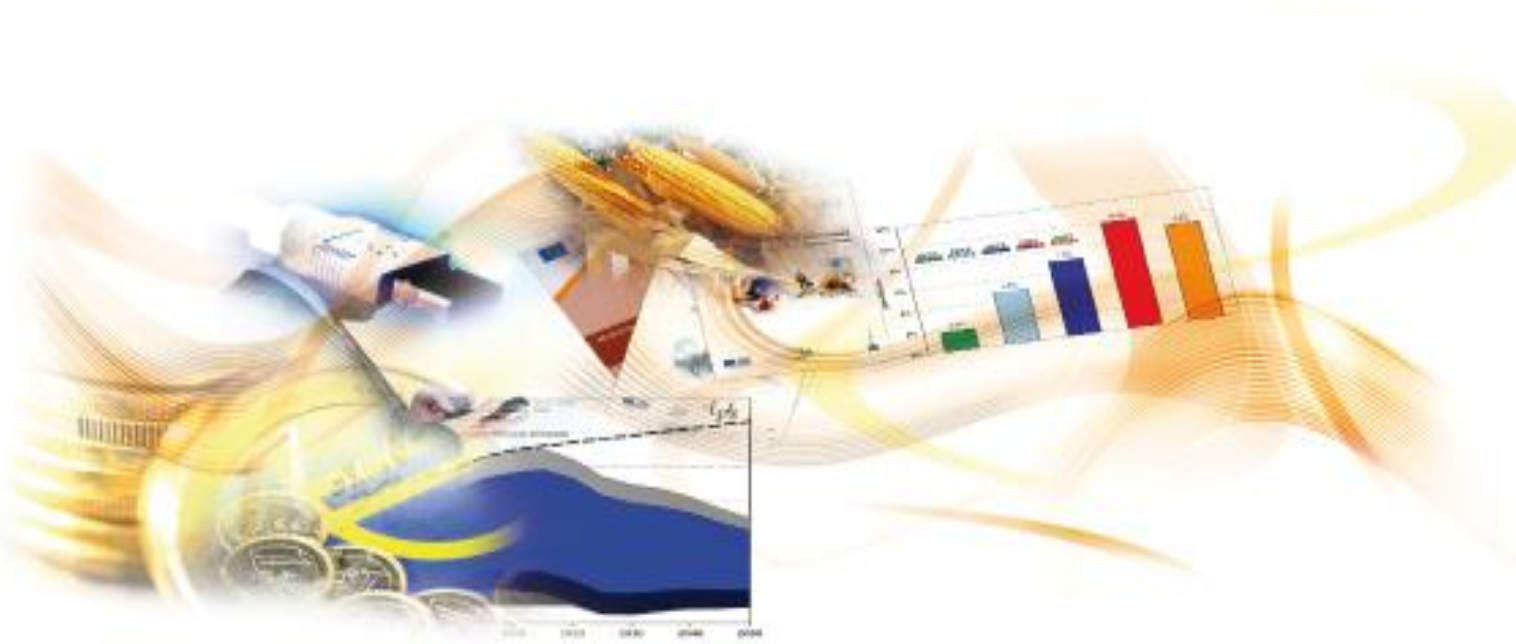


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# Online Copyright Enforcement, Consumer Behavior, and Market Structure

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**Abstract**

Taking down copyright-infringing websites is a way to reduce consumption of pirated media content and increase licensed consumption. We analyze the consequences of the shutdown of the most popular German video streaming website - kino.to - in June 2011. Using individual-level clickstream data, we find that the shutdown led to significant but short-lived declines in piracy levels. The existence of alternative sources of unlicensed consumption, coupled with the rapid emergence of new platforms, led the streaming piracy market to quickly recover from the intervention and to limited substitution into licensed consumption. Our results therefore present evidence of a high elasticity of supply in the online movie piracy market, together with relatively low switching costs for users of copyright infringing platforms. The post-shutdown market structure was much more fragmented, thus making it potentially more resistant to any future interventions.

## Abstract

Taking down copyright-infringing websites is a way to reduce consumption of pirated media content and increase licensed consumption. We analyze the consequences of the shutdown of the most popular German video streaming website - `kino.to` - in June 2011. Using individual-level clickstream data, we find that the shutdown led to significant but short-lived declines in piracy levels. The existence of alternative sources of unlicensed consumption, coupled with the rapid emergence of new platforms, led the streaming piracy market to quickly recover from the intervention and to limited substitution into licensed consumption. Our results therefore present evidence of a high elasticity of supply in the online movie piracy market, together with relatively low switching costs for users of copyright infringing platforms. The post-shutdown market structure was much more fragmented, thus making it potentially more resistant to any future interventions.

*Keywords:* Anti-Piracy Intervention, Copyright, Movie Industry, Natural Experiment

*JEL classification:* K42, L82, O34, O38

# 1 Introduction

The media industry has been drastically affected by digitization, with information and communication technologies changing the way music, movies, and books are consumed and produced. On the one hand, consumers have seen a radical increase in their ability to consume cultural products following digital formatting. On the other hand, digitization has also facilitated access to copyright infringing content thanks to the advent of file-sharing networks and, more recently, unlicensed online streaming. Because of the important investments needed to bring creative products to market, this expansion in unpaid consumption has led to serious concerns about its negative effects on producers' revenue and ultimately on the supply of such products. For this reason, both industry representatives and academics have for many years sought to identify the effects of illegal file-sharing on sales. In the case of the movie industry, most empirical studies find that illegal consumption does indeed displace sales.<sup>1</sup> Given the drastic improvements in both unlicensed video consumption platforms and Internet connection speeds, these findings have understandably raised concerns about continued investment in movie production and overall welfare.

Governments and industry representatives have contemplated different sets of actions to increase copyright enforcement on the Internet. In recent years, one of the most prominent type of intervention involves governments' seizures of specific platforms hosting or providing access to pirated content.<sup>2</sup> These interventions usually involve large amounts of public resources - both in direct intervention costs (e.g. police force) and in court cases<sup>3</sup> - and governments and public entities have realized the importance of taking into account

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<sup>1</sup>See, for instance, [Bai and Waldfogel \(2012\)](#); [Bounie et al. \(2006\)](#); [Danaher and Waldfogel \(2012\)](#); [Rob and Waldfogel \(2007\)](#); [Zentner \(2010\)](#).

<sup>2</sup>Because they aim at reducing the consumption of copyright infringing content by limiting the supply of such products, these interventions are typically referred to as "supply-side" anti-piracy interventions. They can also be implemented through private rather than public effort. For instance, firms can attempt to limit the amount of piracy for their own products, or they may implement technical solutions such as Digital Rights Management. Another type of intervention - referred to as "demand-side" intervention - concentrates its effort on the end consumers of copyright infringing content in order to discourage consumption of such products. These typically include lawsuits against individual users or the introduction of graduated response laws such as the HADOPI law in France, where consumers found guilty of copyright infringement would potentially face loss of Internet access after two warnings and repeated infringement.

<sup>3</sup>For instance, the UK Intellectual Property Office created an Intellectual Property Crime Unit as part of the City of London Police in September 2013, which is "dedicated to tackling online piracy and other forms of intellectual property crime." See <http://tinyurl.com/govuk-piracyunit>. It initially provided £2.5 million in funding over two years to the City of London Police, and has now expanded its budget by £3 million until 2017. See <http://tinyurl.com/govuk-piracyunit2>.

empirical evidence when considering their implementation (Hargreaves, 2011; Intellectual Property Office, 2014). Yet, this evidence is still scarce and instigators of anti-piracy interventions often lack knowledge on their effectiveness and potential pitfalls. As Tony Clayton, chief economist at the UK Intellectual Property Office, argued, “At the moment, the government and industry do not have an evidence-based approach to what works in this area. The trade-off between costs of infringement and gains from enforcement isn’t supported by evidence to give us understanding of policy outcomes. That means policy is often set by people who shout loudest.”<sup>4</sup> And indeed, these anti-piracy interventions are not guaranteed to be effective. First, given the existence of numerous alternative platforms offering copyright infringing content, it is not obvious that the take-down of a specific unlicensed website would lead to a reduction in overall piracy. If users are able to easily switch across platforms, the intervention may result in a simple transfer of consumption from one unlicensed website to another (Bilton, 2012). Second, even if the intervention is successful in reducing overall consumption of pirated content, it will destroy surplus for individuals who consume copyright infringing products. If these consumers are not willing to pay for the licensed version of these products, their surplus will not translate into surplus to producers. Removing access to pirated content will therefore simply convert consumer surplus into deadweight loss, reducing overall welfare. Removal of pirated content can be beneficial to producers, however, if some of the consumers of copyright infringing content are willing to migrate to licensed versions of the product. Any anti-piracy intervention should therefore, as a minimum requirement, manage to convert unlicensed consumers into licensed ones for it to be justified.<sup>5</sup> Finally, seizing the dominant unlicensed website may have important consequences on the structure of the piracy market, as it could both incentivize entry of new platforms and generate more competition among existing websites to get a piece of the unserved market.

Given the inherent difficulty in measuring online piracy, obtaining detailed evidence on consumers’ behavior following anti-piracy interventions is a challenging task and one of the main reasons for the lack of evidence on this issue. Previous literature has predominantly

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<sup>4</sup>Statement of Tony Clayton, chief economist of the UK IPO, at the conference launching the CREATE Research Programme, RCUK Centre for Copyright and New Business Models in the Creative Economy, February 1, 2013. See <http://www.create.ac.uk/context/expert-views/panel-ukipo/>.

<sup>5</sup>Note that this is only a necessary condition. In particular, any anti-piracy intervention will not be worthwhile if the share of converted pirates results in revenue gains that fall short of the intervention’s implementation costs.

relied on product-level data such as digital movie sales or box-office revenues to identify the effects of anti-piracy interventions in the movie industry (Peukert et al., 2013; Danaher and Smith, 2014).<sup>6</sup> While existing studies relying on product sales data are informative and allow the identification of the effect of the intervention on sales, they are constrained to treat consumer behavior as a “black box.” These limitations result in an incomplete picture of the effectiveness and the consequences of these interventions.

The objective of this paper is to evaluate the impact of a specific supply-side anti-piracy intervention in the movie industry by analyzing the unexpected shutdown of the major unlicensed streaming website `kino.to` in Germany. Our analysis relies on clickstream data, which allows us to follow individuals’ behavior on a very large set of websites, including licensed and unlicensed video consumption websites, throughout 2011. Our paper is the first to provide detailed evidence on the effects of a copyright enforcement intervention on consumer behavior and on the structure of the piracy market. In particular, we shed light on the potential pitfalls of anti-piracy interventions in online markets where the elasticity of supply is high and consumers’ switching costs are low.

The results from our empirical analysis show that the shutdown of `kino.to` led to a significant but short-lived decrease in the usage of unlicensed video streaming websites. Unsurprisingly, this effect is particularly large for individuals who were using `kino.to` previous to its shutdown, with decreases of more than 30% in overall piracy consumption during the four weeks directly following the intervention. We nevertheless observe that consumption of pirated content increases again following the fourth week after the shutdown. This increase is driven both by substitution towards existing alternative unlicensed platforms and by the entry of new platforms following the shutdown.

Second, we find limited substitution into consumption of licensed offline video content, proxied by visits to specific types of websites. Our results show that consumers do not increase their visits to websites of movie theaters or to DVD-related `Amazon` webpages. However, we find a small increase in clicks to licensed online video services (such as `Max-dome`, `Lovefilm`, and `iTunes`) after the shutdown, providing evidence that the intervention

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<sup>6</sup>Other studies have made use of product level data to evaluate the effects of copyright enforcement in other industries. See, for instance, Danaher et al. (2014) for an evaluation of the effects of the HADOPI law on digital music sales, Zhang (2013) for the effect of DRM removal on digital music sales, or Reimers (2014) for an analysis of the effectiveness of private copyright protection in the book industry.

was successful in converting part of `kino.to`'s users toward legitimate video consumption. Perhaps more importantly, we also find that heavy `kino.to` users disproportionately increase their visits to websites of licensed video services. This substitution was nevertheless undermined by the existence of alternative unlicensed streaming websites, which allowed consumers to rapidly transfer their consumption of copyright infringing videos from `kino.to` to other platforms. In particular, we document a large increase in clicks to the second-most popular platform - `movie2k.to` - directly after `kino.to` disappears. Only five weeks after the intervention, we also observe the entry of a new platform - `kinoX.to` - which manages to quickly appropriate a significant share of the unlicensed video streaming market at the expense of `movie2k.to` and the other smaller platforms. These results reflect both the high elasticity of supply to the shutdown, and the fact that consumers face little difficulty in switching from one platform to another.

Third, we assess how the shutdown affected the overall structure of the market for unlicensed video streaming. While the market was largely dominated by `kino.to` before its seizure, the intervention triggered an increase in competition between alternative platforms, ultimately resulting in a much more fragmented market. After the shutdown, the market was evenly split between `movie2k.to` (the second largest player at the time of the shutdown), `kinoX.to` (`kino.to`'s substitute), and a remainder of 12 websites which cumulatively account for one third of the market. We also observe that concentration of demand decreases after the shutdown, and that consumers diversify their unlicensed movie consumption more as opposed to concentrating it on a single platform.

Overall, our results raise concerns about the effectiveness of the shutdown of `kino.to`. The existence of alternative sources of unlicensed consumption, coupled with the rapid emergence of new platforms, limited the positive effects of the intervention on overall piracy levels and on movie consumption through licensed alternatives. Most importantly, the unintended effects of the `kino.to` shutdown could have an important impact on the effectiveness of future interventions. In particular, a more fragmented market could potentially make future law enforcement interventions either more costly - as there would not be a single dominant platform to shutdown anymore - or less effective if only a single website is targeted by the intervention.

The remainder of the paper is organized as follows. Section 2 presents some of the mechanics of unlicensed video streaming platforms, discusses the literature relevant to our study, and provides some background on the kino.to shutdown. Section 3 presents the data for the study. Section 4 presents our estimation of the effectiveness of the shutdown on overall piracy levels and substitution toward licensed consumption alternatives. It also presents evidence on consumers' substitution toward alternative sources of unlicensed consumption. Section 5 analyzes the consequences of the shutdown on the overall structure of the market for unlicensed video streaming as well as on consumers' patterns of unlicensed consumption. Section 6 concludes and discusses the policy implications of our results.

## 2 Institutional Background

### 2.1 The Evolution of Movie Piracy

Consumption patterns of media products have drastically changed since the beginning of the 21<sup>st</sup> century. Ever since the advent of Napster in 1999 and the creation of subsequent file-sharing networks, individuals are able to freely share and access vast amounts of digital media files. While this started as a major concern for the music industry, it only appeared as a real threat to the movie industry a few years later. Because videos naturally come in much larger digital files than music, downloads only became feasible with the increasing availability of broadband Internet connections. Furthermore, although very efficient in allowing sharing of relatively small size files, the initial peer-to-peer (P2P) networks (such as Napster and Kazaa) were ill-suited for the sharing of larger files and therefore only allowed for the sharing of relatively low quality videos. In 2003, however, the BitTorrent protocol made sharing of large files much easier, popularizing and drastically increasing high quality video file-sharing and raising important concerns for the movie industry (Thompson, 2005; Danaher and Waldfogel, 2012).

Offering several technical advantages over BitTorrent, the development of cyberlockers and streaming sites services has, in the past few years, facilitated the upsurge of a professional market for unlicensed media content. We can think of cyberlockers and linking sites as



the core of this relatively new piracy ecosystem, as depicted in Figure 1. In their simplest form, cyberlockers are online services that allow Internet users to upload and store large files. While this type of service can be used to back up any type of personal data, it can also be used to share copyright protected files such as movies and episodes of TV series (Antoniades et al., 2009; Liu et al., 2013). A user (or uploader) willing to share a video would start by uploading it to the cyberlocker. Once the video is uploaded, the uploader receives a download URL which provides access to the file. Uploaders could therefore share their content with other individuals, e.g. by simply emailing this link to friends. Alternatively, they could reach a much larger number of users by posting the link on a website – called linking or streaming website within the piracy ecosystem in Figure 1 - where anyone could get direct access to their uploaded content.<sup>7</sup> These linking sites would typically do more than simply providing access to these links, as they would also categorize content, make it searchable, and provide meta-information (such as credits and ratings).

The whole piracy ecosystem depicted in Figure 1 essentially runs on advertisement revenues. The more visits a cyberlocker gets, the more advertisement revenue it will obtain. In order to generate traffic to its website, a cyberlocker would sometimes pay the uploaders a share of the advertising revenue generated by their uploaded content. This naturally generates strong incentives for users to upload as much content as possible and to drive traffic to that content. For uploaders, posting links on popular streaming websites therefore serves as the means to increase their income. Finally, linking sites also show third-party advertisements to final consumers, generating revenue for their owner. Therefore, any individual who visits the linking website and clicks on the link freely enjoys the movie, generating revenue for the cyberlocker, the initial uploader, and the linking site (Parloff, 2012; Torrent Freak, 2013). Overall, this whole process has enabled popular cyberlockers to store huge amounts of media products such as movies, episodes of TV series, e-books, and recorded music. Linking websites play a crucial role in the unlawful sharing of copyright protected movies by acting as platforms for uploaders and final consumers.

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<sup>7</sup>The name streaming site relates to the fact that the links provided on the websites allow for the immediate consumption of the movie, without having to download the complete file. We will use the terms linking and streaming interchangeably in the remainder of the text.

## 2.2 The German Market and kino.to

The German market for unlicensed movie and TV content had a substantial size in 2010, with at least one million people using cyberlockers and linking sites to stream or download motion pictures and TV episodes (GfK et al., 2011, p. 17).<sup>8</sup> This accounts for more than 1% of Germany's entire population. Related evidence also suggests that Germans had downloaded 54 million movies and 23 million TV episodes from unlicensed sources in 2010 (GfK et al., 2011).

While competing linking sites were available in the German market, `kino.to` was, as will be detailed below, the dominant platform providing access to unlicensed video streaming in 2011. Following a complaint filed by movie industry representatives, a joint raid involving police, computer specialists and tax officers led to the seizure of `kino.to` on June 8, 2011, effectively removing access to copyright infringing content. For a couple of months after the intervention, visitors of `www.kino.to` were shown a police notice stating that the domain was seized, owners were arrested, and users that had made or distributed unlawful copies of copyrighted material would be facing prosecution. As a result of various court decisions between December 2011 and June 2012, 6 members of the management team were sentenced to prison for up to four and a half years (Spiegel Online, 2012).

It is typically hard to obtain detailed information on the contents of piracy sites, or even observe revenue figures. In the case of `kino.to`, a publicly available verdict of a German district court nevertheless sheds some light on these questions (Amtsgericht Leipzig, 2011). The document, used against a member of `kino.to`'s management team, reveals that `kino.to` users had clicked 1.74 billion times on links to movies and TV episodes between September 1, 2010 and June 8, 2011 alone, an average of some 7 million clicks per day. The district court considered that the website had made available at least 1.3 million links to some 21,000 motion pictures, 7,000 documentaries, and 106,000 TV episodes. `Kino.to` provided an average of about ten alternative links for each movie,

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<sup>8</sup>A total of 4.3 million consumers accessed movies and 5.8 million accessed TV episodes online in 2010. Most commonly (47%), survey participants indicated that legal streaming sites (such as MyVideo) and TV station websites (many German TV stations have large online archives) were the primary source to consume TV episodes. However, only 22% considered those services as the primary source of movie consumption. The majority of consumers (38%) reported filehosters and streaming sites (such as `kino.to`) as their main source of movie consumption, while 18% indicated that they mainly used filehosters and streaming sites for consuming TV episodes. For movies, 17% of the consumers mainly used paid download services, while only 9% mainly used such services for TV episodes.

about two alternative links for each documentary and some eight alternative links for each TV episode. This content was not directly hosted by `kino.to`, but was mostly available from external cyberlockers. Interestingly enough, `kino.to` was vertically integrated into some of these cyberlockers (`freeload.to` and `ebays.to`). The district court considered that at least 12,970 links (less than 1% of the total number of links) were hosted on vertically integrated filehosters. As is typical for linking sites, the owners of `kino.to` assumed an active role in obtaining links to video files, setting incentives for uploaders, and enforcing minimum quality standards. Monthly advertising revenues were estimated at €150,000, which amounts to almost €6 million over the period from March 2008 to June 2011. During the same period, revenues from integrated cyberlockers were some additional €634,000.

### 3 Data

The data used in our study comes from Nielsen NetView, Nielsen’s Internet audience measurement service. This service monitors the online activity of a representative sample of Internet users by recording all of their URL visits together with visit duration, while guaranteeing them that the data will be kept anonymous. The URL information lets us distinguish different kinds of online activities. In particular, it allows us to identify visits to webpages linking to copyright infringing content – such as unlicensed video streaming – as well as domains related to licensed video consumption.

Our final sample consists of an individual-level panel dataset of 5,000 German Internet users and their weekly visits to licensed and unlicensed movie consumption websites throughout 2011. This provides us with a long enough timeframe around the `kino.to` shutdown on June 8<sup>th</sup>. For one extension of our analysis (see Section 4.3), we extend the sample to also include 5,000 users each from France, Italy, and the United Kingdom. While 16.5% of the German users have visited the `kino.to` website at least once in 2011 before the shutdown, we observe effectively zero visits from other countries.

## 4 The Effectiveness of the Shutdown

We assess the effectiveness of the `kino.to` shutdown according to two dimensions. First, we test whether the shutdown was successful in reducing usage of unlicensed movie streaming websites. Second, we ask if the shutdown lead to substitution towards consumption of licensed content. After exposing the limited effectiveness of the intervention along these two dimensions, we turn to a deeper inspections of the mechanism driving these results.

### 4.1 Reduction in the Usage of Unlicensed Streaming Websites

Measuring the consumption of unlicensed streaming video content requires the identification of domains providing access to such content. We manually identified such websites by going through the top-1000 domains classified by Nielsen as entertainment-related websites. We triangulated this approach by going through available lists of piracy websites compiled around the date of the `kino.to` shutdown.<sup>9</sup> This led us to a total of 15 websites offering unlicensed video streaming content, which defines our unlicensed video streaming market. The most popular site in this set of domains is `kino.to`, which was visited around 6,000 times per week between January and June 2011 in our sample. This is more than 8 times the traffic received by the second most visited website in our data, `movie2K.to`, which had less than 750 weekly visits over the same period of time. The 15<sup>th</sup> and last website included in the definition of our movie streaming piracy market, `streams.to`, only received an average of 6 weekly clicks. With a weekly average of 79% market share, `kino.to` was clearly the dominant unlicensed movie streaming platform in the German market at the time of its shutdown.

Figure 2 depicts the evolution of the aggregated weekly number of clicks on the 15 unlicensed video streaming websites defining our market, together with the weekly number of clicks to `kino.to`. This first set of descriptive evidence shows how the `kino.to` shutdown affected usage of unlicensed streaming websites. Two main points should be taken away from the figure. First, the shutdown of `kino.to` had a significant negative effect on overall piracy levels, although this decline is clearly not as strong as the decline in

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<sup>9</sup>See for example <http://tinyurl.com/lvaunh6> and <http://repat.de/2011/06/alternativen-zu-kino-to>.

`kino.to` usage. Second, one can observe that visits to piracy websites quickly increase again following the 5<sup>th</sup> week after the shutdown.

We start by looking at the change in total visits to unlicensed streaming websites to evaluate the extent of the shutdown’s effects on overall piracy levels. Because `kino.to` users are naturally directly affected by the shutdown, we also distinguish between the effects of the intervention on the piracy levels of the users and non-users of `kino.to`.<sup>10</sup> That is, we estimate:

$$\ln(\text{Clicks}_{it} + 1) = \alpha + \beta \text{After}_t + \delta (\text{KinoUser}_i * \text{After}_t) + \mu_i + \varepsilon_{it}, \quad (1)$$

where  $\text{Clicks}_{it}$  is the sum of clicks to all 15 websites defining our video streaming piracy market for individual  $i$  in week  $t$ ,  $\text{After}_t$  is a dummy variable equal to 1 during the weeks after the shutdown,  $\text{KinoUser}_i$  is a dummy variable indicating whether individual  $i$  was a user of `kino.to` before the intervention,  $\mu_i$  is an individual fixed effect which captures any individual-specific unobserved time-invariant factor, and  $\varepsilon_{it}$  is an individual-time specific error term. We estimate equation (1) by OLS and cluster standard errors at the individual level.

Because our individual-level clickstream data tends to be dispersed and we are interested in relative changes, we use the logarithm of the number of clicks.<sup>11</sup> The parameter  $\beta$  can be interpreted as the post-shutdown change in visits to unlicensed movie streaming websites for individuals who did not use `kino.to` prior to its shutdown. The parameter  $\delta$  captures the effect of the shutdown on the group of `kino.to` users.

Table 1 presents the results of estimating several specifications of equation (1). Column (1) omits the variable  $\text{KinoUser}_i * \text{After}_t$  in order to test for changes in piracy levels for all users, comparing average usage before and after the shutdown. The results show that overall piracy levels went down by 1.5% subsequent to the `kino.to` shutdown.<sup>12</sup> Because Figure 2 showed how piracy levels go up some time after the shutdown, the specification

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<sup>10</sup>We define a user of `kino.to` as any individual who visited `kino.to` at least once in 2011 prior to the shutdown.

<sup>11</sup>Often we do not observe a user visiting a piracy website in a given week. To avoid losing those zero observations, we follow the prior literature and take the log over  $\text{Clicks}_{it} + 1$ .

<sup>12</sup>The coefficient values are transformed to percentage values as follows:  $\text{PercentageChange} = (\exp(\text{Coefficient}) - 1) * 100$ .

in column (2) additionally includes a dummy variable  $After_t + 4$  that is equal to one four weeks after the shutdown and until the end of the sample period.<sup>13</sup> The results from this exercise reveal that while the effect of the shutdown was an initial decrease of 4.4%, overall piracy levels went back up by as much as 3.4% afterwards (compared to the first four weeks after the shutdown). Column (3) corresponds to the specification described in equation (1), in which we distinguish between the impact of the shutdown for users and non-users of `kino.to`. Not surprisingly, the results show that the decline in piracy comes from the users of `kino.to`, with overall decreases of more than 23%. Column (4) finally looks at the immediate and subsequent effects of the shutdown, distinguishing between users and non-users of `kino.to`. Results show that usage of unlicensed video streaming websites went up by 14% for `kino.to` users after four weeks after the shutdown, but this upsurge did not fully compensate the initial decrease.

## 4.2 Increase in the Usage of Licensed Content

While shutting down `kino.to` managed to temporarily decrease overall piracy levels, it could only have improved total welfare by increasing the consumption of licensed content. Put differently, the intervention could only have affected copyright holders' revenue if some consumers decided to stop consuming copyright infringing products and consume the licensed version of these products instead.

Our data provide us with good proxies for several licensed video consumption channels. In particular, we can observe visits to websites related to movie theaters, DVD/Blu-Ray purchases, and paid licensed video services. We proxy for movie theater visits by measuring clicks on the main movie portal that includes showing times (`kino.de`) as well as the websites of the major movie theater companies.<sup>14</sup> We proxy for DVD and Blu-

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<sup>13</sup>Note that the  $After_t$  dummy takes value one in all weeks following the shutdown, including the period starting four weeks after the shutdown. The coefficient on  $After_t + 4$  is therefore interpreted as the additional change in visits to unlicensed movie streaming websites relative to the first four weeks after the shutdown.

<sup>14</sup>A representative survey among 8,639 German consumers estimates that 16.21 million people have bought cinema, concerts or theater tickets online in 2011. Around 30.5 million Germans went to a movie theater in 2011. This implies that almost every second cinema goer purchased tickets online. See <http://tinyurl.com/nhur74u> and GfK and German Federal Film Board (2012).

Ray sales by measuring visits to pages in the DVD and Blu-Ray categories on **Amazon**.<sup>15</sup> The German home video market was dominated by DVD and Blu-Ray in 2011, with a market share of more than 96%, leaving less than 4% to digital distribution channels (**GfK and Bundesverband Audiovisuelle Medien, 2013**). We finally track visits to paid licensed video services. While German consumers could not subscribe to flat-rate services that were already popular in other countries (e.g. **Netflix**) and the number of digital pay-per-view services were limited in 2011, we are still able to measure the visits to platforms such as **Maxdome, Lovefilm, Videoload, and iTunes**.<sup>16</sup>

We now test if the shutdown of **kino.to** was successful in increasing consumption of licensed content as measured by these different channels. We follow a difference-in-differences approach to identify the effect of the shutdown on the consumption of licensed alternatives. We compare the group of users directly affected by the intervention – the **kino.to** users – to a control group of individuals that were not using the **kino.to** website before its shutdown.

Estimates in Table 1 showed how piracy levels of **kino.to** users significantly decreased during the four weeks following the shutdown. Because their piracy consumption increases again in the following weeks, we expect to observe a migration of consumption towards licensed alternatives – if any – during this limited time frame. We therefore consider all weeks previous to the shutdown but only the four weeks directly after the shutdown to estimate the following regression:

$$\ln(\text{Clicks}_{it}^k + 1) = \alpha + \delta (\text{KinoUser}_i * \text{After}_t) + \text{KinoUser}_i * t + \mu_i + \nu_t + \varepsilon_{it}, \quad (2)$$

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<sup>15</sup>**Amazon** is by far the dominant online retailer in the German market with a revenue of €4.8 billion in 2012. The second biggest online retailer is **Otto** with €1.7 billion in revenues. See <http://tinyurl.com/pq9vyvf>.

<sup>16</sup>We cannot observe purchases on **iTunes**, because the Nielsen NetView application only captures traffic within the browser and **iTunes** is a standalone software. We are therefore only able to observe the visits to the **iTunes** webpage, which is a proxy of individuals signing up of the service and downloading the **iTunes** application to make purchases later. Market shares for 2011 are not available, but data in the first half of 2014 show that **Maxdome** dominates the market with a share of 35%, followed by **iTunes** with 18%, **Lovefilm** (12%) and **Videoload** (10%). See <http://tinyurl.com/qb3jjsw>.

where  $k$  represents the kind of website visited, with  $k \in \{Movie\ Theater, Licensed\ Video\ Services, DVD/Blu-Ray\}$ . As before,  $KinoUser_i$  indicates a user of `kino.to` before the intervention and  $\mu_i$  are individual fixed effects to control for any individual-specific and time-invariant unobserved factors. We also include a linear group-specific trend  $KinoUser_i * t$  to allow for different trends in the dependent variable across users and non-users of `kino.to`. The week dummies  $\nu_t$  capture any non-linear time effect that is common to all individuals.

Because we expect heterogeneity across individuals in the effects of the shutdown on licensed movie consumption, we also consider consumers' pre-shutdown usage intensity of `kino.to` in our estimations. We therefore classify the `kino.to` users into three equal-sized groups of low, medium, and high `kino.to` usage, and expand equation (2) by splitting the  $KinoUser_i$  dummy into three separate dummies and interacting them with the  $After_t$  variable.<sup>17</sup>

Table 2 presents the results of our estimations. For each category of licensed consumption, the first column presents the results of equation (2) and the second column the results of the heterogeneous effects according to pre-shutdown `kino.to` usage. The results show no increase in visits to websites of movie theaters or to the DVD/Blu-Ray category at Amazon. However, we find a significant increase of 2.5% in the visits to websites offering paid licensed video services. When distinguishing the effects of the shutdown for different types of users according to their intensity of `kino.to` usage, we observe that the increase in visits to paid licensed video services' websites is entirely driven by the heaviest users of `kino.to`. More precisely, we find an increase of 4.7% in the visits for such individuals, while no significant changes appear for lower intensity users.

Our identification strategy assumes that visits to licensed alternatives for users and non-users of `kino.to` would have followed similar trends had the shutdown not happened. The introduction of group-specific trends allowed us to – somewhat restrictively – relax this assumption. But the panel structure of our data allows us to partially test this

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<sup>17</sup>We measure pre-shutdown intensity of `kino.to` usage as the log of the cumulated number of clicks on `kino.to` up until the shutdown. We define high intensity users as individuals whose pre-shutdown intensity usage of `kino.to` fell into the top 33<sup>rd</sup>-highest percentile of usage intensity. Medium intensity users are defined as individuals whose pre-shutdown intensity usage fell between the top 66<sup>th</sup>-highest and the top 33<sup>rd</sup>-highest percentile of usage intensity. Low intensity users are defined as individuals whose pre-shutdown intensity usage fell below the top 66<sup>th</sup>-highest percentile of usage intensity.



assumption by looking at these trends prior to the intervention. In particular, we can estimate the following specification to test whether pre-trends in the visits to licensed alternatives' websites are statistically different for users and non-users of `kino.to`:

$$\ln(\text{Clicks}_{it} + 1) = \alpha + \beta_1^t w_t + \beta_2^t (w_t * \text{KinoUser}_i) + \mu_i + \varepsilon_{it}, \quad (3)$$

where  $w_t$  is a set of week dummies (omitting the week prior to the shutdown). The  $\beta_2^t$  coefficients therefore reflect the difference in the trends in clicks of the dependent variable between users and non-users of `kino.to`. Figure 3 plots the resulting  $\beta_2^t$  coefficients after estimating equation(3) for the websites included in the licensed video services category. We observe that the coefficients appear to be statistically indistinguishable from zero before the intervention, indicating that users and non-users of `kino.to` follow very similar trends in the period preceding the shutdown and giving further support to our identification strategy.

Our results show that shutting down the `kino.to` platform led to rather limited effects on overall levels of unlicensed movie consumption as well as on consumption through licensed alternatives. Limited substitution toward licensed alternatives following the shutdown is, to some extent, not surprising given the characteristics of the German online video market in 2011. For instance, it may be that consumers did not find the licensed alternatives available to be appealing enough at that time.<sup>18</sup> If consumers are not able to find licensed products that match their tastes, or if prices are still above their willingness to pay, they may well stop consuming altogether. Moreover, the availability of alternative sources of unlicensed movie consumption could still enable users to transfer their consumption from one unlicensed platform to another. If consumers face sufficiently low switching costs, these alternative websites may pose a serious threat to the effectiveness of any intervention that only aims at capturing the platform dominating the market.

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<sup>18</sup>We do not have reliable data on the catalogues of licensed services in 2011. However, according to the comparison website [www.werstreamt.es](http://www.werstreamt.es), still in November 2014, the licensed German market offers less content than `kino.to`, with 11,600 movies on iTunes, 8,500 on Maxdome, 5,800 on Videoload, and 1,000 on Netflix compared to 20,000 movies on `kino.to`.

In order to understand better the mechanisms leading to the relatively low effectiveness of the intervention, we now turn to the effects of the shutdown on the usage of alternative platforms of unlicensed movie consumption.

### 4.3 Increase in the Usage of Alternative Unlicensed Content

The existence of alternative unlicensed platforms naturally generates concerns about the effectiveness of `kino.to`'s shutdown in decreasing overall piracy levels and in converting users to consumption through licensed alternatives. Figure 2 indeed revealed that the immediate decrease in overall piracy levels was much lower than the decrease in overall `kino.to` usage. Likewise, our estimation results in Table 1 pointed to an increase in overall piracy shortly after the shutdown of `kino.to`. These facts suggest that consumers face relatively low switching costs in their usage of copyright-infringing streaming websites, leading to an immediate and sustained substitution towards alternative unlicensed platforms.

Figure 4 presents the average weekly visits to the 15 websites that define our unlicensed movie streaming market by the 5,000 participants of our panel, both before and after the shutdown of `kino.to`. A few important points can be observed. First, `kino.to` was, by far, the most visited website prior to its shutdown, with more than 8 times the average amount of clicks received by the second most visited domain, `movie2k.to`. Second, traffic to several competing linking sites changed significantly after `kino.to` was seized. For example, the average traffic to `movie2k.to` more than tripled, and the average traffic to `oload.to` more than quadrupled. Third, we also observe four entrants in the unlicensed movie streaming market following the seizure of `kino.to`, namely `kinoX.to`, `mega-stream.to`, `video2k.tv`, and `streams.to`. The entry of `kinoX.to` should be given special attention, as this platform was considered a direct substitute to `kino.to`, especially because its design was almost identical.<sup>19</sup> However, it remains unclear whether this

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<sup>19</sup>We note that this is not merely a particular case confined to the shutdown of `kino.to` or to the German market. The re-appearance of an almost identical substitute following the shutdown of a particular platform has often been observed in practice. For instance, the popular sports streaming portal `Cricfree.tv` was shut down by the City of London Police's Intellectual Property Crime Unit (PIPCU) on May 24, 2014. The owner of the site quickly put up a new domain – `Cricfree.eu` – only a few hours after the initial intervention (Torrent Freak, 2014a). Concerning music piracy, the PIPCU shut down the unlicensed MP3 search engine `MP3Juices.com` in September 2014. The platform came back online under a new domain name - `MP3Juices.to` - a couple of months after the initial seizure (Torrent Freak, 2014b).

website was operated by the same set of people that were operating `kino.to` or whether an independent entrant chose to free-ride on the well-known brand name (Focus, 2011). Regardless, these figures clearly show that the supply of copyright infringing products on unlicensed streaming platforms is very elastic and able to adapt quickly to market disruptions. Additionally, consumers were also able to quickly respond and adapt their consumption toward the new players in the market. Of all entrants, `kinoX.to` particularly stands out, as it was able to gain considerable traffic, just behind `movie2k.to`.

Figure 5 shows these changes in more detail by presenting the evolution of visits to these alternative unlicensed streaming platforms together with the evolution of overall streaming piracy levels. We distinguish between `kinoX.to` and `movie2k.to`, the second most visited website at the time of the shutdown, and combine the visits to the 12 remaining websites into a single category (“Others”). The figure shows how traffic to these alternative unlicensed streaming websites increased immediately during the week of `kino.to`’s shutdown. In particular, we observe the largest increase in clicks on `movie2k.to` (the dashed red line), up to a level that is even larger than the sum of all other streaming sites (the dotted orange line). Immediately after its entry four weeks after the shutdown, `kinoX.to` captures the same amount of traffic as `movie2k.to` and the sum of all other platforms. In the following weeks, traffic to `kinoX.to` and `movie2k.to` increases slightly, while clicks to the remaining unlicensed streaming sites decrease slightly. This is mirrored in the solid blue line (“Total Piracy”) which aggregates the clicks received by all streaming sites. Total piracy quickly grows to its pre-shutdown level (and sometimes even higher levels), after 8 weeks of less-than-average usage. The trend then remains relatively flat, with some decline toward the end of the observation period.

We now identify the effect of the shutdown on the consumption of products hosted by alternative unlicensed platforms by following a similar strategy as in Section 4.2. We compare the group of users directly affected by the intervention – the `kino.to` users – to a control group of individuals that were not using the `kino.to` website before its shutdown. As before, our identifying assumption is that visits to unlicensed alternatives for users and non-users of `kino.to` would have followed similar trends had the shutdown not happened. To partially test this assumption, we estimate equation (3) with clicks to alternative unlicensed platforms as the dependent variable and compare trends before the

intervention. Figure 6 plots the resulting  $\beta_2^t$  coefficients. These appear to be statistically indistinguishable from zero prior to the intervention, indicating that users and non-users of `kino.to` follow very similar trends in the period preceding the shutdown and giving further support to our identification strategy. The figure clearly shows a jump in the consumption originating from alternative websites for the individuals using `kino.to` prior to its shutdown.

We proceed by estimating equation (2), using visits to alternative unlicensed platforms as the dependent variable and using all 51 weeks available in our sample. To explore individual heterogeneity in the effects of the shutdown, we also consider consumers' pre-shutdown usage intensity of `kino.to` in our estimations. We therefore expand equation (2) by again splitting the  $KinoUser_i$  dummy into three separate dummies and interacting them with the  $After_t$  variable.

Table 3 presents the results of our estimations. Column (1) shows a large and significant effect of the `kino.to` shutdown on the visits to alternative unlicensed websites, with an increase of 37%. Column (2) splits the period following the shutdown in two parts, considering the four weeks following the intervention first. This is the period when `kinoX.to` had not yet appeared on the market. The second period includes all weeks following four weeks after the shutdown. The estimates show that the immediate effect of the shutdown was an increase in visits to the alternative unlicensed platforms of 31%, reflecting very low switching costs for users of unlicensed streaming platforms. These visits increased an extra 11% during the period in which `kinoX.to` is on the market. Column (3) looks at the overall effect of the shutdown for different types of users according to their intensity of `kino.to` usage. The estimates reveal that most of the migration towards alternative unlicensed platforms is made by high-intensity users, with increases of more than 114%. The migration for medium intensity users is lower, with an increase of 15%, while the change for low-intensity users is about 3.5%.

Those estimates again depend on the validity of our control group, and one possible worry is that the non-users of `kino.to` may have been affected by the shutdown one way or another. Because we also have access to clickstream data for individuals coming from non-German-speaking countries, we can check the robustness of our results. In particular, we can use individuals located in other European countries as a control group. We therefore

replace the German non-users of `kino.to` from our sample with 5,000 users each located in France, Italy, and the United Kingdom. We essentially observe zero clicks to `kino.to` for individuals coming from these countries, which makes those users unaffected by the shutdown almost by definition. Table 4 presents the results of this exercise and shows estimates that are similar to the ones in Table 3, giving further support to our initial identification assumption and earlier results.

We finally highlight the impact of the entry of `kinoX.to` by estimating a specification along the lines of equation (2), with clicks to all alternative unlicensed streaming websites except `kinoX.to` as the dependent variable. Results in the first column of Table 5 show that clicks to those websites increase by about 32% over the whole second half of 2011 as a result of the shutdown of `kino.to`. Column (2) shows that this increase is larger during the first four weeks after the shutdown (about 36%), and that consumption is drawn away from these alternatives by around 6.6% when `kinoX.to` enters the market.<sup>20</sup> These results show that not only did supply adapt quickly to the shutdown, but that consumers responded rapidly to entry and faced no difficulty in switching from existing platforms to the services offered by the new entrant.

## 5 The Post-Shutdown Piracy Market

We now turn to the effects of the `kino.to` shutdown on the overall structure of the market for unlicensed video streaming and on users' patterns of consumption. In particular, we highlight their importance for the effectiveness of potential future anti-piracy interventions.

### 5.1 Market Structure

The raid against `kino.to` on June 8, 2011 involved the seizure of servers, databases of the linking site itself, and integrated cyberlocker services. However, the shutdown only resulted in a shock to part of the whole piracy ecosystem. Because content hosted on other

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<sup>20</sup>Note that the entry timing of `kinoX.to` may or may not be considered as exogenous to the development of clicks on alternative unlicensed streaming websites. We therefore do not interpret the estimates as causal here.

cyberlockers remained online, it was relatively easy for existing competitors or even new entrants to supply similar content as the one initially offered by `kino.to`. Shutting down the major platform may therefore simply result in a new website capturing most of the market. However, as illustrated by our results in Table 3, the shutdown of `kino.to` also drastically increased traffic on a variety of alternative unlicensed websites. It is therefore a priori not clear whether a new dominant platform would emerge to take `kino.to`'s place, or if a more fragmented market should be expected as a result of the intervention. Because these alternative scenarios lead to very different policy implications, it is crucial to understand how the intervention affected the overall structure of the unlicensed video streaming market.

We can look at the evolution of unlicensed platforms' weekly market shares to assess how the structure of the streaming piracy market is affected by the shutdown of `kino.to`. Figure 7 presents the evolution of market shares for the different platforms defining our market, distinguishing between `kino.to`, its successor `kinoX.to`, `movie2k.to`, and the 12 remaining websites included in our market definition. The figure shows that the intervention changed the structure of the streaming piracy market massively. Before the shutdown, `kino.to` (dashed blue line) clearly dominated the market with an average market share of about 80%. The second largest player `movie2k.to` had a market share of about 10%, and the remaining 9 websites jointly accounted for an average market share of 10%. During the first four weeks after the intervention, `movie2k.to`'s market share increased to about 55%, and the market share of all other streaming sites increased to about 45%. After four weeks `kinoX.to` entered and immediately gained 20% market share, while `movie2k.to`'s market share decreased to about 30%.<sup>21</sup> Eight weeks after the shutdown, the market shares started to stabilize at about one third each.

The changes in market shares naturally imply changes in market concentration. Figure 8 shows the weekly evolution of the Herfindahl-Hirschman Index (HHI) of the unlicensed video streaming market. This adds some additional insight, since we do not aggregate the "long tail" websites in the HHI measure. Before the shutdown of `kino.to`, the HHI averages at around 6,500. It decreases sharply to 3,000 during the week of the shutdown, but immediately increases to about 4,000 after two weeks. After four weeks, and following

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<sup>21</sup>Note that the decrease in `movie2k.to`'s market share is not due to a decrease in traffic to the platform (see Figure 5), but by an expansion of the overall piracy market driven by the entry of `kinoX.to`.

the entry of `kinoX.to`, the HHI decreases again sharply to about 2,000, where it remains for six weeks before increasing slightly to about 3,000 at the end of the year.

Put together, our data clearly shows that the shutdown massively altered the German market for unlicensed video streaming, making it less concentrated and more competitive. These changes are mirrored in the comments of Christiane Ehlers, spokeswoman of the industry organization *Gesellschaft zur Verfolgung von Urheberrechtsverletzungen* (society for the prosecution of copyright infringement), saying in newspaper interviews that “we were successful in removing the top dog [...]”, but “successors will make an appearance” even if the shutdown has “somewhat shocked” the whole industry, such that “[...] there is apparently a fight for customers.” ([Handelsblatt, 2011](#); [Focus, 2011](#))

We now turn to a description of the effects of the intervention on individuals’ patterns of piracy consumption.

## 5.2 Patterns of Piracy Consumption

The effectiveness of an intervention aiming at shutting down a single platform not only depends on the structure of the market, but also on users’ patterns of consumption. If consumers mainly concentrate their demand on a single platform, then taking down this website affects overall piracy consumption differently than if consumers originally rely on a variety of platforms. In particular, a more diversified consumption may result in a less effective intervention. To evaluate the consequences of `kino.to`’s shutdown on the effectiveness of potential future interventions, we now assess whether consumers changed their patterns of piracy consumption.

Because the vast majority of the overall copyright infringing consumption was taking place through `kino.to`, a natural question to ask is whether, following the shutdown, consumers concentrate their consumption on one of the alternatives available, or whether they decide to diversify their consumption across multiple platforms. Our results in Tables 3 to 5 have shown how consumers face relatively low costs of switching consumption across unlicensed movie streaming platforms. If information on the quality of competing websites is incomplete, and if switching costs are low, we would expect consumers to search and sample alternative websites after the disappearance of their main source of unlicensed

movie consumption. We can look at the average number of distinct unlicensed streaming websites visited per week and user to gain some insight on this point. While users visited about 1.15 distinct platforms per week before the shutdown, they used around 1.4 websites after the disappearance of `kino.to`. The average user therefore visited a larger number of distinct unlicensed platforms as a result of the intervention. In the same vein, we construct a user-specific measure of piracy consumption concentration by looking at the weekly individual HHI of unlicensed streaming consumption. Figure 9 shows the average weekly HHI for the users in our sample. Again, while users concentrated their demand on a few platforms before `kino.to`'s seizure, the concentration index decreased by 7–8% after the intervention.

Our results present two important changes following the shutdown of `kino.to`, with the streaming piracy market becoming much more fragmented and unlicensed movie streaming consumption growing much less concentrated. Both of these results have important implications for the effectiveness of future anti-piracy interventions. In particular, they could make them either more costly - as there would not be a single dominant platform to shutdown anymore - or less effective if only a single website is targeted by the intervention.

## 6 Conclusions

Anti-piracy interventions involve large amounts of public resources, yet very little is known about their effectiveness, benefits, and consequences. This paper evaluates the impact of the shutdown of the largest unlicensed movie streaming site in the German market - `kino.to` - on June 8, 2011. Relying on clickstream data for a set of 5,000 Internet users, we provide detailed evidence on the effects of this intervention on consumer behavior and on the structure of the unlicensed movie streaming market. In particular, we shed light on the potential pitfalls of such copyright enforcement policies in online markets where the elasticity of supply is high and consumers' switching costs are low.

Our results show that the shutdown of `kino.to` led to a significant but short-lived decrease in the usage of unlicensed video streaming websites. The existence of alternative sources of unlicensed consumption consequently resulted in relatively limited substitution into licensed consumption. Additionally, the rapid emergence of new copyright-infringing



platforms led the movie streaming piracy market to quickly recover from the intervention. These results reflect both a high elasticity of supply, and the fact that consumers face little difficulty in switching from one unlicensed platform to another. A more detailed look shows how anti-piracy interventions can importantly affect the structure of the market for unlicensed video streaming . While dominated by a single platform before the intervention, we document a large deconcentration in the market for copyright-infringing content. We also observe that concentration of demand decreases after the shutdown, with users basing their unlicensed movie consumption on a larger set of websites rather than on a single platform.

Our results have important implications for policy and must be interpreted with caution. While users of `kino.to` decreased their levels of piracy consumption by 30% during the four weeks following the intervention, their consumption through licensed movie platforms increased by only 2.5%. Taken at face value, these results indicate that the intervention mainly converted consumer surplus into deadweight loss. If we were to take the costs of the intervention into account (raid, criminal prosecution, etc.), our results would suggest that the shutdown of `kino.to` has not had a positive effect on overall welfare. However, we also note that we cannot observe what kinds of offline-activities consumers turn to after the shutdown of `kino.to`, limiting our possibilities of measuring the full producer gains of the intervention. We also highlight that the effects of anti-piracy interventions are specific to the context in which they are implemented. In particular, it is likely that the effects of such interventions will vary in function of the licensed consumption alternatives available in the market. Because German licensed online consumption channels were scarce in 2011, consumers had only limited opportunities to switch to licensed digital consumption of movies after the shutdown of `kino.to`. Given the importance of licensed alternatives to reduce piracy (Danaher et al., 2010, 2013), the results of these anti-piracy interventions may well be very different in an environment with more and better licensed offers available to consumers. In particular, they may be more effective in converting consumers from unlicensed to licensed consumption.

Finally, our analysis shows that the shutdown of `kino.to` resulted in a much more fragmented structure of the market for unlicensed movie streaming. This potentially makes future law enforcement interventions either more costly - as there would not be a sin-

gle dominant platform to shutdown anymore - or less effective if only a single website is targeted by the intervention.

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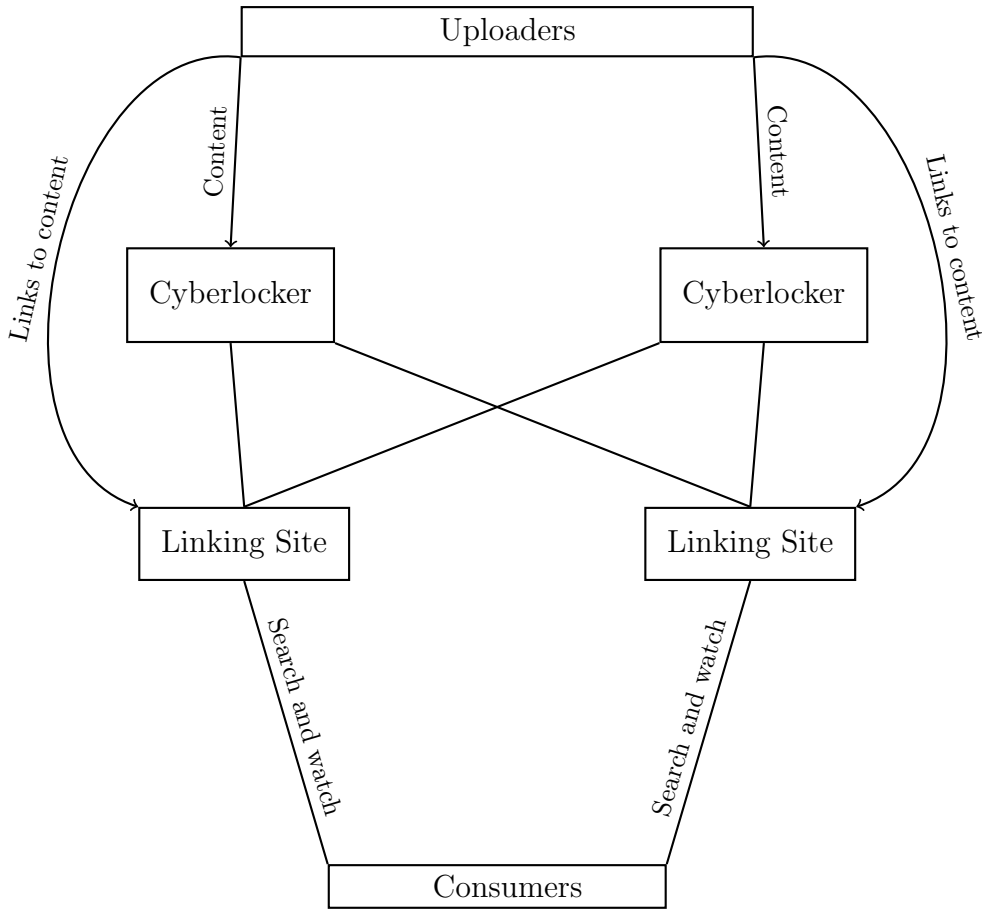
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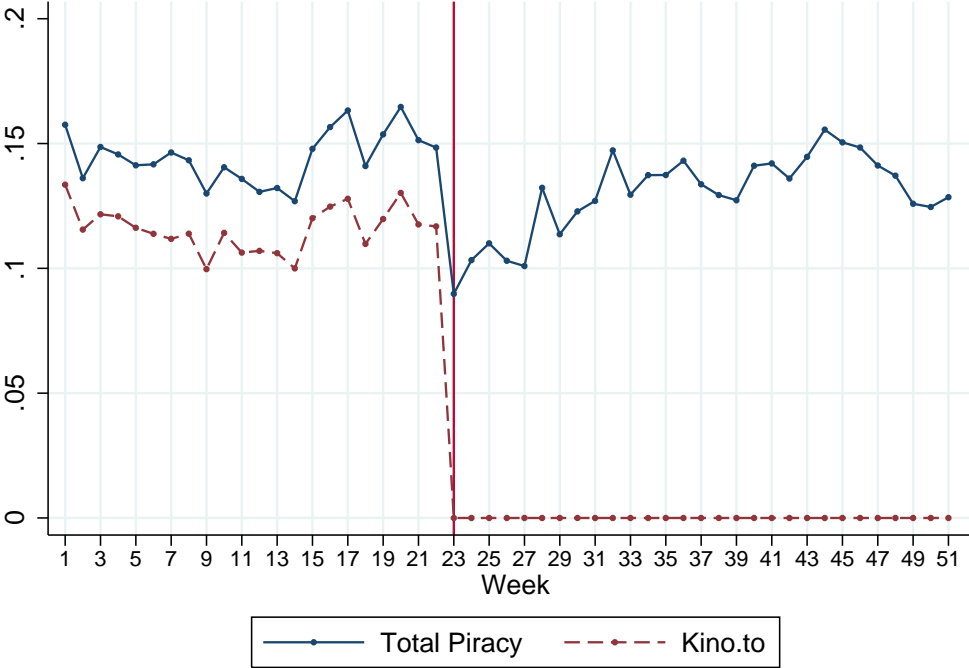
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# A Figures and Tables

**Figure 1:** The Online Piracy Ecosystem

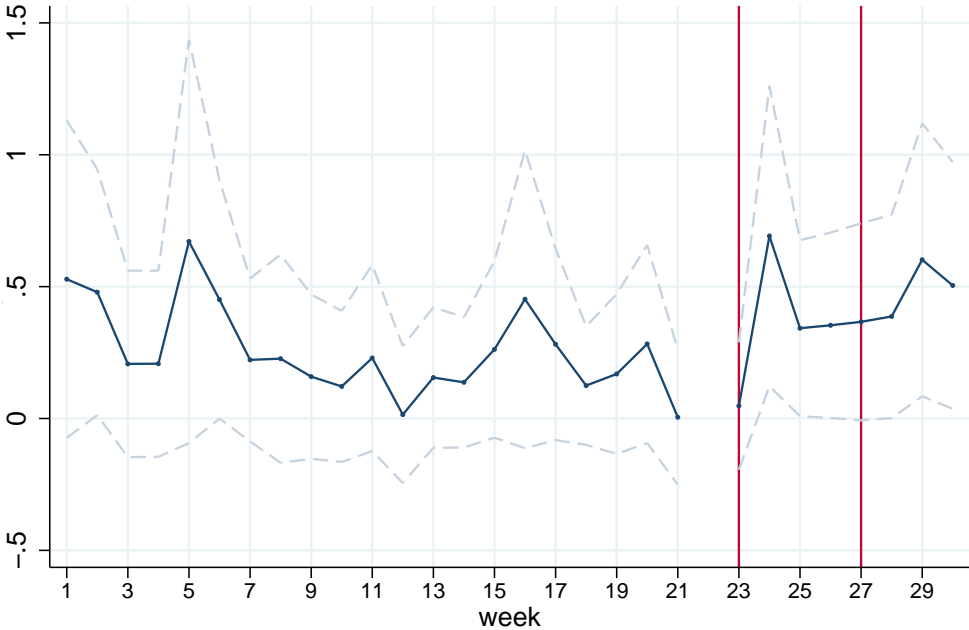


**Figure 2:** Evolution of Online Movie Streaming Piracy



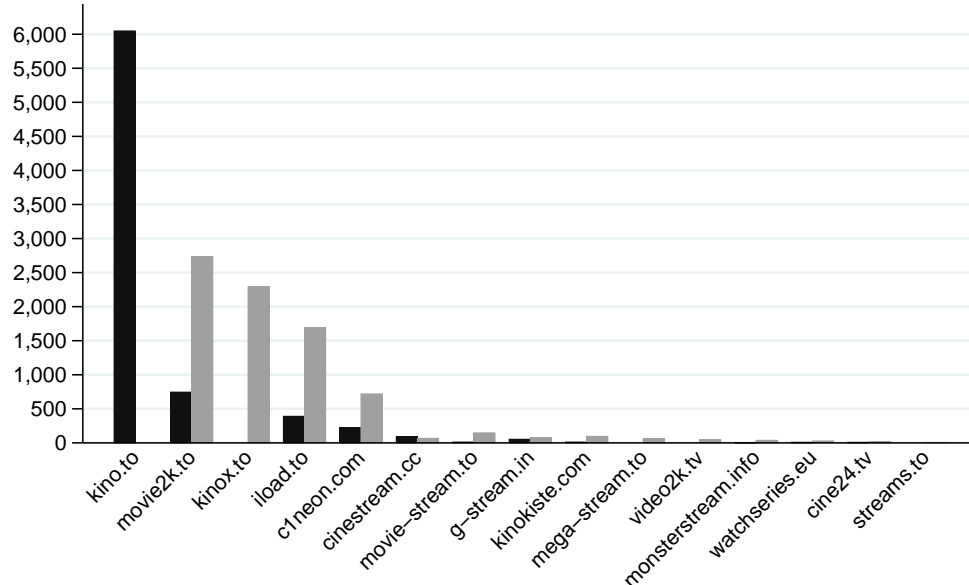
Vertical axis: Average log weekly clicks per user. Horizontal axis: Calendar weeks in 2011.  
**Solid blue:** Average log weekly clicks per user on all unlicensed streaming websites.  
**Dashed red:** Average log weekly clicks per user on kino.to.

**Figure 3:** Trend Difference: Licensed Video Streaming



Vertical axis: OLS coefficients. Horizontal axis: Calendar weeks in 2011.  
**Solid blue:** Week-specific difference coefficient  $\delta * \nu$ . **Dashed blue:** 95% Confidence bands.

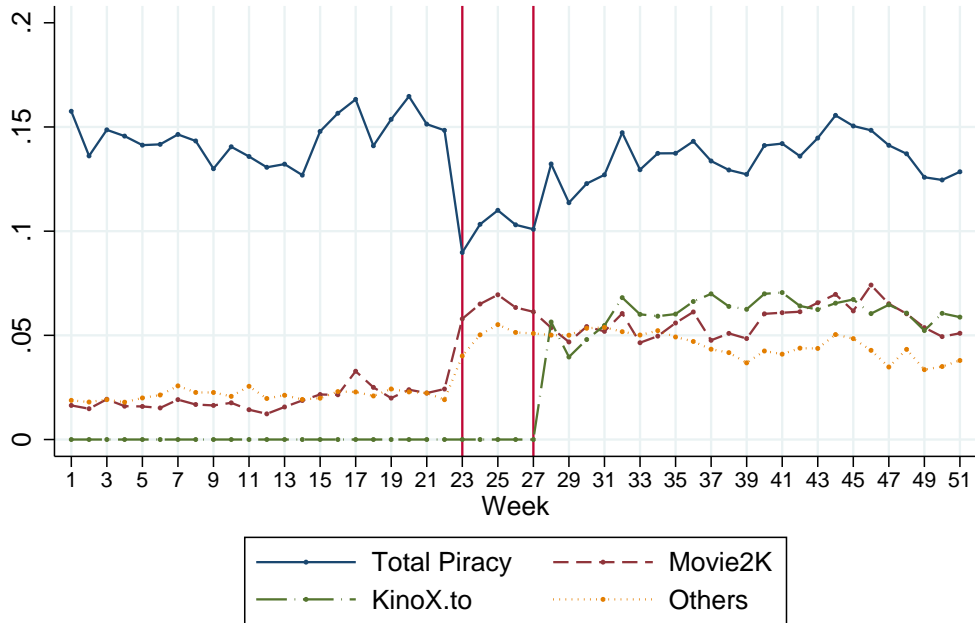
**Figure 4:** Movie Streaming Piracy Websites



Vertical axis: Average weekly clicks.  
**Black bars:** Before June 8, 2011. **Gray bars:** After June 8, 2011.

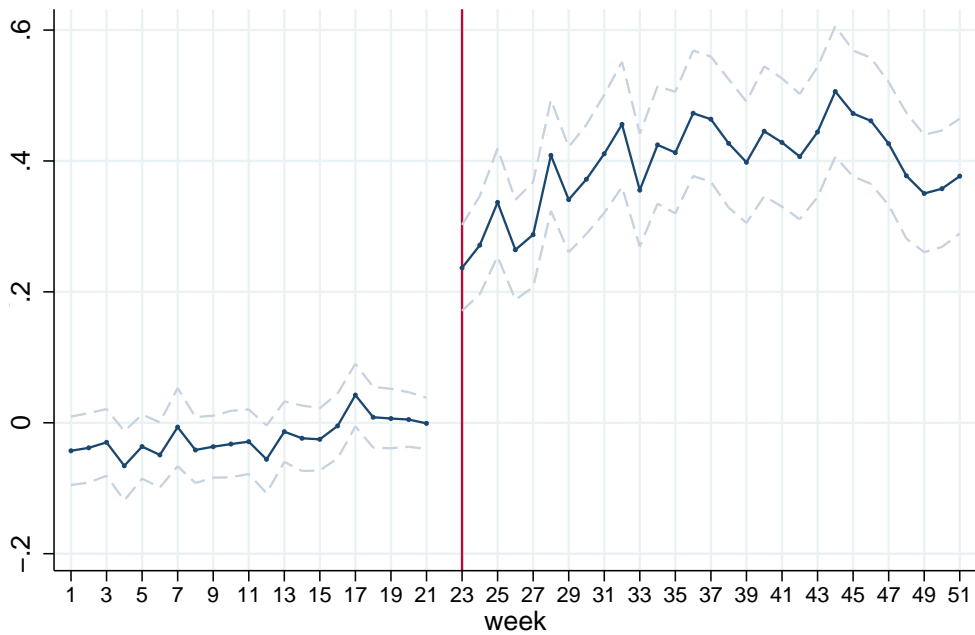


**Figure 5:** Usage of Unlicensed Video Streaming Websites



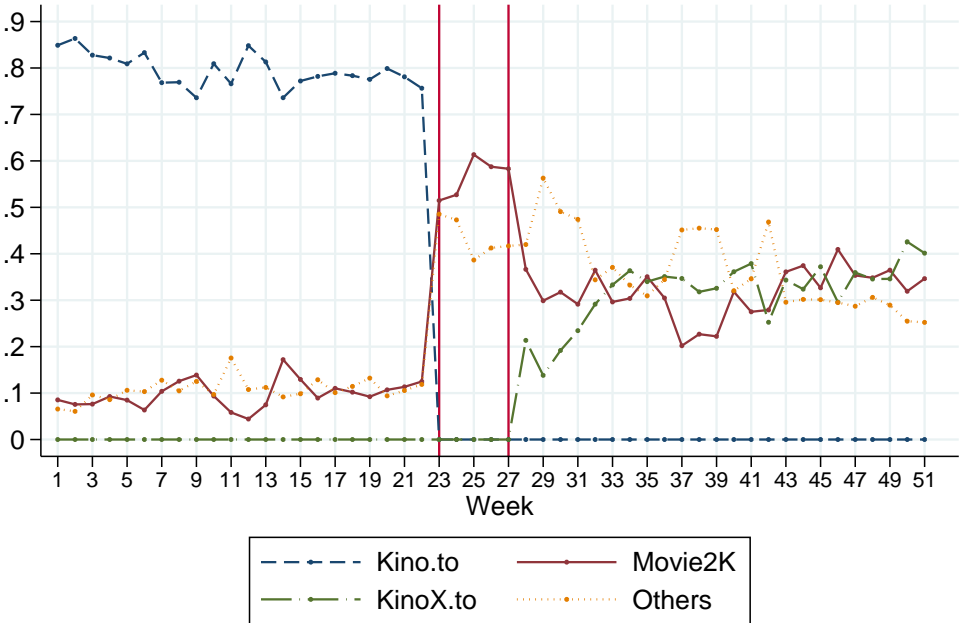
Vertical axis: Average log weekly clicks per user. Horizontal axis: Calendar weeks in 2011.  
**Solid blue:** Average log weekly clicks per user on all unlicensed streaming websites.  
**Dashed red:** Average log weekly clicks per user on movie2k.to.  
**Dashed green:** Average log weekly clicks per user on kinox.to.  
**Dotted orange:** Average log weekly clicks per user on all other unlicensed streaming websites.

**Figure 6:** Trend Difference: Unlicensed Video Streaming



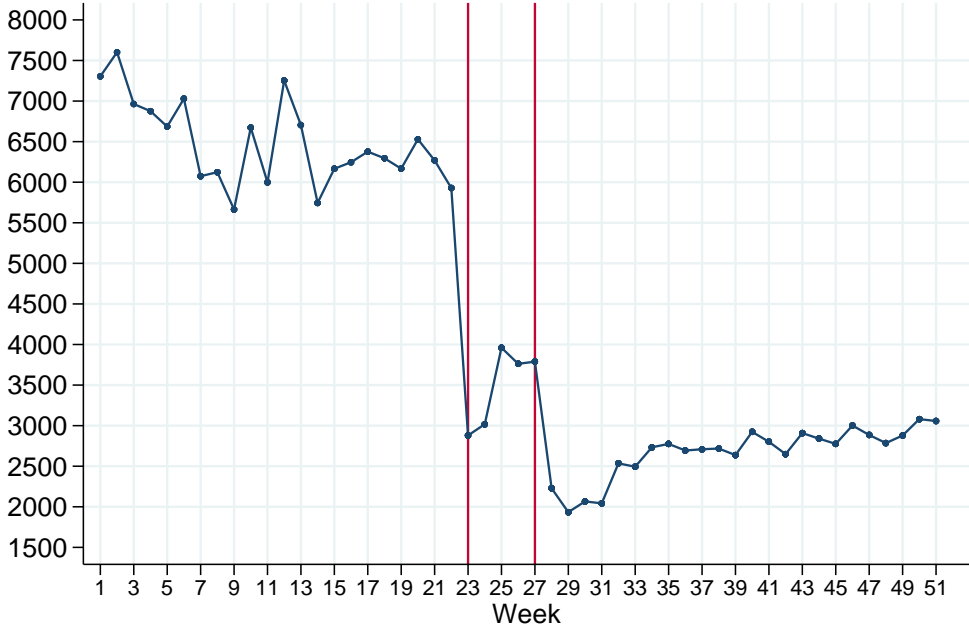
Vertical axis: OLS coefficients. Horizontal axis: Calendar weeks in 2011.  
**Solid blue:** Week-specific difference coefficient  $\delta * \nu$ . **Dashed blue:** 95% Confidence bands.

**Figure 7:** Market Shares of Unlicensed Video Streaming Websites



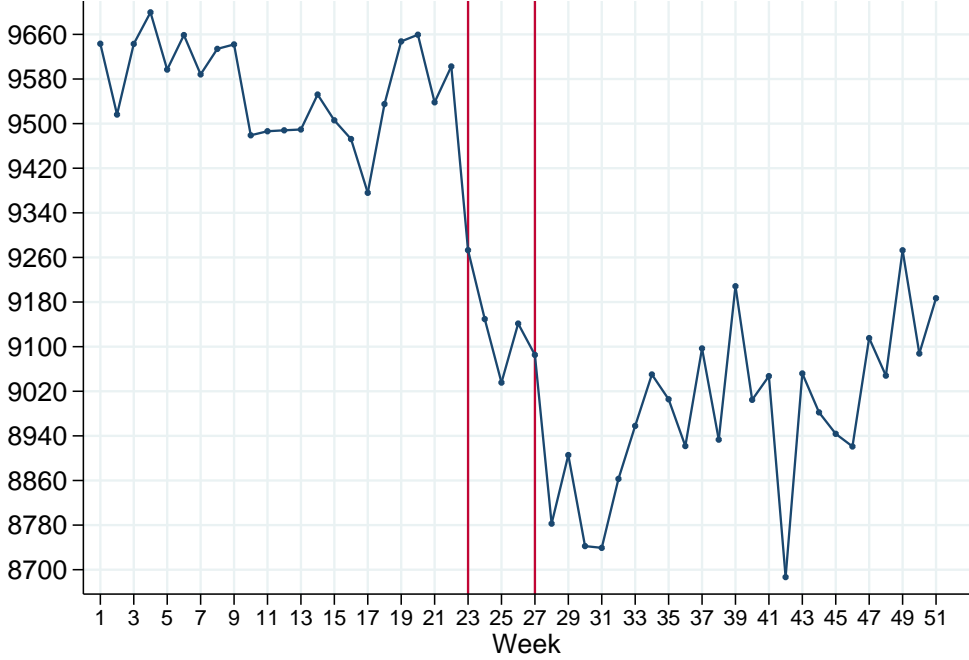
Vertical axis: Weekly market share. Horizontal axis: Calendar weeks in 2011.  
**Dashed blue:** Weekly market share of kino.to.  
**Solid red:** Weekly market share of movie2k.to.  
**Dashed green:** Weekly market share of kinox.to.  
**Dotted orange:** Weekly market share of all other unlicensed streaming websites.

**Figure 8:** Concentration in the Unlicensed Video Streaming Market



*Vertical axis: Weekly HHI. Horizontal axis: Calendar weeks in 2011.*

**Figure 9:** Concentration in the Usage of Unlicensed Video Streaming Sites



*Vertical axis: Average weekly HHI per user. Horizontal axis: Calendar weeks in 2011.*

**Table 1:** Overall Piracy<sup>†</sup>

|                         | (1)                 | (2)                 | (3)                 | (4)                 |
|-------------------------|---------------------|---------------------|---------------------|---------------------|
|                         | Coef./s.e.          | Coef./s.e.          | Coef./s.e.          | Coef./s.e.          |
| After                   | -0.015***<br>(0.00) | -0.043***<br>(0.01) | 0.021***<br>(0.00)  | 0.012***<br>(0.00)  |
| After * Kino User       |                     |                     | -0.213***<br>(0.02) | -0.329***<br>(0.03) |
| After + 4               |                     | 0.033***<br>(0.01)  |                     | 0.010***<br>(0.00)  |
| (After + 4) * Kino User |                     |                     |                     | 0.134***<br>(0.03)  |
| Constant                | 0.145***<br>(0.00)  | 0.145***<br>(0.00)  | 0.145***<br>(0.00)  | 0.145***<br>(0.00)  |
| Adjusted-R <sup>2</sup> | 0.500               | 0.500               | 0.503               | 0.504               |
| No. of Individuals      | 5000                | 5000                | 5000                | 5000                |
| No. of Observations     | 255000              | 255000              | 255000              | 255000              |

<sup>†</sup> Standard errors are in parenthesis and clustered at the individual level. All specifications include individual fixed effects.

\* Significant at the 10% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 1% level.

**Table 2:** Legal Alternatives<sup>†</sup>

|                               | Movie Theater      |                    | Licensed Video     |                    | DVD/Blu-ray        |                    |
|-------------------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|                               | (1)<br>Coef./s.e.  | (2)<br>Coef./s.e.  | (3)<br>Coef./s.e.  | (4)<br>Coef./s.e.  | (5)<br>Coef./s.e.  | (6)<br>Coef./s.e.  |
| After * Kino User             | -0.002<br>(0.01)   |                    | 0.025***<br>(0.01) |                    | 0.011<br>(0.01)    |                    |
| After * Low Kino Intensity    |                    | 0.011<br>(0.02)    |                    | 0.020<br>(0.02)    |                    | -0.003<br>(0.01)   |
| After * Medium Kino Intensity |                    | -0.024<br>(0.02)   |                    | 0.009<br>(0.02)    |                    | 0.022<br>(0.02)    |
| After * High Kino Intensity   |                    | 0.007<br>(0.03)    |                    | 0.046***<br>(0.02) |                    | 0.015<br>(0.02)    |
| Constant                      | 0.085***<br>(0.01) | 0.085***<br>(0.01) | 0.071***<br>(0.01) | 0.071***<br>(0.01) | 0.075***<br>(0.00) | 0.075***<br>(0.00) |
| Adjusted-R <sup>2</sup>       | 0.226              | 0.226              | 0.384              | 0.384              | 0.360              | 0.360              |
| No. of Ind.                   | 5000               | 5000               | 5000               | 5000               | 5000               | 5000               |
| No. of Obs.                   | 135000             | 135000             | 135000             | 135000             | 135000             | 135000             |

<sup>†</sup> Standard errors are in parenthesis and clustered at the individual level. All specifications include individual fixed effects, week fixed effects, and linear kino-user specific trends.

\* Significant at the 10% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 1% level.

**Table 3:** Alternative Piracy<sup>†</sup>

|                               | (1)                | (2)                | (3)                |
|-------------------------------|--------------------|--------------------|--------------------|
|                               | Coef./s.e.         | Coef./s.e.         | Coef./s.e.         |
| After * Kino User             | 0.317***<br>(0.03) | 0.272***<br>(0.03) |                    |
| (After + 4) * Kino User       |                    | 0.105***<br>(0.03) |                    |
| After * Low Kino Intensity    |                    |                    | 0.035*<br>(0.02)   |
| After * Medium Kino Intensity |                    |                    | 0.144***<br>(0.04) |
| After * High Kino Intensity   |                    |                    | 0.764***<br>(0.08) |
| Constant                      | 0.027***<br>(0.00) | 0.034***<br>(0.00) | 0.034***<br>(0.00) |
| Adjusted-R <sup>2</sup>       | 0.408              | 0.409              | 0.435              |
| No. of Ind.                   | 5000               | 5000               | 5000               |
| No. of Obs.                   | 255000             | 255000             | 255000             |

<sup>†</sup> Standard errors are in parenthesis and clustered at the individual level. All specifications include individual fixed effects, week fixed effects, and linear kino-user specific trends.

\* Significant at the 10% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 1% level.

**Table 4:** Alternative Piracy, Cross Country Sample<sup>†</sup>

|                               | (1)                | (2)                | (3)                |
|-------------------------------|--------------------|--------------------|--------------------|
|                               | Coef./s.e.         | Coef./s.e.         | Coef./s.e.         |
| After * Kino User             | 0.286***<br>(0.03) | 0.237***<br>(0.03) |                    |
| (After + 4) * Kino User       |                    | 0.115***<br>(0.03) |                    |
| After * Low Kino Intensity    |                    |                    | 0.041*<br>(0.02)   |
| After * Medium Kino Intensity |                    |                    | 0.138***<br>(0.04) |
| After * High Kino Intensity   |                    |                    | 0.671***<br>(0.07) |
| Constant                      | 0.108***<br>(0.00) | 0.124***<br>(0.00) | 0.124***<br>(0.00) |
| Adjusted-R <sup>2</sup>       | 0.442              | 0.443              | 0.447              |
| No. of Ind.                   | 15841              | 15841              | 15841              |
| No. of Obs.                   | 807891             | 807891             | 807891             |

<sup>†</sup> Standard errors are in parenthesis and clustered at the individual level. All specifications include individual fixed effects, week fixed effects, and linear kino-user specific trends.

\* Significant at the 10% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 1% level.

**Table 5:** Alternative Piracy Excluding KinoX †

|                         | (1)<br>Coef./s.e.  | (2)<br>Coef./s.e.   |
|-------------------------|--------------------|---------------------|
| After * Kino User       | 0.279***<br>(0.03) | 0.306***<br>(0.03)  |
| (After + 4) * Kino User |                    | -0.064***<br>(0.02) |
| Constant                | 0.035***<br>(0.00) | 0.034***<br>(0.00)  |
| Adjusted-R <sup>2</sup> | 0.402              | 0.402               |
| No. of Ind.             | 5000               | 5000                |
| No. of Obs.             | 255000             | 255000              |

† Standard errors are in parenthesis and clustered at the individual level. All specifications include individual fixed effects, week fixed effects, and linear kino-user specific trends.

\* Significant at the 10% level.

\*\* Significant at the 5% level.

\*\*\* Significant at the 1% level.



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