to one for the DOJ/FTC enforcement procedures that lasted more than the median enforcement procedure duration (139 days). Panel B focus on two alternative proxies for uncertainty: the abnormal volume around the announcement date of the regulatory procedure (Columns 1 and 2) and the standard deviation of the arbitrage spread computed over a window of fifty days after the deal announcement date (Columns 3 and 4). All specifications include 10NN cluster fixed effects (*Cluster FE*) and year fixed effects (*Year FE*). *N* stands for the number of observations and standard-errors are clustered at the 10NN cluster level. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. All variables are defined in Appendix 1.

Panel A - Procedure Duration

	(1)	(2)	(3)	(4)
Enforcement	-0.0111***	-0.0098***	0.0007	0.0056
	(-7.06)	(-6.01)	(0.09)	(0.73)
Enforcement x dDUR	-0.0062***	-0.0055**	-0.0094***	-0.0066***
	(-2.68)	(-2.23)	(-4.12)	(-2.74)
Enforcement x ln(DealValue)			-0.0011	-0.0016*
			(-1.29)	(-1.89)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1630	0.1680	0.1640	0.1680
N	88,393	60,725	88,393	60,725

Panel B - Alternative Proxies for Uncertainty

	Abnormal Volume		Std Arbitrage Spread	
	(1)	(2)	(3)	(4)
Enforcement	-0.0132***	-0.0114***	-0.0130***	-0.0104***
	(-9.64)	(-7.91)	(-10.06)	(-7.53)
Enforcement x Uncertainty	-0.0330	-0.0484*	-0.0071	-0.0674***
	(-1.33)	(-1.85)	(-1.23)	(-3.21)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.1640	0.1690	0.1640	0.1680
N	87,275	59,821	87,331	59,790

Table 9 – The Case of Pending Transactions

Table 9 reports results of linear regressions exploring the effect of regulatory interventions on pending transactions the time to resolution (the natural logarithm of one plus the number of days between the announcement date and either the deal completion date or the date of deal cancellation). In each panel, Columns 1 and 2 are for DOJ/FTC enforcements, Columns 3 and 4 for firm withdrawals and Columns 5 and 6 for the number of DOJ-TFC injunctions from a Federal court. Our set of control variables includes the natural logarithm of the deal value (*ln(DealValue)*), dummy variables identifying listed acquirers (*AcqPub*), U.S. acquirers (*AcqUS*), all cash and all stock transactions (*AllCash* and *AllStock*), the presence of poison pill (*dPoison*), tender offer (*TenderOffer*), the presence of toehold (*dToehold*), transactions by parties belonging to the same 4-digit SIC code (*dHoriz*), unsolicited transactions (*dHostile*), the 4-weeks transaction premium as reported in SDC database (*Premium*) and the target run-up (*TargRunUp*). All specifications include year fixed effects (*Year FE*). *N* stands for the number of observations and standard-errors are robust to heteroskedasticity. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. All variables are defined in Appendix 1.

	(1)	(2)	(3)	(4)	(5)	(6)
Enforcement	0.5183***	0.4689***				
	(5.85)	(5.52)				
Withdrawal			0.3628***	0.4400***		
			(2.61)	(2.74)		
Rejection					0.3538***	0.3563***
					(3.81)	(3.62)
ln(DealValue)	0.0567***	0.0333***	0.0585***	0.0350***	0.0586***	0.0352***
	(6.54)	(4.58)	(6.72)	(4.82)	(6.74)	(4.84)
AcqPub	0.0175	-0.0373	0.0165	-0.0398	0.0176	-0.0381
	(0.60)	(-1.36)	(0.56)	(-1.45)	(0.60)	(-1.38)
AcqUS	0.0004	-0.0422	-0.0033	-0.0453	-0.0018	-0.0435
	(0.01)	(-1.44)	(-0.10)	(-1.55)	(-0.06)	(-1.49)
AllCash	-0.1524***	-0.2078***	-0.1563***	-0.2129***	-0.1561***	-0.2123***
	(-4.84)	(-7.37)	(-4.94)	(-7.53)	(-4.94)	(-7.51)
AllStock	0.0403	0.0041	0.0348	0.0000	0.0336	-0.0011
	(1.40)	(0.15)	(1.20)	(0.00)	(1.16)	(-0.04)
dPoison	0.5003***	0.5612***	0.4922***	0.5539***	0.4915***	0.5529***
	(3.19)	(3.49)	(3.13)	(3.44)	(3.13)	(3.44)
TenderOffer	-0.5999***	-0.6223***	-0.6035***	-0.6240***	-0.6033***	-0.6239***
	(-23.60)	(-25.10)	(-23.50)	(-24.96)	(-23.49)	(-24.95)
dToehold	0.3532***	0.3339***	0.3593***	0.3408***	0.3588***	0.3402***
	(6.50)	(6.18)	(6.53)	(6.22)	(6.52)	(6.21)
dHoriz	0.0181	0.0017	0.0190	0.0023	0.0184	0.0017
	(0.79)	(0.08)	(0.83)	(0.10)	(0.80)	(0.08)
dHostile	-0.4363***	-0.4767***	-0.4373***	-0.4768***	-0.4378***	-0.4775***
	(-5.14)	(-5.46)	(-5.13)	(-5.43)	(-5.13)	(-5.44)
Premium		0.0002***		0.0002***		0.0002***
		(5.48)		(5.43)		(5.40)
TargRunUp		-0.0154		-0.0154		-0.0159
		(-0.76)		(-0.77)		(-0.79)
Year FE	yes	yes	yes	yes	yes	yes
adjusted R^2	0.1870	0.2260	0.1810	0.2200	0.1800	0.2190
N	4,536	4,204	4,536	4,204	4,536	4,204

Table 10 – The Deterrence Effect of U.S. Department of Justice and Federal Trade Commission enforcements – Acquisition Size

Table 10 presents a replication of the results in Table 4 except that the dependent variable is replaced by the natural logarithm of one plus acquisition size as reported in the SDC database. In Panel A, the independent variable of interest is the number of DOJ/FTC enforcements in the 10NN cluster lagged by one year, denoted *# Enforcement$_{t-1}$* (Columns 1 and 2) or lagged by one to three years, denoted *# Enforcement$_{t-1}$* to *# Enforcement$_{t-3}$* (Columns 3 and 4). In Panel B, the independent variable of interest is the number of firm withdrawals and in Panel C, the number of DOJ/FTC injunctions from a Federal court. In Panel D, the independent variable is a binary treatment variable that takes value one if the corresponding 10NN cluster witnessed at least one DOJ/FTC enforcements (Columns 1 and 2), one firm withdrawal (Columns 3 and 4) or one DOJ/FTC injunction to a Federal court (Columns 5 and 6), each time within the three last years. Control variable coefficients are not reported (*Controls* indicates whether they are included in the corresponding specification). All specifications include industry fixed effects (*Cluster FE*) and year fixed effects (*Year FE*). *N* stands for the number of observations and standard-errors are clustered at the TNIC industry level. * indicates statistical significance at the 10% level, ** at the 5% level and *** at the 1% level. All variables are defined in Appendix 1.

Panel A - Year by Year Treatment effect - DOJ/FTC Enforcement

	(1)	(2)	(3)	(4)
# Enforcement$_{t-1}$	-0.3692***	-0.3516***	-0.3031***	-0.3006***
	(-4.15)	(-3.85)	(-2.93)	(-2.81)
# Enforcement$_{t-2}$			-0.4438***	-0.4376***
			(-4.53)	(-4.34)
# Enforcement$_{t-3}$			-0.6145***	-0.5816***
			(-6.65)	(-6.15)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.0870	0.0910	0.0850	0.0900
N	74,329	58,619	54,032	42,267

Panel B - Year by year treatment effect - Firm Withdrawal

	(1)	(2)	(3)	(4)
# Withdrawal$_{t-1}$	-0.6047**	-0.5481**	-0.8485***	-0.8074**
	(-2.27)	(-2.01)	(-2.64)	(-2.43)
# Withdrawal$_{t-2}$			-0.2844	-0.3721
			(-0.82)	(-1.06)
# Withdrawal$_{t-3}$			-0.9211***	-0.8849***
			(-3.21)	(-3.07)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.0910	0.0960	0.0850	0.0910
N	58,881	44,062	41,614	30,567

Panel C - Year by year treatment effect - DOJ/FTC Injunction to a Federal Court

	(1)	(2)	(3)	(4)
# Rejection$_{t-1}$	-1.1128***	-1.0260***	-1.1930***	-1.0029***
	(-3.66)	(-3.24)	(-3.83)	(-3.11)
# Rejection$_{t-2}$			0.3617	0.3366
			(0.73)	(0.64)
# Rejection$_{t-3}$			-1.1231***	-1.2660***
			(-3.24)	(-3.49)
Controls	no	yes	no	yes
Cluster FE	yes	yes	yes	yes
Year FE	yes	yes	yes	yes
adjusted R^2	0.0950	0.1000	0.0870	0.0940
N	57,392	42,531	40,404	29,319

Panel D - Treatment Effect over Three Years

	(1)	(2)	(3)	(4)	(5)	(6)
Enforcement	-0.6946***	-0.6405***				
	(-10.73)	(-9.21)				
Withdrawal			-0.6206***	-0.5983***		
			(-3.33)	(-3.03)		
Rejection					-1.3600***	-1.2666***
					(-4.95)	(-4.27)
Controls	no	yes	no	yes	no	yes
Cluster FE	yes	yes	yes	yes	yes	yes
Year FE	yes	yes	yes	yes	yes	yes
adjusted R^2	0.0900	0.0920	0.0940	0.0960	0.0970	0.1000
N	88,393	60,725	71,185	45,818	69,522	44,236

Appendix 1 – Variable definitions

Variable	Definition	Source
# Enforcement	number of case of deal under enforcement in firm HP cluster during the period t	congress report
# M&As	number of m&a announced in the firm HP cluster	sdc
# Rejection	number of deal under enforcement and that will be rejected after this enforcement in firm HP cluster during the period t	congress report
# Withdrawal	number of deal under enforcement and that will be withdrawal after this enforcement in firm HP cluster during the period t	congress report
Abnormal Volume	cumulative abnormal volume during the [-1;+1] window centered on the enforcement annoucement. Volume are computed as the ratio of share volume on number of share outstanding. Abnormal volume are the difference of volume and the average volume computed during an estimation window [-300,-10]	crsp
AcqPub	Indicator variable =1 in case of public acquirer	sdc
AcqUS	Indicator variable =1 in case of US acquirer	sdc
AllCash	Indicator variable =1 in case of full cash deal	sdc
AllStock	Indicator variable =1 in case of full stock deal	sdc
Avg Score	average SS of the firms in the HP cluster	HP
dDUR	dummy equal to one if the time of the resolution of at least one enforcement in the cluster is stricty superior of the (139 days) of the duration in number of days of all the enforcement	congress report
dHoriz	Indicator variable=1 when the bidder and the target share the same 4-digit SIC code reported by SDC	sdc
dHostile	Indicator variable=1 if the deal is flagged by SDC as hostile or unsolicited	sdc
dPoison	Indicator variable=1 if poison_pill SDC item equal yes	sdc
dToehold	Indicator variable=1 if SDC reported percentage held at announcement (item perc_held_ann) is greater than zero	sdc
HHI	herfindal-hirschman index sales based computed in the hp firm cluster	HP & compustat
Enforcement	Indicator variable =1 in case of at least one deal was under enforcement in firm HP cluster during the last 3 years, 0 otherwise	congress report
Leverage	total long term debt plus total current portion of long term debt of firms belonging to the HP cluster divided by total asset	compustat
Liquidity	current asset minus current liabilities divided by total asset	compustat
ln(DealValue)	logarithm of the deal value	sdc
ln(Total Assets)	logarithm of total assets	compustat
Premium	price offer divided by target price 4w before deal announcement	sdc
Rejection	Indicator variable =1 in case of at least one deal was under Enforcement and was rejected in firm HP cluster during the last 3 years, 0 otherwise	congress report
ROA	income before extraordinary items divided by total asset	compustat
Sales Growth	total firms sales in t minus total firms sales in t-1 divided by total firms sales in t-1	compustat
Std Arbitrage Spread	standard deviation of the arbitrage spread during the [+1;+50] windows after deal annoucement. Arbitrage spread is computed as (initial price offer-price(t)) /price(t)	crsp, SDC
Tangibility	total property, plant and equipment (gross) of firms belonging to the HP cluster divided by total asset	compustat
TargRunUp	market adjusted buy and hold return of the target over [-250,-11] window	crsp
TenderOffer	Indicator variable=1 if the deal is flagged by SDC as tender offer	sdc
Time to resolution	the number of days between the deal announcement date and either the deal completion date or the date of deal cancellation	sdc
Tobin's Q	(total asset + total market value-total book value of equity)/total asset	compustat
Total Assets	total assets of firms in the HP cluster	compustat
Total Market Value	total market value of the firms in the HP cluster	compustat
Total Sales	Total sales of the firms in the HP cluster	compustat

Withdrawal	Indicator variable =1 in case of at least one deal was under enforcement and was withdrawn in firm HP cluster during the last 3 years, 0 otherwise	congress report