Copyright Enforcement in Stock Photography*

Hong Luo† Julie Holland Mortimer‡

December 19, 2014

(Work in progress. Please do not cite or circulate.)

Abstract

This paper studies the effects of different enforcement methods on the settlement outcome of commercial copyright-infringement instances. We use a new, proprietary dataset from a leading agency in the stock photography industry. Two field experiments exogenously (1) vary the requested amount for a set of cases; and (2) vary how the price information is conveyed to the infringer and acknowledge the possibility of accidental infringement. We find that, on average, infringers are insensitive to the initial settlement request; reducing the requested amount results in lower expected revenue. However, for the same reduced request, a message explaining the price reduction and acknowledging the possibility of accidental infringement has a large positive effect. We also find that imposing a deadline, after which the requested amount increases, has a positive and significant effect on the pre-deadline outcome. Finally, the results reveal large heterogeneity across infringers in the response to different messages.

1 Introduction

Digital goods such as music, videos, and images are important inputs for commercial activities like advertising campaigns, corporate promotions, firm websites, and media

*The authors thank James Dana, Alberto Galasso, Shane Greenstein, Gastón Llanes, Mike Luca, Felix Oberholzer-Gee, Scott Stern, Dennis Yao and seminar participants at Canadian Conference on the Economics of Innovation and Entrepreneurship, Harvard Business School, MIT Sloan, NBER Productivity Lunch and Strategic Research Forum for helpful comments. We also thank Danielle Wedde for her excellent research assistance. All errors and omissions are ours.

†Harvard Business School; email: hluo@hbs.edu.

‡Boston College; julie.mortimer.2@bc.edu.

productions. An effective market for licensing these products is important both for satisfying the demand for creative inputs, and also for maintaining incentives to produce creative content. Copyright laws provide the framework under which licensing of these goods occurs.[1] In some settings, however, it may be difficult for copyright owners to connect with potential consumers in order to license a creative good before use, and from a consumer's perspective, navigating the process of ex-ante licensing may be difficult.

For example, suppose a small bakery wants to play Christmas songs in December. The bakery owns a stereo and a legitimate CD of Christmas songs. How should the bakery owner proceed? The answer may require a lawyer.[2] In such a setting, consumers, which are often business owners, may be confused about whether, and which, copyright laws apply, how to license creative goods, and the extent of their own liability if they fail to comply with the appropriate Intellectual Property (IP) laws. The sources of this confusion have several potential negative consequences, including an increased cost of doing business, and the potential for widespread copyright violations, which in turn may reduce incentives for artists to produce creative goods.

In contrast to the difficulties associated with ex-ante licensing of copyrighted goods, the cost of identifying unauthorized use of copyrighted goods ex-post has fallen, at least when these violations occur online.[3] For example, concentration in social media centralizes many instances of copyright infringement, lowering monitoring costs for copyright owners and providing reputational incentives for social media platforms to assist copyright owners in managing piracy.[4] The ability to detect these instances of infringement has opened the possibility of 'ex-post' licensing as a potential path to commercialization.How to effectively license after use, however, remains a challenging problem. Upon being caught, an infringer may want to simply choose "not to infringe,"

[1]For example, the public performance of a copyrighted song requires licensing, usually through performing rights organizations such as the American Society of Composers, Authors and Publishers (ASCAP). Private use of copyrighted goods is also governed by copyright laws; for example, iTunes provides an interface that automatically licenses songs, allowing for legitimate private use.

[2]Several legislative and copyright regulations may apply, including, for example, the Copyright Act of 1976, the Copyright Term Extension Act and the Fairness in Music Licensing Act (both of 1998), and the Digital Millennium Copyright Act, also passed in 1998. These acts provide for various exemptions based on the type, revenue, and physical size of the business, and the type of equipment used to play the music. For one discussion of these issues, see http://firemark.com/2007/08/23/restaurants-sued-for-playing-music-without-ascapbmi-licenses/.

[3]See Bechtold (2013) for a survey on recent studies of the impacts of digital-rights management technologies.

[4]An example is YouTube's Content ID. Videos uploaded to YouTube are scanned against a database of files that have been submitted by content owners. Copyright owners get to decide what happens when content in a video on YouTube matches a work they own (such as monetizing the video by running ads or blocking the viewing of the video).

rather than pay for past use of the infringed content. The nature of the relationship between users and content producers further complicates the problem.[5] Indeed, several legal studies have shown that as copyright owners increase sanctions for infringement, public adherence to copyright law declines (see, e.g., Balestrino (2008); Depoorter et al. (2011)).[6]

In this paper, we study decisions by infringers to settle copyright violations ex-post (i.e., after infringement has occurred and been detected), and the effectiveness of different approaches to enforcement. In particular, we focus on (1) the effect of changing the requested settlement amount (i.e., the price of an ex-post license) and (2) the effect of non-price information communicated to the infringer, with the price held constant. To the extent that ex-post licensing is more effective, the copyright owner maintains stronger incentives for the production of creative goods, and lowers the social costs of escalating disputes (e.g., incurring legal fees through litigation). Thus, a better understanding of factors that influence infringers' settlement behavior is not only important for content producers, but also for improving social welfare.

Our empirical application comes from the stock-photography industry.[7] Stock photos are pre-shot images that are available for licensing. Agencies such as Getty Images, Corbis Images and Shutterstock manage, market and license images, on behalf of photographers. Their customers are businesses, ranging from small local service providers, such as restaurants and laundromats, to large corporations, such as advertising agencies and publishing companies. There is large demand for stock images for designing business websites, but widely-used search engines provide easy access to digital images online.[8] Thus, the extent of piracy in this market is enormous.

Recent technological advances have improved the effectiveness with which copyright owners can monitor infringement in this industry.[9] Attached meta-data aids

[5] In the early 2000s, the recording industry in the U.S. and Europe took highly publicized legal actions against file-sharing networks (such as the shutdowns of Napster in 2001, of Megaupload in 2012, and of the Piracy Bay in 2013) as well as individual file sharers; between 2003 and 2008, legal proceedings were filed against about 35,000 individuals. After intense lobbying efforts by content industries, a number of countries have strengthened anti-piracy regulations, such as the so-called "three-strikes anti-piracy law" in France and the UK, and the IPRED law in Sweden (both implemented in 2009).

[6] According to a survey conducted by Civic Science, 33 percent of the respondents support increased regulations to prohibit software piracy and copyright infringement on the Internet and 47 percent oppose (21 percent have no strong opinions). We thank Jason Snyder for suggesting the survey evidence from Civic Science. The summary is based on 206,077 responses from 02/27/2012 to 02/05/2014.

[7] According to Glückler and Panitz (2013), the estimated gross global revenues in the stock image market is $2.88 billion in 2011.

[8] For any image found on the Internet, one can simply right-click to download.

[9] According to a 2010 survey conducted by the Picture Archive Council of America (PACA), 47 percent of participating stock-photography agencies take an active approach in monitoring infringement using either in-house or external resources, and the rest take an reactive approach when alerted to an

in identifying images, but more importantly, new software developed in the industry enables identification of images based on the same algorithms used to match human fingerprints.[10] This new technology enables a copyright owner to crawl websites for copyrighted images, which, after being matched to a database of legitimate licenses, identifies instances of infringement. The technology is currently used to crawl approximately 40 million commercial websites, and identifies about 160,000 potential cases of infringement every month.

The data we use in this paper are provided by one of the leading agencies in the industry (hereafter, the Agency), through the use of this technology. The Agency monitors online use of a small set of the most expensive images it manages, and pursues only commercial instances of infringement. The Agency also maintains an active portfolio of ex-ante licenses, which constitute the large majority of its revenues.[11] The dataset contains detailed information on all instances of infringement for which the Agency pursues settlement in the U.S. and Canada between October 2013 and March 2014, including the requested amount, the image use (e.g., a high-resolution image used on the firm's homepage), the characteristics of the infringing firm (such as annual sales), and outcomes (e.g., whether and when the case is settled, and at what price).

The nature of our data is quite special, for at least two reasons. First, to the best of our knowledge, this is the first large-sample dataset on pre-court enforcement and settlement of intellectual property disputes. Prior studies depend primarily on court filings, which in our dataset capture a small percentage of all disputes. Second, the data include variation generated by two field experiments run by the Agency. In the first experiment, the Agency exogenously varied the requested amount for different instances of infringement; in the second, the Agency varied the wording of the settlement request letters.

Prior to running the two experiments, the Agency's approach was to send a settlement request letter that (1) informs the business that its infringement has been detected; (2) requests the removal of the image(s); and (3) asks for a settlement to cover the (past) infringing use. Prior to either experiment, the requested amount in-

infringement.PACA is a leading trade organization of photography agencies and has over 150 member organizations. This particular survey was conducted in collaboration with Getty Images and Corbis Images and the report is available at http://www.pacaoffice.org/pdfs/Piracy_Survey_Results_2011.pdf. The participants in the survey include member and non-member organizations (not individual photographers or filmmakers), and the participation by members is 52 percent.

[10] Images are more difficult to match than human fingerprints, because unlike fingerprints, images can be altered (e.g., cropped, stretched, or turned).

[11] Agencies typically distinguish between two types of content: creative and editorial. Editorial images, such as photos of a current event, are more 'perishable' and less likely to be infringed. The Agency focuses its monitoring activities on creative content, which is also the focus of our study.

cluded a licensing fee for using the image(s), plus a $400 per-image fee to cover the Agency's costs of enforcement activities. The two components of price were not separately broken down in the letter to the infringer.

In the first experiment, the *pricing experiment*, the Agency exogenously varied the settlement amount requested by either maintaining the historical $400 per-image surcharge, or eliminating it. The wording of the letter was kept identical; that is, no information on this price reduction was provided in the letters to the lower-priced group. The licensing fee ranges from $380 to $825 per image (depending on the nature of use), so removing the $400 surcharge is economically significant.[12]

After the pricing experiment, the Agency implemented the following changes in its enforcement policy. First, it stopped pursuing settlement from relatively small firms and, instead, provided firms with coupons for alternative, lower-priced images.[13] Second, for cases that they continue to pursue, they no longer add a surcharge to the settlement demand. Following these policy changes, the Agency ran a *message experiment*, in which they informed the firms of the price reduction (i.e., surcharge elimination) in the letters sent to treatment groups. For the control group, no information was provided about the price reduction. In all letters, the requested amount consists of the licensing fee. In the four treatment arms, a statement in boldface was added just below the invoiced amount. In this statement, the Agency presented the $400 per image it gives up as (1) waiving the costs incurred through enforcement activities; (2) the same as (1) but with a deadline after which the additional enforcement cost would be added; (3) a discount off the 'average unauthorized-use settlement offer'; or (4) the same as (3) but with a deadline. All statements acknowledge the possibility of unintentional infringement.

The main result from the pricing experiment is that, on average, firms are not very sensitive to the change in the requested amount. Infringers are more likely to settle if they are initially offered a lower price, but the increase in the settlement probability is very small. Conversely, the removal of the surcharge results in significantly lower revenue for those cases that do settle. As a result, the expected revenue per case is significantly lower at the low-price offer compared to the high-price offer. In contrast to the weak price effects, the main result of the message experiment is that adding any of the messages that contain information on the price reduction leads to an increase of 80-130 percent in the settlement probability, on average, compared to the control

[12]There was also a small treatment arm in which a $100 surcharge was added to the licensing fee. The Agency discontinued this price point after a short time. We exclude these observations in the current results, but adding them in does not qualitatively change the basic conclusions.

[13]The removal of the infringed image(s) is still requested.

group that does not provide such information. Second, holding constant the content of the message, a deadline after which the forgiven amount is added has a significantly positive effect on the settlement probability before the deadline. This effect is driven by firms with annual sales less than $900K (the lower three quartiles).

The two experiments, combined together, generate at least two interesting results. First, the same price difference, when varied in the initial requested amount, makes only a small difference in the settlement probability; but generates a large and significant positive effect when offered as an increase from the same lower price point. This seemingly inconsistent result can be rationalized if firms perceive the Agency as more serious when a larger amount is requested. Thus, the lower initial offer does not generate a higher settlement probability even if the firm is very price sensitive, because it sacrifices the degree of threat at the same time.

Second, a small change in communication generates a large effect, even (and especially for) the largest firms. The explanation could be behavioral: employees in these firms have a certain degree of discretion so that reciprocity concerns that matter to these individuals would be reflected in the firm's settlement decision. However, the explanation could also be economic; for example, a softer tone and an explicit recognition of the potential un-intentionality may reduce the incentive to hide the matter for individuals who feel responsible, or avoid triggering a more involved review procedure because the perceived threat is lower. Our data provide some evidence in favor of the friction-reduction explanation, though cleanly identifying the exact mechanism is beyond the scope of the paper.

1.1 Related literature

The paper is closely related to the law and economics literature on settlement, in which the key question is why some cases fail to reach settlement that is more efficient and go to trial (see, e.g., Priest and Klein (1984); Bebchuk (1984); and surveys by Cooter and Rubinfeld (1989) and Spier (2007)).[14] Related to our results on firm heterogeneity, Eisenberg and Farber (1997) test their case-selection model on over 200,000 federal civil litigations and find that the variance of litigation costs is larger for individuals than for corporations (that is, individuals are relatively free to "indulge" their tastes for litigation than corporations that are more constrained by market forces).[15]

[14] An application of this theoretical framework is patent litigation (Meurer (1989); Crampes and Langinier (2002); Bessen and Meurer (2006)). Empirical studies on patent litigation include Lanjouw and Schankerman (2001, 2004); Galasso et al. (2013).

[15] Eisenberg and Farber (2003) further find support for their case-selection model comparing private litigants to the federal government. Other empirical papers have studied whether the litigants have

Our paper is also closely related to the extensive literature on piracy (see surveys by Waldfogel (2012); Belleflamme and Peitz (2012)) and a small number of papers that study the effects of enforcement. Prior studies on piracy focus almost exclusively on individuals' consumption use and, hence, the focus is to evaluate the effects of piracy and enforcement on legitimate sales (see, e.g., Rob and Waldfogel (2006); Oberholzer-Gee and Strumpf (2007); Mortimer et al. (2012); Bhattacharjee et al. (2006); Athey and Stern (2013); Danaher and Smith (2014)). In the context of commercial infringement, pursing settlement can itself be a source of revenue. In this sense, our context is closer to patent litigation in which it is common for patents to be licensed as part of settlement agreements.

The study of non-price information borrows a number of literatures in behavioral economics,[16] including studies on gift-exchange (Fehr et al. (1993); Roth (1995); Falk (2007)), the fairness of pricing (Kahneman et al. (1986); Shiller et al. (1991); Frey and Pommerehneb (1993)), and the role of information on the bargaining outcome (Roth and Malouf (1979); Roth and Murnighan (1982)).[17]

Finally, a parallel literature on tax compliance also study the roles of standard economic parameters such as the detection probability and penalty, and non-pecuniary motivations like ethics and social norms (see surveys by Alm and Torgler (2011); Luttmer and Singhal (2014)). The literature also sees an increasing use of randomized field experiments (Blumenthal et al. (2001); Hallsworth et al. (2014)).

The rest of the paper proceeds as follows. Section 2 describes the data and introduces the two experiments. Section 3 presents a simple discrete-choice framework that generates the basic predictions. Section 4 reports the results, and Section 5 concludes.

2 Data

The data are provided by one of the leading agencies in the stock-photography industry. The primary data are generated by two field experiments run by the Agency in the U.S. and Canada between October 2013 and March 2014. The dataset includes information on all the infringement instances that the Agency pursued settlement during the experiments, including the requested amount, the characteristics of the infringing

asymmetric beliefs (Waldfogel (1995)); information acquisition and learning in the litigation process (Farber and White (1991); Watanabe (2006)); and the effect of legal environments on the timing of settlement (Fournier and Zuehlke (1996)).

[16] See surveys by Fehr and Gächter (2000); DellaVigna (2009); Cooper and Kagel (2013).

[17] Related to this, the marketing literature has found that placing a sale sign on an item is sufficient to increase demand for the item even without changing the actual price (Inman et al. (1990); Anderson and Simester (1998, 2001)).

use (e.g., the number of images, their resolution and placement on the firm's website), and the outcomes (e.g., whether and when the case is settled, and at what amount). The data on firm characteristics are provided by Dun & Bradstreet (D&B), including annual sales, the number of employees, age, the industry and the firm's location.

The Agency monitors the Internet use of images that it represents if they satisfy the following criteria: First, the image is under the rights-managed license model, which allows a licensee a one-time use of the image and the fee depends on the specified scope of use (e.g., a medium-resolution image placed on a firm's home page for three months); and second, the image is distributed exclusively by the Agency so that whether the use is unauthorized can be determined by checking its own licensing database. Images that satisfy the above criteria are the most expensive ones and account for about two percent of its complete portfolio. The Agency pursues the infringement only if it is for commercial purpose, and it drops cases that involve small non-profit organizations or current customers.[18]

A letter is sent to the infringing firms that (1) informs them of the detection of the infringement, (2) requests the removal of the image(s); and (3) asks for a settlement that covers the (past) infringing use. The requested amount is the (ex-post) licensing fee plus a surcharge to recoup some of the costs incurred by the Agency. In the letter, a single amount is displayed instead of a breakdown between these two components.[19] Table 1 lists the six use categories for a single image and the corresponding licensing fee. When multiple images are involved in a case, the licensing fee is the sum of the fees for all images. The posted price on the Agency's website (for ex-ante licensing) varies by image resolution, by image type (e.g., theme and quality) and by the duration. The fee offered for an infringing use is a weighted average of a few listing prices from within one of the six categories listed in Table 1.[20] Before January 2014, the surcharge added was $400 per image.

Upon receiving the first letter, the firm may settle directly without getting in touch; contact the Agency to clarify the situation, provide proofs if the use is legitimate or negotiate the settlement amount, in which case the case may or may not settle eventually; or ignore the letter. After about 30 days, the Agency starts to send follow-up letters. First, a second letter is sent after about 30 days unless the case is settled

[18]Current customers may infringe if the use is beyond the scope of the current license. Beyond-scope use for prior licensees is still pursued.

[19]The letter consists of seven pages in total. The invoiced amount is displayed on the third page of the letter. On page six, as one of the Frequently Asked Questions, a generic explanation of how the requested amount is calculated is provided (again, without the breakdown of the two components.

[20]In principle, an infringing firm could look up posted prices online. We have no data on whether any of them does this.

Table 1: Licensing fee for a single image

Image-use category	Licensing fee
Low resolution & secondary page	\$380
High resolution & secondary page	\$475
Low resolution & home page	\$565
Low resolution & repeat pages	\$665
High resolution & home page	\$775
High resolution & repeat pages	\$825

Notes: This table describes the licensing-fee part of the total requested amount for a single image. The actual licensing fee may deviate slightly due to taxes that differ by states.

by then. Second, also after 30 days, an extra FedEx letter is sent to a set of relatively large firms that have not yet responded.[21] Third, a final notice is sent by email after 60 days if the case ignores all previous letters. Cases that do not settle (either because the firms ignore the letters or do not settle after making contact) are eventually sent to external law firms.[22]

2.1 Experiment one: the requested amount

Between October and December 2013, for cases in the U.S. and Canada, the Agency randomly selected a subset of cases for which it removed the surcharge completely (the '\$0-Surcharge' group); and for the rest of the cases, it continued to add \$400 per image on top of the licensing fee (the '\$400-Surcharge' group). The letters of the two groups were, otherwise, identical. In particular, no explanation was given for the price reduction for the lower-priced group. This exogenous price variation is valuable because, otherwise, it would be impossible to separately identify the price effect from how the image is used as the licensing fee is completely determined by the latter.

At the Agency, firms are categorized into five tiers based on their observable characteristics, with tier 1 being the most likely to settle and tier 5 the least likely. The allocation of the cases into the two groups was randomized within each infringer tier. Within each infringer tier, the cases were first sorted by the requested amount and then alternated into different groups. Because the system-generated requested amount automatically included the surcharge, for cases in the \$0-Surcharge group, \$400 was removed for each image; and for cases in the \$400-Surcharge group, the requested

[21] In contrast, the first and the second letters are sent in USPS standard mails.

[22] About 60 percent of the sample are sent to external law firms, and 90 percent of these cases were sent between 55 to 165 days.

amount was kept unchanged.

$0-Surcharge cases were not selected every week during the three-month period. According to the Agency, because this process was done manually, whether $0-Surcharge cases were selected in a certain week and how many cases were allocated for the group in a given week largely depend on the overall workload of the team. In order to preserve a greater number of observations (and, hence, more accurate estimates), we keep all cases that were sent during the three-month period for the analysis. As a result, 87 percent of the observations are in the $400-Surcharge group and 13 percent are in the $0-Surcharge group. To the best of our knowledge, the allocation is not correlated with any unobservable factors that may affect the settlement outcomes.[23]

2.2 Experiment two: the messages

In January 2014, the Agency implemented the following changes in its enforcement policy: First, it no longer requests settlement from firms in tiers 4 and 5 (firms that are the least likely to settle), even though the removal of the images is still requested; and second, it no longer adds any surcharge for cases they continue to pursue.

Following the policy change of lowering the requested amount, the Agency conducted the second experiment in the U.S. and Canada. The cases were randomly allocated into four treatment groups and a control group. The requested amount for all groups is the licensing fee. The letter used in the control group is exactly the same as that used in the pricing experiment; that is, no information of the price reduction is given. For the treatment groups, an extra message (in boldface) is placed just below the invoiced amount, informing the infringing firm of the substantial price reduction.

The following lists the four treatment messages. Two messages explain the price reduction as waiving the surcharge that is meant to cover the enforcement cost; and the other two as a discount from an average settlement offer. Within each type of explanation, one group has a deadline (22 days after the mail date of the first letter) after which the forgiven amount is added, while the other does not. All messages acknowledge the possible un-intentionality of the instance.

1. Control group: no extra message.
2. (Waive the surcharge) Please note, we are only charging the average licensing fee for commercial use of the rights-managed image(s) found on your website. The Agency has incurred additional costs of $400 per image related to the pursuit of

[23]The next subsection provides additional statistical details on the two groups.

this matter; we are currently waiving this cost, as we understand this unlicensed use may have been unintentional.

3. (Waive the surcharge + Deadline) Please note, we are only charging the average licensing fee for commercial use of the rights-managed image(s) found on your website. The Agency has incurred additional costs of $400 per image related to the pursuit of this matter; we are currently waiving this cost, as we understand this unlicensed use may have been unintentional. However, cases not settled before xx-xx-xx will be charged the additional $400 cost per image related to the pursuit of this matter.
4. (Discount) Please note, this settlement amount is $400 per image lower than the average unauthorized use settlement offer. We are providing this discount, as we understand this unlicensed use may have been unintentional.
5. (Discount + Deadline) Please note, this settlement amount is $400 per image lower than the average unauthorized use settlement offer. We are providing this discount, as we understand this unlicensed use may have been unintentional. However, cases not settled before xx-xx-xx will no longer be eligible for this discount.

Similar to the pricing experiment, the cases were first sorted by the requested amount within each infringer tier and then alternated into five groups. For cases in the control group, the letter was left unchanged; and for cases in the four treatment groups, the extra messages above were inserted in the letter. The experiment was conducted in every week between the end of January and the end of March, 2014.

2.3 Sample and variables

11,486 cases were sent in the two experiments. A case is excluded from the analysis if (1) the mail was returned (11.6 percent); (2) the case was later closed because the firm is able to show valid licenses or permissions from the photographers (6.8 percent); (3) there is no information on the firm's annual sales either because D&B cannot find a match or because the sales data are not available (13 percent);[24] and (4) if it involves more than 9 images (19 cases). The eventual analysis sample includes 9,249 cases.

Panel 1 in Table 2 summarizes the total requested amount (inclusive of the surcharge when applicable) and image-use categories. Overall, the total requested amount ranges from $355 to $9,875, with the median being $865. 55 percent of the cases are in the

[24]The results for an average case do not change much if cases with missing sales data are included.

two lowest-priced use categories. 12 percent of the cases involve multiple images, and the medium number of images for these cases is 2.

Table 2: Summary statistics

Variables	N	Mean	SD	Min	Median	Max
Panel 1: Price and image use						
Requested amount	9,249	962.9	669.4	354.9	864.5	9875
Use cat 1: Low res. + secondary page	9,249	0.27	0.44	0	0	1
Use cat 2: High res. + secondary page	9,249	0.28	0.45	0	0	1
Use cat 3: Low res. + home page	9,249	0.09	0.28	0	0	1
Use cat 4: Low res. + repeat pages	9,249	0.05	0.22	0	0	1
Use cat 5: High res. + home page	9,249	0.12	0.32	0	0	1
Use cat 6: High res. + repeat pages	9,249	0.07	0.26	0	0	1
Use cat 7: Multi-image cases	9,249	0.12	0.33	0	0	1
Image count (if a multi-image case)	1,143	2.66	1.28	2	2	9
Panel 2: Firm characteristics						
Annual sales ($000's)	9,249	19456.1	366460.1	0	210	23.7B
Employees	9,230	94.93	1210.15	0	3	67800
Age	8,722	15.29	19.38	0	9	271
U.S.	9,249	0.89	0.31	0	1	1

Notes: This table summarizes the characteristics of the case, the requested amount, and firm characteristics using cases in both experiments. Industry and state (province) dummies are omitted.

Panel 2 in Table 2 summarizes firm characteristics. Because 99 percent of the cases involve unique firms, we treat firms involved in different cases as different firms. The median firm has $210K in annual sales; the median number of employees is 3 and the median firm age is 9 years. Because annual sales and the number of employees are highly correlated (the correlation is 0.92), we use only the former to measure the firm's size. 89 percent of the firms are located in the U.S. The top ten industries (defined by the SIC 2-digit codes) are responsible for 64 percent of the cases and they are largely service industries.[25] The top three states cover 67 percent of the cases.[26]

Table 3 shows that, for each experiment, different groups look statistically similar in the basic variables. The pricing-experiment sample includes 6,840 cases, 87 percent of which belong to the $400-Surcharge group as discussed previously. Panel (a) shows that there is no significant difference in the average baseline price (i.e., the licensing-

[25]Top ten SIC-2 digit industries are Business Services; Health Services; Engineering, Accounting, Research, Management and Related Services; Membership Organizations; Amusement and Recreation Services; Real Estate; Personal Services; Miscellaneous Retail; Social Services; and Legal Services.

[26]Top ten states (provinces) are California, Florida, New York, Texas, Ontario, Illinois, Pennsylvania, Massachusetts, New Jersey, Georgia.

Table 3: Group assignment

(a) Pricing experiment

Group	N	Baseline price	Image count	log(Sales+1)	log(Age + 1)
$400 surcharge	5,951	664.79	1.23	12.43	2.21
$0 surcharge	889	653.42	1.19	12.55	2.27
		(0.47)	(0.13)	(0.20)	(0.12)

(b) Message experiment

Group	N	Requested amount	Image count	log(Sales+1)	log(Age + 1)
Control	633	592.54	1.15	12.62	2.56
Waive the surcharge	393	634.72	1.20	12.86	2.55
		(0.05)	(0.19)	(0.29)	(0.86)
Waive the surcharge + Deadline	438	595.02	1.14	12.37	2.45
		(0.90)	(0.59)	(0.26)	(0.06)
Discount	465	588.27	1.14	12.69	2.55
		(0.82)	(0.63)	(0.75)	(0.85)
Discount + Deadline	480	582.06	1.13	12.41	2.51
		(0.58)	(0.34)	(0.31)	(0.37)

Notes: Table (a) summarizes the baseline price (i.e., the licensing-fee part of the total requested amount), the number of images, and firms' basic characteristics between the two groups in the pricing experiment, and the two-sided p-values are in the parentheses. Table (b) summarizes the same information by group for the message experiment, and the two-sided p-values are between this particular treatment group and the control group.

fee part of the requested amount) or the image count between these two groups. The average firm size and age are also statistically the same between the two groups. The message-experiment sample includes 2,409 cases. The p-values in Panel (b) in Table 3 are based on two-sided t-tests between this particular treatment group and the control group. Compared to the control group, the average requested amount in the 'Waive the surcharge' group is significantly higher; and firms in the 'Waive the surcharge + Deadline' group are marginally younger. The requested amount of the cases and the firms look similar across different groups, otherwise.

In the paper, we focus on the settlement outcomes in the first 30 days because they provide the cleanest assessment of the interventions.[27] First, proportionately more follow-up letters are sent to groups that have worse 30-day outcomes. If follow-up letters encourage settlement (either as a reminder or by increasing the threat level), the worse-performing groups would start to catch up after 30 days. Second, constraints of the IT system resulted in a significantly more intense follow-up for the group that takes the default approach that the Agency uses for all cases in non-experimental

[27]Cases in our sample are all older than 5 months. For settled cases, 98 percent settle by 120 days and 51 percent by 30 days.

countries during a particular time period (i.e., the $400-Surcharge group in the pricing experiment and the control group in the message experiment).[28] The main results in the analysis are, therefore, all on the 30-day outcome unless indicated differently. We use the 120-day outcome to complement the analysis when it is appropriate to do.

Table 4: 30-day outcomes

Variables	N	Mean	SD	Min	Median	Max
Whether settle	9,249	0.16	0.36	0	0	1
Revenue per case	9,249	100.3	271.8	0	0	3500
Revenue per settled case	1,463	633.9	359.1	91	505	3500
Whether discounted	1,463	0.47	0.50	0	0	1
Discount % (if discounted)	691	0.41	0.16	0.02	0.42	0.90
Settle without contacting	9,249	0.06	0.23	0	0	1
Contact	9,249	0.26	0.44	0	0	1
Ignore	9,249	0.69	0.46	0	1	1
Time to settle (>150-day outcome)	2,886	40.1	31.8	3	30	269

Notes: This table summarizes the 30-day outcomes using cases in both experiments. Revenue is coded as $0 if the case does not settle within 30 days. The only exception is the time to settle, which is based on a case's total duration in the sample (the minimum is 5 months).

Table 4 summarizes the 30-day outcome. The settlement rate is 16 percent. For settled cases, the average revenue collected is $633. 47 percent of the settled cases are discounted, and for discounted cases, the median percentage of discount is 42 percent. Taking into account the settlement probability, the average revenue per case is $100. Finally, breaking down by firms' response to the first letter, 6 percent settle directly without making contact; 26 percent make contact (40 percent of which settle by 30 days); and 69 percent ignore the first letter.

3 Conceptual framework

This section describes a simple framework that captures the basic tradeoffs an infringing firm faces when deciding whether or not to settle. The firm's utility is

$$U = \begin{cases} -\alpha p + \lambda m - \varepsilon & \text{if settle} \\ -C(p) & \text{if not settle} \end{cases}, \tag{1}$$

where p is the requested amount; $\alpha > 0$ measures the marginal disutility of money; $m > 0$ represents non-pecuniary benefits from settling; $\lambda > 0$ measures the sensitivity

[28] Additional details are available in Appendix B.

to non-pecuniary benefits; $\varepsilon \sim G$ (density g) is the random factor; and $C(p) > 0$ is the expected cost from not settling (i.e., the firm's outside option).

$C(p)$ includes potential reputation and legal costs from not settling, in which case the Agency may take further actions (such as involving external law firms, publicizing the infringement, and litigation). In addition to avoiding a reputation of evading liabilities in the market place, a firm may also want to be compliant for internal reasons (such as maintaining the culture and disciplines of honesty and ethics in the work place). The firm may expect a higher expected cost from not settling when the requested amount is higher ($C'(p) > 0$). This is because the requested amount is positively correlated with the commercial value of the copyrighted goods and, thus, the probability of escalation by the Agency as well as the potential damage awards the firm has to pay.[29]

We use m to denote a broad set of non-pecuniary benefits from settling (such as ethical reasons to correct a mistake beyond the fear for pecuniary punishment). The role of non-pecuniary considerations may be more or less important (i.e., δ may vary), depending on the decision-maker (e.g., a small business owner versus an employee in a large corporation) and the decision-making process (e.g., whether formal dispute-resolution routines are in place).

The probability of settlement is, therefore, $\Pr(\text{Settle} = 1) = G(C(p) + \lambda m - \alpha p)$.

3.1 Price effect

Let $\bar{\epsilon} = C(p) + \lambda m - \alpha p$ be the marginal type that is indifferent between settling and not. The price derivative of the settlement probability is $\frac{\partial \Pr(\text{Settle} = 1)}{\partial p} = g(\bar{\epsilon})(-\alpha + C'(p))$. A higher requested amount signals that the Agency is more serious about pursuing the matter. This effect, if present, would offset the typical negative price effect of having to pay a greater amount. Depending on the magnitudes of these two effects, a higher price may even result in a higher settlement probability.

Prediction 1 (Price effect)**.** *The effect of an increase in the requested amount on the settlement probability is the sum of two effects: the negative effect of settling at a higher amount and the positive effect of a greater expected cost from not settling.*

3.2 Message effects

The following first discusses the effect of including any of the four messages relative to the control group, and then the potential differences between the messages. The same

[29] The Agency is also more likely to escalate the dispute when the commercial value of the goods is higher to maintain a tough reputation to deter future infringement.

amount is requested from all five groups. Compared to the control group, however, all treatment messages contain the following extra information. First, the settlement request could have been substantially higher and that the Agency is sharing part of the potential damage. The bargaining and the gift-exchange literature have consistently found experimental evidence supporting the presence of reciprocal behaviors (Fehr et al. (1993); Roth (1995); Falk (2007)). Reciprocity may encourage firms in the treatment groups to return the Agency's positive action by settling more. Second, the Agency explicitly recognizes that the incidence may have been unintentional. Frey and Feld (2002) find that taxpayers' willingness to pay their taxes is significantly higher if the tax authority treats them with respect. For the above reasons, we expect firms in the treatment groups to attach a higher m if settle. Note that we cannot distinguish their separate effects because all messages include the above two types of information.[30]

Prediction 2 (Message effect)**.** *By increasing non-pecuniary benefits from settling, all treatment messages increase the settlement probability relative to the control group.*

The following prediction shows that, under certain conditions, the message effect decreases with the marginal disutility of money; decreases with the requested amount; and increases with the firm's sensitivity to non-pecuniary benefits.[31] The first result is intuitive because firms that are more financially-constrained, for example, are less able to reciprocate even if they want to. The second result is consistent with a stylized fact captured in a number of reciprocity models (such as Rabin (1993)) that reciprocal motivations have a smaller effect as the material cost of sacrificing becomes bigger. The last result is also quite intuitive, suggesting that how effective these messages are would vary by factors (such as formal dispute-resolution routines) that affect how the role of non-pecuniary motivations in the decision-marking process.

Prediction 3 (Message effect by other parameters)**.** *When $g'(\bar{\epsilon}) > 0$, the message effect is smaller (1) for firms with a greater disutility of money (a bigger α); (2) when the price is lower, given that the signaling effect of price is not too large ($C'(p) < \alpha$); and (3) for firm that are more sensitive to non-pecuniary motivations (a larger λ).*

Comparing the messages with and without a deadline, we expect that, other things being equal, the former generates a higher settlement rate before the deadline than the

[30] In addition, an extra message in boldface alone may also cause the firm to pay more attention. The data show that the messages perform significantly differently from each other, suggesting that content (not just the salience effect of an extra message) matters.

[31] The secondary derivatives of the message effect respect to other parameters are $\frac{\partial^2 \Pr(\text{Settle} = 1)}{\partial m \partial \alpha} = -\lambda g'(\bar{\epsilon})p$, $\frac{\partial^2 \Pr(\text{Settle} = 1)}{\partial m \partial p} = \lambda g'(\bar{\epsilon})(-\alpha + C'(p))$, and $\frac{\partial^2 \Pr(\text{Settle} = 1)}{\partial m \partial \lambda} = g(\bar{\epsilon}) + \lambda g'(\bar{\epsilon})m$.

latter during the same time period. First, the potential price increase after the deadline reduces the payoff from delaying the settlement. Second, a deadline message, by laying out what would happen next, may give the firm a clearer and a stronger sense of potential escalation if not settle. Finally, experimental evidence suggests that deadlines reduce the tendency to procrastinate or to forget (e.g., Ariely and Wertenbroch (2001)).

Prediction 4 (Comparing deadline to non-deadline messages)**.** *Holding the rest of the message constant, the pre-deadline settlement probability is higher for the deadline message than for the non-deadline message during the same time period.*

The messages also differ in their explanation for the price reduction; and here, the prediction is less clear. On the one hand, we expect the 'Waive the surcharge' message to perform better than the 'Discount' message for the following reasons. First, studies in the 'fairness of pricing' literature have consistently found that consumers view a price increase as less unfair if it is justifiable by a cost increase than if it exploits excess demand (see Okun (1981); Kahneman et al. (1986); Shiller et al. (1991); Frey and Pommerehneb (1993)). Following this logic, firms may appreciate the Agency's positive action more when knowing that the forgiven amount was to cover costs than a discount from the potential revenue because the firms are likely to infer that the Agency's net profit is lower in the former case. Second, firms may simply appreciate a concrete justification more than a discount that has the flavor of sales techniques.

On the other hand, there are also reasons to expect the opposite. First, in law and enforcement contexts, people may be less sympathetic to the costs incurred by the enforcer than in typical market settings.[32] Second, specifically in our setting, firms may perceive a penalty as unfair because many of the incidences are either accidental due to the lack of awareness or a mistake made by third-party designers and, as a result, 'firms often feel penalized for mistakes they did not even know.'[33] Therefore, even if the Agency is waiving the surcharge, the notion of a penalty on top of the licensing fee may make waive-the-surcharge message perform worse than the discount message.

Prediction 5 (Comparing the 'Discount' and the 'Waive-the-surcharge' messages)**.** *The 'Discount' message may perform better or worse than the 'Waive the surcharge' message, depending on whether firms' reaction towards enforcement and/or penalty is sufficiently negative.*

[32] According to *The American Assembly Copyright Infringement and Enforcement in the U.S.: A Research Note*, 69% of the respondents oppose monitoring of their internet activities for the purpose of enforcement.

[33] From interviews with employees at the Agency who interact directly with the infringing firms.

4 Results

4.1 Pricing experiment

Table 5 summarizes the settlement outcomes of the pricing experiment based on the raw data. It shows that, for an average case, compared to the $0-Surcharge group, the 30-day settlement probability of the $400-Surcharge group is 2 percentage points lower (the p-value is 0.07). For settled cases, the average revenue collected is $235 higher. Notice that the difference in the expected revenue conditional on settling is less than that in the requested amount, suggesting that the extent of discount is greater for the higher-priced group but not big enough to completely offset the price difference.[34] Taking into account the settlement probability, the expected 30-day revenue of a case is $18.9 higher for the $400-Surcharge group (the p-value is 0.06).

Table 5: Price effects on the settlement outcomes (the raw data)

	$0-Surcharge	$400-Surcharge	Difference	p-value
Requested amount	653.4	1157.2	503.8	0.00
Settlement probability	0.15	0.13	-0.02	0.07
Revenue for settled cases	515.0	750.4	235.4	0.00
Revenue	77.1	96.0	18.9	0.06
N	889	5,951		

Notes: This table summarizes the 30-day outcomes of the $400-Surcharge and the $0-Surcharge groups in the pricing experiment. p-values are based on two-sided tests.

Table A1 reports the regression results for three settlement outcomes: (1) whether the case settles in 30 days (logit); (2) the revenue for cases that settle in 30 days (OLS); and (3) the revenue for a case, which is coded as $0 if not settled in 30 days (OLS). All regressions control for the following: a set of dummies indicating the image-use categories, log(baseline price), image count, log(sales +1), log(age+1),[35] and dummies indicating the top-ten industries (defined by the two-digit SIC codes), the top ten states/provinces, the U.S., and the mail month of the first letter. The regression results are consistent with the raw-data results.

[34] In particular, 61 percent of the settled cases in the $400-Surcharge group are discounted compared to 40 percent for the $0-Surcharge group; and the average discount given is $225 for the latter and $462 for the former.

[35] 366 firms (5 percent) do not have age information. To preserve the sample size, a dummy variable indicating that the age information is missing is included in the regressions, and log(age+1) is replaced with 0 for these observations.

Overall, the results show that firms are, on average, price-inelastic in the sense that the increase in the settlement probability due to removing $400 per image is not big enough to offset the decrease in the expected revenue per settled case. As a result, the expected revenue per case is significantly higher for the higher-priced group. More formally, the expected revenue of a case is the settlement probability multiplied by the expected revenue conditional on settling.[36] Thus, the price elasticity of the expected revenue is the sum of that of the settlement probability and that of the expected revenue conditional on settling.[37] The two elasticities based on the regression results are, respectively, -0.15 and 0.66, implying a positive elasticity of the expected revenue.[38]

Coefficients of the control variables in Table A1 show that larger firms (measured by annual sales) are significantly more likely to settle, less likely to negotiate a discount conditional on settling and, thus, are associated with a significantly higher expected revenue. These results also hold for firm age. The set of image-use dummies are jointly significant. The coefficients of log(Baseline price) and the number of images are not always significant because they capture only the residual differences in the baseline price after the complete set of image-use dummies are controlled for.[39] Finally, the dummies indicating the top ten states (or provinces) are jointly significant; the country dummy is significant; the dummies indicating the top ten industries are not jointly significant; and neither are the mail-month dummies.

In our sample, firms vary greatly in size (the quartiles are $100K, $210K and $900K in annual sales). Intuitively, firms with greater financial resources are less price-elastic. The marginal effect of a price increase may also differ by the level of the baseline price, which ranges from $380 for a low-resolution image on a secondary page to a few thousand dollars for a multi-image case. Table 6 reports the marginal effects of the $400-Surcharge dummy on the three settlement outcomes separately for four subsamples divided by the median firm size and the median baseline price.[40]

The results show that, regardless of the subsample, firms are *not* price-elastic: the

[36] $R(p) = \Pr(p)\hat{R}(p)$, where p is the requested amount and $\hat{R}(p) < p$ because negotiation is allowed.

[37] The decomposition of the price elasticities is $\frac{\partial R(p)}{\partial p}\frac{p}{R(p)} = \frac{\partial \Pr(p)}{\partial p}\frac{p}{\Pr(p)} + \frac{\partial \hat{R}(p)}{\partial p}\frac{p}{\hat{R}}$.

[38] Directly estimating the price elasticity of the expected revenue yields 0.31. The discrepancy may be because the exogenous price difference is large while the equality result is from a small price change.

[39] For single-image cases, once the image-use categories are controlled for, log(Baseline price) captures only the small baseline-price differences due to taxes that differ by states. For multi-image cases, the number of images and log(Baseline price) capture the deviations in the baseline price from the mean of this category, and the two variables are highly correlated.

[40] There are slightly more firms below the median size than above because the median size is defined over firms in both the pricing and the message experiments, and that firms in the pricing experiment are stochastically smaller than firms in the message experiment. Because prices are lumpy, the number of cases below the median baseline price is not the same as that above.

Table 6: Price effects on the settlement outcomes by firm size and by baseline price

	Below-median firm size		Above-median firm size	
	Below-median baseline price	Above-median baseline price	Below-median baseline price	Above-median baseline price
	(1)	(2)	(3)	(4)
Regression 1 (Logit): DV = Settle				
$400-Surcharge dummy	0.01	-0.01	-0.06**	0.01
	(0.02)	(0.02)	(0.02)	(0.03)
Regression 2 (OLS for settled cases): DV = Revenue				
$400-Surcharge dummy	192.6***	280.8***	243.2***	447.1***
	(21.1)	(76.5)	(18.7)	(62.3)
Regression 3 (OLS): DV = Revenue				
$400-Surcharge dummy	29.86***	12.55	13.18	28.24
	(10.36)	(15.58)	(12.92)	(31.35)
Elasticity of exp. revenue	0.66	0.34	0.16	0.33
Summary statistics for the $0-Surcharge group				
Mean(Requested amount)	435.7	914.9	431.9	909.3
Settlement probability	0.13	0.09	0.22	0.14
Mean(Revenue|Settle = 1)	378.6	635.8	395.8	857.5
Mean(Revenue)	49.5	59.5	88.6	119.0
N: $0-Surcharge group	222	235	259	173
N: $400-Surcharge group	1,655	1,516	1,482	1,298

Notes: This table reports the marginal effects of three sets of regressions using subsamples of cases in the pricing experiment divided by (1) the median firm size and (2) the median baseline price. The dependent variables of the three sets of regressions are (1) whether the case settles in 30 days, (2) the revenue for settled cases; and (3) the revenue of a case (coded as $0 if not settled in 30 days). In all regressions, the independent variable is a dummy indicating the $400-Surcharge group (the $0-Surcharge group is the default). The regressions use the same controls as in Table A2 except for excluding the dummies for the top-10 industries and the top-10 states (provinces). The robust standard errors are in the parentheses; ***, **, and * are, respectively, significant levels of 1%, 5%, and 10%

lower-priced group does not generate an increase in the settlement probability that is large enough to result in a significantly higher expected revenue. In fact, the point estimates of the marginal effects of the $400-Surcharge dummy on the expected revenue of a case is positive for all subsamples, and is statistically significant for below-median firms facing cases with below-median baseline prices.

This result is perhaps not surprising for relatively large firms because their financial resources seem plentiful relative to the size of the claim. However, firms below the median size have less than $210K in annual revenues, so neither the baseline price nor the price difference (even after the discount) between the two groups seems trivial. Thus, lacking financial constraints does not seem to explain the whole story.

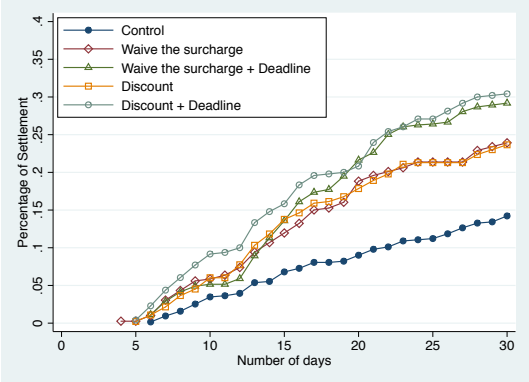
A potential explanation suggested by the conceptual framework is that firms may

perceive a higher expected cost from not settling when seeing a higher requested amount (e.g., a greater probability of escalation by the Agency). Thus, reducing a substantial amount from the settlement offer may not generate a large increase in the settlement probability even if firms are indeed price-elastic in the traditional sense, because the lower offer sacrifices the threat level at the same time (Prediction 1).[41]

4.2 Message experiment

Figure 1 plots the cumulative percentage of cases that settle in the first 30 days based on the raw data. The regression results are consistent with the raw data:[42] For an average case, adding either of the two non-deadline messages increases the settlement probability by 12 percentage points, and adding either of the two deadline messages improves the probability by another six to seven percentage points. The treatment effects (relative to the control) range from 80 to 130 percent and are all statistically significant. The difference between the deadline and the non-deadline messages is significant regardless of the explanation for the price reduction; and given that a deadline is added (or not), there is no significant difference between the two types of explanations.

Figure 1: Message effects on the settlement probability



Notes: This figure plots the cumulative percentage of cases that settle in the first 30 days for the four treatment groups and the control group in the message experiment. The plot is based on the raw data.

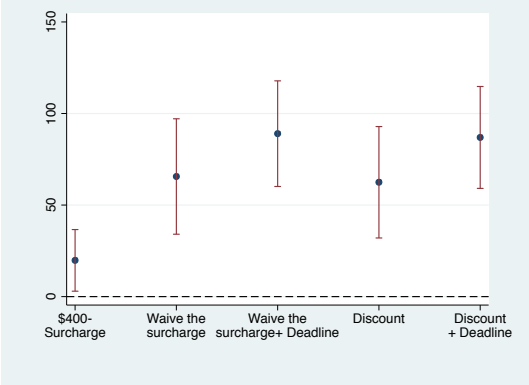
The large effects show that the information contained in all the messages matters a great deal, and this is in sharp contrast to the weak price effect from the first ex-

[41] Lanjouw and Schankerman (2001) show that the likelihood of patent litigation is higher when the stake is higher either because the commercial value of the patent is higher or because there is a greater incentive to establish a tougher reputation in a particular technology area.

[42] Refer to Column (1) in Table A2.

periment. In terms of the expected revenue, Figure 2 plots the marginal effect of the \$400-Surcharge dummy estimated from the pricing experiment and that of the four treatment-message dummies estimated from the message experiment.[43] In both experiments, the baseline group (normalized at 0) adds \$0 surcharge and does not include any extra message. For an average case, simply lowering the requested amount by \$400 per image reduces the expected revenue by \$18 per case; while including a message that informs the firm of such reduction and recognizes the possible un-intentionality of the incidence recoups between \$62 to \$90.

Figure 2: Comparing price and message effects in terms of the expected revenue



Notes: This figure compares the marginal effect of the \$400-Surcharge dummy on the 30-day expected revenue of a case estimated from the pricing-experiment sample to that of the four treatment-message dummies from the message-experiment sample (refer to Column (3) in Tables A1 and A2 for the regression results). The baseline group in both samples (normalized at 0) adds \$0 surcharge and does not include any extra message.

As discussed in Prediction 2, there are potentially a number of explanations for the significant message effects. It could be behavioral in that the decision-maker appreciates the Agency's 'gift-giving' (i.e., the price reduction) and the explicit recognition of the possible un-intentionality of the incidence and thus, reciprocate by settling more. It is reasonable to be skeptical, however, about the importance of behavioral explanations because our subjects are firms not individuals. In the next section, we examine heterogenous treatment effects of the messages by firm size. If formal routines restrict the role of individual psychology in the decision process, perhaps the mom-and-pop shops are more likely to behave like individuals than larger corporations.

[43]Refer to Column (3) in Tables A1 and A2 for the regression results. Note that because firms in the message experiment are stochastically larger than firms in the pricing experiment, the difference resulted from removing \$400 per image from the settlement request would be even smaller if we adjust the firm-size difference. Even though these estimates are obtained from two different samples, it is reasonable to make the comparison because (1) the two periods are not far from each other, and (2) within each experiment, the estimated effects are consistent across time.

The framework also suggests that perhaps these messages increase the expected cost from not settling (i.e., worsening the firm's outside option). This mechanism is unlikely to explain the large observed effects. On the one hand, firms in the treatment groups may indeed infer a higher risk because they know that the recoupable revenue for the Agency is $400 higher per image. On the other hand, however, the softer tone and the price compromise may signal a lower risk of escalation. In particular, the recognition of the possible un-intentionality could reduce the perceived threat because the damage award is substantially lower for un-willful than for willful infringement.[44]

To unpack the large message effects, we would like to observe more about both the decision-maker and the decision (and the negotiation) process, which naturally may vary by firm. An important measure of firm heterogeneity is its size, and it potentially correlates with a number of factors that may influence a firm's reaction to these messages. The following analysis exploits this heterogeneity.

4.2.1 Message effects by firm size

Firms of different sizes may differ in a number of dimensions. First, the decision-maker may be different. Interviews with the Agency reveal that, for larger firms, the person who contacts the Agency is typically an employee in the marketing or legal departments; while for smaller firms, it is typically the owner.[45] Second, the decision-making process may also be different. Larger organizations are more likely to have formal routines and resources (such as internal legal councils) to deal with legal liabilities. Formal routines tend to restrict the role of individual psychology and legal resources are likely to reduce confusions about the legitimacy of the enforcement and how to resolve the disputes. Third, larger firms may be less price-elastic either because they are less financially-constrained or because employees have less personal stake in the matter.

Table 7 presents some qualitative evidence based on the notes of phone and email correspondences between the Agency and firms that made contact.[46] For each firm-size quartile, we randomly selected 40 cases that made contact and categorized them into different emotional categories. A number of interesting patterns emerge. First, the

[44] According to *17 U.S. Code §504: Remedies for infringement: Damages and profits*, the statutory damages can be up to $150,000 per work in the case of willful infringement; while if the court finds that the infringer was not aware and had no reason to believe that his or her acts constituted an infringement of copyright, the court in its discretion may reduce the award of statutory damages to a sum of not less than $200.

[45] Bloom et al. (2012) found that their measure of decentralization (which relates to capital decisions, hiring, marketing and product introduction) increases with firm size.

[46] Even though this does not capture firms that do not contact (either settle directly or ignore the letters), the qualitative data are quite informative about firms of different sizes.

qualitative data are consistent with the prior that emotions play a smaller role in larger organizations. For example, the smallest firms are relatively equally distributed across different emotions ranging from apologetic to confrontational/firm and to angry; and they are never compliant/neutral. The largest firms, in contrast, largely concentrate in two categories (compliant/neutral, 60 percent; and confrontational/firm, 28 percent); and there are no angry interactions with the Agency and even some cheerful ones.

Table 7: Qualitative categorization of randomly-selected cases that made contact

	Quartile 1	Quartile 2	Quartile 3	Quartile 4
Apologetic:	13%	5%	0%	5%
Cheerful:	0%	0%	0%	8%
Negotiator:	43%	28%	15%	5%
Compliant/neutral:	0%	23%	40%	60%
Suspicious:	23%	8%	10%	3%
Confrontational/firm:	35%	30%	38%	28%
Angry:	23%	15%	5%	0%
Total	40	40	40	40

Notes: For each firm-size quartile, we randomly select 40 cases that made contact. We categorize them into different emotional categories based on the notes taken by the compliance team after phone conversations and the actual email correspondences. A case may fall into multiple categories and, hence, the percentages sum up to more than one.

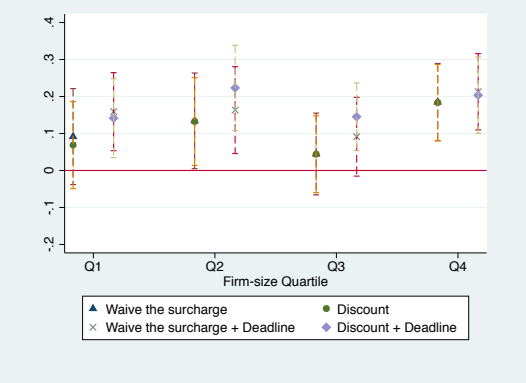
Second, the proportion of negotiators decreases substantially as firm size increases (from 43 percent in the first quartile to 5 percent in the fourth), confirming that larger firms are less price-elastic. Third, the proportion of cases that are suspicious drops from 23 percent in the first quartile to 3 percent in the fourth, suggesting that larger firms are more informed about licensing copyrighted products and the legitimacy of copyright enforcement.

Figure 3 plots the marginal effects of the four messages on the settlement probability based on separate logit regressions by firm-size quartile.[47] For each quartile, the two non-deadline messages are plotted together first and then the two deadline messages. Interestingly, for the largest firms in the fourth quartile (more than $900K in annual sales), all four messages have a large and significant positive effect on the settlement probability relative to the control group, and the magnitudes of the effects are indistinguishable from each other. For smaller firms in the first three quartiles, the two deadline messages are consistently effective; while the two non-deadline messages are only sometimes significant (though the estimates are economically non-trivial).

To determine whether the message effects for the largest set of firms is statistically

[47]Refer to Columns (1) to (4) in Table A2 for the regression results.

Figure 3: Message effects on the settlement probability by firm size



Notes: This figure plots the marginal effects of the four treatment messages on the 30-day settlement probability (relative to the control group that is normalized at zero) by firm-size quartile (Q1 are the smallest firms and Q4 the largest). For each quartile, the two non-deadline messages are plotted together first and then the two deadline messages. Refer to Columns (1)-(4) in Table A3 for the regression results.

different from that for smaller ones, another regression uses all the cases, adds a dummy indicating firms in the fourth quartile and interacts it with two dummy variables (one indicating the two non-deadline messages and the other the two deadline messages).[48] The results show that the two non-deadline messages increase the settlement likelihood relative to the control by 9 percentage points (and statistically significant) for firms in the first three quartiles, and the increase is 19 percentage points for firms in the fourth quartile. The 10 percentage-point difference is marginally significant (p-value is 0.06). The effects of the two deadline messages are statistically the same across all quartiles.

We often think that dispute resolution is more routinized in larger organizations. Thus, it is surprising to find that a small change in communication generates a large effect for the largest firms; and in the case of the two non-deadline messages, the effect is even bigger for them than for smaller ones. A behavioral explanation is that employees have a certain degree of discretion so that non-pecuniary motivations that are important to these individuals are reflected in the firm's decision. Exactly because large firms are financially resourceful (or because the payment does not come out of the employee's own pocket), they are more capable to reciprocate. However, as presented previously, qualitative evidence suggests that the role of emotions, at least, is quite restricted in these organizations. Furthermore, Prediction 3 shows that the message effect due to reciprocal motivations (i.e., by increasing m) is larger when the requested amount is smaller. As the next paragraph shows, the data actually show the opposite.

[48] Refer to Column (5) of Table A2.

The following discusses a number of alternative non-behavioral explanations. First, interviews with the Agency suggest that, for large firms, it is often the involved internal process that delays the settlement. These treatment messages may have helped overcome certain frictions in this process. For example, the softer tone and the recognition of un-intentionality may reduce the incentive to hide the matter for individuals who feel responsible, or avoid triggering a more stringent review procedure. Under this mechanism, we expect that the message effect is larger when the requested amount is higher; and there is some (weak) evidence supporting this. Columns (1) and (2) in Table 8 present the marginal effects from logit regressions that use only firms in the fourth quartile, and the independent variables include a dummy indicating any of the four treatment groups, a dummy for above-median requested amount, and their interaction term. For the 30-day settlement probability, the coefficient of the interaction term is positive but not significant; and it becomes marginally significant and economically large (14 percentage points) when examining the 120-day outcome.[49,50]

Second, a softer tone and 'gift-giving' on the Agency's side may signal a willingness to collaborate and increase the firm's incentive to settle given that it wants to initiate a longer-term relationship (e.g., Camerer (1988); Bolle (2001)). Under this mechanism, we would expect the effect to be larger for firms that are more likely to become the Agency's customer. We use a variable created by D&B that predicts the tendency of becoming a customer based on observable firm characteristics (such as size and industry).[51] Columns (3) and (4) in Table 8 show that the effect is indeed larger for firms that are above the median of this measure than firms below; however, the difference is not statistically significant for either the 30-day or the 120-day outcome.

Third, as we discussed previously, it is difficult to argue that the messages imply a greater threat. Even if they do, it is unlikely to explain the large effects observed these large firms. As we will show later, holding the content of the message constant, adding a deadline does not generate a significantly better outcome. This result also suggests that these large firms do not respond much to an increased level of threat.

[49]Note that because of the technical issues we discussed in the Data section, the 120-day performance of the control group may be substantially positively biased (and hence, the coefficient of Message in Column (2) is not significant). The comparison of the marginal effects between cases above and below the median price, however, should not be affected.

[50]Running the same regressions for firms in the first three quartiles shows that the coefficient of the interaction term is negative for both the 30-day and the 120-day settlement probabilities, and is marginally significant for the latter.

[51]D&B created this variable using the historical licensing data that are not available to us.

Table 8: Message effects by other characteristics for the largest firms (4th quartile)

	30-day	120-day	30-day	120-day
	(1)	(2)	(3)	(4)
Message	0.19***	-0.02	0.17**	0.01
	(0.05)	(0.05)	(0.07)	(0.06)
Above-median requested amount	-0.02	-0.14		
	(0.09)	(0.09)		
Above-median requested amount × Message	0.07	0.14*		
	(0.09)	(0.08)		
More likely to become a customer			0.06	0.13*
			(0.08)	(0.07)
More likely to become a customer × Message			0.08	0.05
			(0.08)	(0.08)
Controls	Y	Y	Y	Y
N	742	742	742	742

Notes: This table reports the marginal effects of logit regressions that use cases in the message experiment for which the firm belongs to the fourth size quartile. The dependent variables are whether the case settles in 30 or 120 days. Message indicates any of the four treatment groups (the default is the control group); 'Above-median requested amount' equals one if the requested amount is above the median; and 'More likely to become a customer' equals one if the measure for the tendency of becoming the Agency's customer is above the median (the measure is developed by D&B). The control variables are the requested amount, firm size and age, and country and month dummies. The robust standard errors are in the parentheses; ***, **, and * are, respectively, significant levels of 1%, 5%, and 10%.

4.2.2 Comparing messages with and without a deadline

This section examines the effect of including a deadline after which the forgiven amount is added on the pre-deadline outcome, holding the rest of the message constant. Because the requested amount varies for a single image while the forgiven amount is uniform, there is a large variation in the ratio between the price increase after the deadline and the initial offer (from 44 to 113 percent). We expect that the deadline effect is larger when the ratio is higher. We also expect the deadline effect to be smaller for larger firms, because they are less price-elastic and less likely to procrastinate either due to routines or because an employee is less distracted by other decisions than an owner.

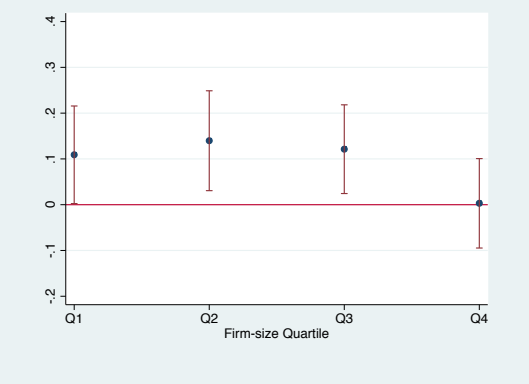
Figure 4 plots the deadline effect on the pre-deadline settlement probability (holding the rest of the message constant) for eight subsamples divided by (1) the median ratio between the price increase after the deadline and the initial offer;[52] and (2) the firm-size quartile.[53] Figure 4a shows that when the price increase after the deadline is high with respect to the requested amount, adding a deadline has a significant and positive effect for all but the largest firms in the fourth quartile. A regression that uses an interaction term between a dummy indicating the fourth quartile and the deadline dummy shows

[52]Because the requested amount is lumpy, 38 percent are above the median (which is 0.84).
[53]Refer to Columns (2)-(5) and (7)-(11) in Table A4 for the regression results.

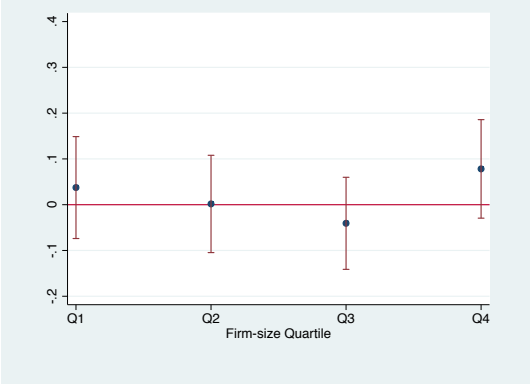
that the deadline effect for firms in the first three quartiles is statistically larger than that for firms in the fourth quartile.[54] Figure 4b shows that when the ratio is relatively low, adding a deadline does not make a significant difference regardless of the firm size.

Figure 4: Effect of a deadline on the pre-deadline (22-day) settlement probability

(a) When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is high



(b) When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is low



Notes: This figure plots the marginal effects of adding a deadline on the pre-deadline (22-day) settlement probability, holding the rest of the message constant, for eight separate subsamples divided by (1) the median ratio between the forgiven amount (the increase after the deadline) and the requested amount and (2) the firm-size quartile (Q1 are the smallest and Q4 the largest). All subsamples use cases in the four treatment groups (not the control group). Refer to Columns (2)-(5) and (7)-(11) in Table A4 for the regression results.

4.2.3 Comparing the 'Discount' and the 'Waive-the-surcharge' messages

This section compares the two non-deadline messages. As shown previously, in the first 30 days, they do not perform differently regardless of the firm size. When examining the 120-day outcome, however, the difference between the two explanations becomes significant under certain circumstances.[55] Figure 5 plots the *difference* in the 120-day settlement probabilities between the 'Discount' and the 'Waive the surcharge' messages for eight subsamples divided by (1) the median of the ratio of the forgiven amount and the requested amount and (2) the firm-size quartile.[56]

Figure 5a shows that when the forgiven amount is relatively large compared to the requested amount, the 'Discount' message performs better than the 'Waive the

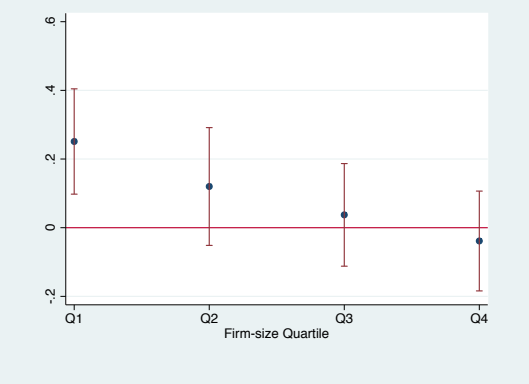
[54] Refer to Column (6) in Table A4 for the regression results.

[55] Note that the technical mishaps that potentially bias the comparison between the treatment groups and the control group for post-30 day outcomes do not affect the comparison between the two non-deadline messages. Table A6 shows that 16.3 percent of the 'Waive the surcharge' group receive the FedEx letter and 14.5 percent of the 'Discount' group do; and the difference is not significant.

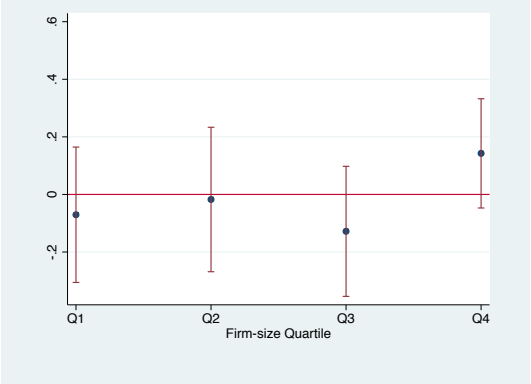
[56] The logit regression results are reported in columns (2)-(5) and (7)-(11) of Table A5.

Figure 5: Difference between 'Discount' and 'Waive the surcharge' messages (120-day)

(a) When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is high



(b) When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is low



Notes: This figure plots the *differences* in the 120-day settlement probabilities between the 'Discount' and the 'Waive-the-surcharge' messages for eight separate subsamples divided by (1) the median ratio between the forgiven amount (the increase after the deadline) and the requested amount and (2) the firm-size quartile (Q1 are the smallest and Q4 the largest). All subsamples use cases in the two non-deadline message groups only. Refer to Columns (2)-(5) and (7)-(11) in Table A5 for the regression results.

surcharge' message by more than 20 percentage points for firms in the first quartile. For firms in the second quartile, the difference is economically large but not significant. The two messages perform similarly for above-median firms. A regression that uses an interaction term between a dummy indicating above-median firms and the 'Discount'-message dummy shows that the difference between the two explanations for below-median firms is statistically different from that for above-median firms.[57] Figure 5b shows that when the forgiven amount is relatively small compared to the requested amount, the two messages do not perform differently regardless of the size.

These results are consistent with that small firms hold a negative attitude towards copyright enforcement and are, hence, not very sympathetic to the cost incurred in the enforcement actives. They seem to associate the listing price of the copyrighted goods as the 'fair' compensation for infringing use and perceive excessive penalties as unfair. In contrast, large firms respond neutrally towards these two types of explanations probably because formal routines restrict the role of individual opinions or because they are more informative and acceptive of copyright enforcement.

[57]Refer to Column (6) in Table A5 for the regression results.

5 Conclusion

This paper studies the effects of different enforcement methods on the settlement outcome of commercial copyright-infringement instances. We use a new, proprietary dataset from a leading agency in the stock photography industry. Two field experiments provide exogenous variation in the requested amount and the wording of the letter. The first experiment exogenously lowered the requested amount for a subset of cases by eliminating $400 surcharge per image on top of the licensing fee of the image(s). The second experiment exogenously varied how the price-reduction information is conveyed to the infringer and acknowledge the possibility of accidental infringement.

The two experiments, combined together, generate the following results. First, the same price difference, when varied in the initial requested amount, makes only a small difference in the settlement probability; but generates a large and significant positive effect when offered as an increase from the same lower price point. This seemingly inconsistent result can be rationalized if firms perceive the Agency as more serious when a larger amount is requested. Thus, the lower initial offer does not generate a higher settlement probability even if the firm is very price sensitive, because it sacrifices the degree of threat at the same time.

Second, a small change in communication generates a large effect, even (and especially for) the largest firms. The explanation could be behavioral: employees in these firms have a certain degree of discretion so that reciprocity concerns that matter to these individuals would be reflected in the firm's settlement decision. However, the explanation could also be economic; for example, a softer tone and an explicit recognition of the potential un-intentionality may reduce the incentive to hide the matter for individuals who feel responsible, or avoid triggering a more involved review procedure because the perceived threat is lower. Our data provide some evidence in favor of the friction-reduction explanation, though cleanly identifying the exact mechanism is beyond the scope of the paper.

Finally, smaller firms seem to behave closer to individuals than larger firms. Whether explicitly explaining the forgiven amount as waiving the enforcement cost or as a discount from an average settlement offer makes a significant difference only for the smallest firms (less than $100K in annual revenue) and when the forgiven amount is relatively high compared to the requested amount. In this scenario, the discount explanation performs significantly better than the waiving-the-cost explanation. The result is consistent with these firms perceiving the listing price of the copyrighted goods as the fair compensation for the infringement and excessive penalties as unfair, which

resembles survey evidence on individual opinions towards copyright enforcement. Such sentiment is not reflected in larger firms probably because formal routines restrict the role of individual opinions or because they are more informative of the legitimacy (and, hence, move acceptive) of copyright enforcement.

References

Alm, J. and B. Torgler (2011). Do ethics matter? tax compliance and morality. *Journal of Business Ethics 101*, 635–651.

Anderson, E. and D. Simester (1998). The role of sale signs. *Marketing Science 17*, 139–155.

Anderson, E. and D. Simester (2001). Are sale signs less effective when more products have them? *Marketing Science 20*, 121–142.

Ariely, D. and K. Wertenbroch (2001). Procrastination, deadlines, and performance: Self-control by pre-commitment. *Psychological Science 13*, 219224.

Athey, S. and S. Stern (2013). The nature and incidence of software piracy: Evidence from windows. NBER Working Paper No. 19755.

Balestrino, A. (2008). It is a theft but not a crime. *European Journal of Political Economy 24*, 45569.

Bebchuk, L. (1984). Litigation and settlement under imperfect information. *RAND Journal of Economics 15*, 404415.

Bechtold, S. (2013). law and economics of copyright and trademarks on the internet. In S. N. Durlauf and L. E. Blume (Eds.), *The New Palgrave Dictionary of Economics*. Palgrave Macmillan.

Belleflamme, P. and M. Peitz (2012). Digital piracy: theory. In M. Peitz and J. Waldfogel (Eds.), *The Oxford Handbook of the Digital Economy*, pp. 489530. Oxford: Oxford University Press.

Bessen, J. E. and M. J. Meurer (2006, May). Patent Litigation with Endogenous Disputes. *American Economic Review 96*(2), 77–81.

Bhattacharjee, S., R. D. Gopal, K. Lertwachara, and J. Marsden (2006). Impact of legal threats on individual behavior: An analysis of music industry actions and online music sharing. *Journal of Law and Economics 49*, 91–114.

Bloom, N., R. Sadun, and J. V. Reenen (2012). The organization of firms across countries. *Quarterly Journal of Economics*, 1663–1705.

Blumenthal, M., C. Christian, and J. Slemrod (2001). Do normative appeals affect tax compliance? evidence from a controlled experiment in minnesota. *National Tax Journal 54*, 125–38.

Bolle, F. (2001). Why to buy your darling flowers: On cooperation and exploitation. *Theory and Decision 50*, 1–28.

Camerer, C. (1988). Gifts as economic signals and social symbols. *American Journal of Sociology 94*, 180–214.

Cooper, D. J. and J. H. Kagel (2013). Other regarding preferences: A survey of experimental results. In J. Kagel and A. Roth (Eds.), *The Handbook of Experimental Economics*, Volume 2. Princeton: Princeton University Press.

Cooter, R. and D. Rubinfeld (1989). Economic analysis of legal disputes and their resolution. *Journal of Economic Literature 27*, 10671097.

Crampes, C. and C. Langinier (2002). Litigation and settlement in patent infringement cases. *RAND Journal of Economics 33*, 258–274.

Danaher, B. and M. Smith (2014). Gone in 60 seconds: The impact of the megaupload shutdown on movie sales. forthcoming International Journal of Industrial Organization.

DellaVigna, S. (2009). Psychology and economics: Evidence from the field. *Journal of Economic Literature 47*, 315–72.

Depoorter, B., A. v. Hiel, and S. Vanneste (2011). Copyright backlash. *Southern California Law Review 84*, 125192.

Eisenberg, T. and H. Farber (2003). The government as litigant: Further tests of the case selection model. *American Law and Economics Review 5*, 94–133.

Eisenberg, T. and H. S. Farber (1997). The litigious plaintiff hypothesis: Case selection and resolution. *The RAND Journal of Economics 28*, 92–112.

Falk, A. (2007). Gift exchange in the field. *Econometrica 75*, 1501–1511.

Farber, H. and M. White (1991). Medcial malpractice: An empirical examination of the litigation process. *Rand Journal of Economics 22*, 199–217.

Fehr, E. and S. Gächter (2000). Fairness and retaliation: The economics of reciprocity. *Journal of Economic Perspectives 14*, 159–181.

Fehr, E., G. Kirchsteiger, and A. Riedl (1993, May). Does Fairness Prevent Market Clearing? An Experimental Investigation. *The Quarterly Journal of Economics, MIT Press 108*(2), 437–59.

Fournier, G. M. and T. W. Zuehlke (1996). The timing of out-of-court settlements. *Rand Journal of Economics 27*, 310–321.

Frey, B. S. and L. P. Feld (2002). Deterrence and morale in taxation: An empirical analysis. CESifo Working Paper Series 760, CESifo Group Munich.

Frey, B. S. and W. W. Pommerehneb (1993). On the fairness of pricing—an empirical survey among the general population. *Journal of Economic Behavior & Organization 20*, 295307.

Galasso, A., M. Schankerman, and C. Serrano (2013). Trading and enforcing patent rights. *RAND Journal of Economics 44*, 275–312.

Glückler, J. and R. Panitz (2013). Survey of the global stock image market 2012. part i: Players, products, business. Technical report, Heidelberg: GSIM Research Group.

Hallsworth, M., J. List, R. Metcalfe, and I. Vlaev (2014, March). The behavioralist as tax collector: Using natural field experiments to enhance tax compliance. Working Paper 20007, National Bureau of Economic Research.

Inman, J. J., L. McAlister, and W. D. Hoyer (1990). Promotion signal: proxy for a price cut? *Journal of consumer research 17*, 74–81.

Kahneman, D., J. L. Knetsch, and R. Thaler (1986). Fairness as a constraint on profit seeking: Entitlements in the market. *American Economic Review 76*, 728741.

Lanjouw, J. and M. Schankerman (2001). Characteristics of patent litigation: A window on competition. *RAND Journal of Economics 32*, 129–151.

Lanjouw, J. O. and M. Schankerman (2004). Protecting intellectual property rights: are small firms handicapped? *The Journal of Law and Economics 47*, 45–74.

Luttmer, E. F. P. and M. Singhal (2014). Tax morale. *Journal of Economic Perspectives 28*, 149–68.

Meurer, M. (1989). The settlement of patent litigation. *RAND Journal of Economics 20*, 7791.

Mortimer, J., C. Nosko, and A. Sorensen (2012). Supply responses to digital distribution: Recorded music and live performances. *Information Economics and Policy 24*, 3–14.

Oberholzer-Gee, F. and K. Strumpf (2007). The effect of file sharing on record sales: An empirical analysis. *Journal of Political Economy 115*, 142.

Okun, A. (1981). *Prices and Quantities: A Macro-Economic Analysis*. Washington: The Brookings Institution.

Priest, G. and B. Klein (1984). The selection of disputes for litigation. *Journal of Legal Studies 13*, 155.

Rabin, M. (1993, December). Incorporating Fairness into Game Theory and Economics. *American Economic Review 83*(5), 1281–1302.

Rob, R. and J. Waldfogel (2006). Piracy on the high c's: Music downloading, sales displacement, and social welfare in a sample of college students. *Journal of Law and Economics 49*, 29–62.

Roth, A. E. (1995). Bargaining experiments. In J. H. Kagel and A. E. Roth (Eds.), *Handbook of Experimental Economics*. Princeton: Princeton University Press.

Roth, A. E. and M. W. Malouf (1979). Game-theoretic models and the role of information in bargaining. *Psychological Review 86*, 574–594.

Roth, A. E. and J. K. Murnighan (1982, September). The Role of Information in Bargaining: An Experimental Study. *Econometrica 50*(5), 1123–42.

Shiller, R. J., M. Boycko, and V. Korobov (1991). Popular attitudes toward free markets: The soviet union and the united states compared. *American Economic Review 81*, 385400.

Spier, K. E. (2007). Litigation. In A. M. Polinsky and S. Shavell (Eds.), *Handbook of Law and Economics*, Chapter 4. North-Holland.

Waldfogel, J. (1995). The selection hypothesis and the relationship between trial and plaintiff victory. *Journal of Political Economy 103*, 229260.

Waldfogel, J. (2012). Copyright protection, technological change, and the quality of new products: Evidence from recorded music since napster. *Journal of Law & Economics 55*, 71540.

Watanabe, Y. (2006). Learning and bargaining in dispute resolution: Theory and evidence from medical malpractice litigation. Mimeo, Northwestern University.

Appendix A. Tables and Figures

Table A1: Price effects on the settlement outcomes

Dependent variable	Settle	Revenue for settled cases	Revenue
	Logit	OLS	OLS
	(1)	(2)	(3)
$400-Surcharge dummy	-0.02	267.17***	18.39**
	(0.01)	(21.40)	(8.58)
Use cat 2: high res + secondary page	0.03*	-142.11***	11.62
	(0.02)	(45.78)	(14.50)
Use cat 3: low res + home page	-0.01	-245.17***	-16.12
	(0.03)	(82.73)	(24.25)
Use cat 4: low res + repeat page	0.08**	-290.12***	50.90
	(0.03)	(111.49)	(35.92)
Use cat 5: high res + home page	0.02	-415.37***	-5.44
	(0.04)	(139.55)	(41.51)
Use cat 6: high res + repeat page	0.06	-396.94***	26.48
	(0.04)	(152.87)	(45.85)
Use cat 7: multi-images	0.09**	-468.88***	80.40*
	(0.04)	(155.07)	(46.79)
log(Sales+1)	0.01***	14.15***	7.71***
	(0.00)	(5.32)	(1.93)
log(Age+1)	0.01***	24.58**	13.98***
	(0.00)	(9.67)	(3.60)
Missing-age dummy	0.10***	131.16**	99.59***
	(0.02)	(63.00)	(19.93)
log(Baseline price)	-0.09*	896.49***	9.92
	(0.05)	(192.12)	(56.96)
Number of images	-0.02	322.90*	-22.38
	(0.02)	(175.77)	(14.79)
Top 10 state dummies	Y	Y	Y
U.S. dummy	Y	Y	Y
Top 10 industry dummies	Y	Y	Y
Mail month dummies	Y	Y	Y
Price elasticity	-0.15	0.67	0.31
Mean(dependent variable) for the $0-Surcharge group	0.15	515.05	77.05
Adj R-squared		0.563	0.019
N	6840	894	6840

Notes: This table reports the marginal effects of regressions using the pricing-experiment sample. The dependent variables are (1) whether the case settles in 30 days, (2) the revenue for settled cases; and (3) the revenue (coded as $0 if not settled in 30 days) of a case. The independent variable is a dummy indicating the $400-Surcharge group (the $0-Surcharge group is the default). Columns (1) and (3) use all cases and (2) uses cases that settle in 30 days. The corresponding price elasticities are calculated based on the formula $\frac{\Delta DV}{\Delta p}\frac{p}{DV}$. For each regression, ΔDV takes the estimated marginal effect of the $400-Surcharge dummy, Δp is the difference between the mean requested amounts of the two groups, and p and DV take the respective means for the $0-Surcharge group. The robust standard errors are in the parentheses; ***, **, and * are, respectively, significant levels of 1%, 5%, and 10%.

Table A2: Message effects on the settlement outcomes

Dependent variable	Settle	Revenue for settled cases	Revenue
	Logit	OLS	OLS
	(1)	(2)	(3)
Waive the surcharge	0.12***	0.64	66.63***
	(0.03)	(17.70)	(16.25)
Waive the surcharge + Deadline	0.18***	7.95	89.93***
	(0.03)	(15.51)	(14.65)
Discount	0.12***	14.65	62.17***
	(0.03)	(17.19)	(15.26)
Discount + Deadline	0.19***	7.39	88.19***
	(0.03)	(15.05)	(14.09)
Use cat 2: high res + secondary page	-0.04	-180.07***	-37.37
	(0.03)	(45.29)	(34.89)
Use cat 3: low res + home page	-0.08	-314.21***	-68.14
	(0.06)	(80.38)	(61.20)
Use cat 4: low res + repeat page	0.03	-446.55***	-23.48
	(0.08)	(113.95)	(89.44)
Use cat 5: high res + home page	-0.11	-483.33***	-101.73
	(0.09)	(142.71)	(109.58)
Use cat 6: high res + repeat page	-0.05	-537.48***	-71.08
	(0.09)	(154.64)	(119.00)
Use cat 7: multi-images	-0.07	-711.51***	-77.38
	(0.09)	(171.77)	(109.05)
log(Sales+1)	0.01**	5.52**	7.76***
	(0.00)	(2.40)	(2.62)
log(Age+1)	0.02	0.43	10.12
	(0.01)	(6.46)	(6.64)
Missing-age dummy	0.14***	75.65**	111.03***
	(0.05)	(38.39)	(34.26)
log(Requested amount)	-0.00	1138.00***	170.98
	(0.11)	(197.59)	(150.83)
Number of images	-0.02	100.67	-14.56
	(0.05)	(88.73)	(53.83)
Top 10 state dummies	Y	Y	Y
U.S. dummy	Y	Y	Y
Top 10 industry dummies	Y	Y	Y
Mail date dummies	Y	Y	Y
Mean(dependent variable) for the control group	0.14	483.3	68.7
Adj R-squared		0.813	0.061
N	2409	569	2409

Notes: This table reports the marginal effects of regressions using the message-experiment sample. The dependent variables are (1) whether the case settles in 30 days, (2) the revenue for settled cases; and (3) the revenue (coded as $0 if not settled in 30 days) of a case. The independent variables are four dummies indicating the treatment messages (the default is the control group). Columns (1) and (3) use all cases and (2) uses cases that settle in 30 days. The robust standard errors are in the parentheses; ***, **, and * are, respectively, significant levels of 1%, 5%, and 10%.

Table A3: Message effects on the settlement probability by firm size

	By firm-size quartile				All
	Q1	Q2	Q3	Q4	cases
	(1)	(2)	(3)	(4)	(5)
Waive the surcharge	0.09	0.13**	0.04	0.18***	0.09**
	(0.07)	(0.07)	(0.06)	(0.05)	(0.03)
Waive the surcharge + Deadline	0.16***	0.16***	0.09*	0.21***	0.17***
	(0.05)	(0.06)	(0.05)	(0.05)	(0.03)
Discount	0.07	0.13**	0.04	0.18***	0.08**
	(0.06)	(0.06)	(0.05)	(0.05)	(0.03)
Discount + Deadline	0.14***	0.22***	0.15***	0.20***	0.17***
	(0.05)	(0.06)	(0.05)	(0.05)	(0.03)
Quartile 4					0.01
					(0.05)
Quartile 4 × Deadline					0.03
					(0.05)
Quartile 4 × No deadline					0.10*
					(0.05)
Control variables	Y	Y	Y	Y	Y
N	492	492	649	742	2409

Notes: This table reports logit regression results (marginal effects) using cases in the message-experiment sample. The first four columns use subsamples by firm-size quartile (Q1 are the smallest and Q4 the largest), and the last column uses all cases. For all regressions, the dependent variable is whether the case settles in 30 days and the independent variables include four dummies indicating the treatment messages (the default is the control group). In Column (5), a dummy indicating firms in the fourth quartile (the largest) and an interaction term between this dummy and two dummy variables (one indicating the two non-deadline dummies and the other the two deadline messages) are also included. The control variables for all regressions include log(Requested amount), log(Sales), log(Age + 1), Missing age dummy, dummies for top ten industries, top ten states (provinces), country, and each mailing date. The robust standard errors are in the parentheses; ***, **, and * are, respectively, significant levels of 1%, 5%, and 10%.

Table A4: Marginal effect of adding a deadline on the pre-deadline (22-day) settlement probability

	All	When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is high					When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is low				
	cases	Q1	Q2	Q3	Q4	All	Q1	Q2	Q3	Q4	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Deadline	0.06***	0.11**	0.14**	0.12**	0.00	0.12***	0.03	0.01	-0.05	0.08	-0.01
	(0.02)	(0.05)	(0.06)	(0.05)	(0.05)	(0.03)	(0.06)	(0.07)	(0.06)	(0.06)	(0.04)
Quartile 4						-0.13**					0.07
						(0.06)					(0.06)
Quartile 4 × Deadline						0.12**					0.06
						(0.05)					(0.06)
Waive-the-surcharge explanation	0.00	0.04	-0.02	0.02	0.01	0.01	0.08	-0.04	-0.03	0.04	0.00
	(0.02)	(0.05)	(0.05)	(0.05)	(0.05)	(0.03)	(0.06)	(0.07)	(0.05)	(0.06)	(0.03)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	1776	224	232	293	328	1078	143	147	187	207	698

Notes: This table reports logit regression results (marginal effects) that use cases in all four treatment groups in the message experiment. For all regressions, the dependent variable is whether the case settles in the first 22 days and the independent variables include a dummy that equals one if the message contains a deadline (the default group are the two messages that do not contain a deadline). In Columns (6) and (11), a dummy indicating firms in the fourth quartile (the largest) and an interaction term between this dummy and the deadline dummy are also included. The control variables for all regressions are a dummy that equals one if the message explains the price reduction as waiving the surcharge, the requested amount, firm size and age, and mail-month and country dummies. Q1-Q4 stand for firm-size quartiles, with Q1 including the smallest firms and Q4 the largest. The robust standard errors are in the parentheses; ***, **, and * are, respectively, significant levels of 1%, 5%, and 10%.

Table A5: Comparing the 'Waive-the-surcharge' and the 'Discount' messages (120-day)

	All	When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is high					When $\frac{\text{forgiven amount}}{\text{requested amount}}$ is low				
	cases	Q1	Q2	Q3	Q4	All	Q1	Q2	Q3	Q4	All
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Discount	0.04	0.25***	0.12	0.04	-0.04	0.18***	-0.07	-0.02	-0.13	0.14	-0.04
	(0.03)	(0.08)	(0.09)	(0.08)	(0.07)	(0.07)	(0.12)	(0.13)	(0.12)	(0.10)	(0.09)
Above-median size						0.18**					-0.07
						(0.07)					(0.10)
Above-median size × Discount						-0.19**					0.06
						(0.08)					(0.12)
Controls	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
N	858	117	115	163	189	591	55	56	65	84	267

Notes: This table reports logit regression results (marginal effects) that use cases in two treatment groups (the 'Waive-the-surcharge' and the 'Discount' messages) in the message experiment. For all regressions, the dependent variable is whether the case settles in 120 days and the independent variables include a dummy that equals one if it is the discount message (the default group is the waive-the-surcharge message). In Columns (6) and (11), a dummy indicating firms above the median size and an interaction term between this dummy and the discount dummy are also included. The control variables for all regressions are the requested amount, firm size and age, and mail-month and country dummies. Q1-Q4 stand for firm-size quartiles, with Q1 including the smallest firms and Q4 the largest. The robust standard errors are in the parentheses; ***, **, and * are, respectively, significant levels of 1%, 5%, and 10%.

Appendix B. Details on the technical mishaps

Constrained by the IT system, the information indicating which group a case belongs to is recorded in a field that is used to record whether the firm makes contact. However, this group information is *not* recorded for the group that takes the default approach at the time (i.e., the \$400-Surcharge group in the pricing experiment and the control group in the message experiment). Normally, the extra FedEx letter and the last reminding email are sent only if the case-handler field is empty (and thus, the case is ignored by the firm). During the trial periods, the non-default groups do not get these two types of follow-up letters because the case-handler field is not empty even if the firm has not contacted. This is sometimes corrected for but not always.

Table A6 reports the percentage of cases that receive these two types of letters by group, and the differences suggest that the potential upward bias for the default group is likely to be substantial for the message experiment. These incidences, though not ideal, reflects the complexity and constraints in conducting field experiments. Here, it is fortunate in the sense that we know the exact data-generating process so as to discover the confounding factors if there are any.

Table A6: Follow-up letters affected by technical mishap

	Pricing experiment		Message experiment				
	\$400-Surcharge	\$0-Surcharge	Control	Waive the surcharge	Waive the surcharge + Deadline	Discount	Discount + Deadline
FedEx letter	5.2%	0%	41.9%	16.3%	15.6%	14.5%	14.2%
Final email	7.9%	0%	14.1%	0%	0%	0%	0%

Notes: This table reports the proportion of cases that receive the FedEx letter (typically sent around 30 days after the first letter) and the last email notice (typically sent after 60 days). Because of the technical mishap, the default group in each experiment (i.e., the \$400-Surcharge group in the pricing experiment and the control group in the message experiment) are significantly more likely to receive these two types of letters.