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Exclusive content and platform competition in Latin America

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## Abstract

Platforms often compete over non-price strategies such as the exclusive distribution of products. But these strategies are not always welfare-enhancing. Using rich data on audiovisuals distributed on platforms in Brazil, we find that non-exclusive distribution and availability of titles across platforms is more effective in deterring online piracy than in the singlehoming case. Moreover, in certain markets (TVOD), it induces higher average investment in the production of new titles upstream. We discuss options of copyright and antitrust policies in the light of these findings.

**Keywords:** platform, copyright, exclusivity, movies, piracy, torrent, investment in quality

**JEL Codes:** O31, O34, L86

## 1 Motivation

Business models in creative industries have long operated and built upon exclusivity and control over content, well before the introduction of copyright as a legal instrument established

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such exclusivity more formally [24]. However, content exclusivity can also be established or reinforced via market power and firms' distribution choices in markets. Similar to the effects from granting exclusive rights to new content producers, exclusive distribution can help segment markets, allowing for higher pricing and staggered online attention. In online distribution, when competition among servicing platforms is fierce, the ability to distribute content exclusively can help improve a platform's market position due to vertical differentiation, relaxing the price competition with rival platforms [32].<sup>1</sup> Game of Thrones for HBO, Adam Sandler's Sandy Wexler for Netflix, The Handmaid's Tale for Hulu, or Jack Ryan for Amazon are all distributed on a single platform. On the opposite side, under non-exclusive licensing, i.e. when content 'multihomes' on more than one platform, price competition tends to tighten and service fees charged to consumers are likely lower. However, under this regime upstream incentives of sellers to provision content of higher quality might also be lower ([19], [36]).

At the same time, studies have identified the availability of content online as a determining factor for the levels of unauthorized consumption in music and movies ([13],[35],[12],[11],[1]):<sup>2</sup> When content is exclusively promoted and sellers singlehome rather than multihome their content, markets will become more fragmented for consumers. In turn, some consumers might increasingly search for alternative channels to access content when they face budget restrictions and switching costs.<sup>3</sup> Put simple, "when access to all services with favorite content gets very expensive for a consumer, they might subscribe to one or two services and pirate the rest", writes Sandvine's Cam Cullen in a recent blog post. This is what we test for in this paper and this is also where the possible policy dilemma sits. Conditional on be-

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<sup>1</sup>However, two-sided market models with endogenous homing decision of sellers and consumers point in a slightly different direction. On the demand side, exclusivity also makes some consumers 'multihome' on more than one platform [22], reinstalling some of the lost platform competition via pricing.

<sup>2</sup>While much of the previous research has centered on the impact of piracy on sales and supply of content ([25], [26],[38],[40]), fewer studies have addressed the origins of piracy.

<sup>3</sup>Put simple, changing to another platform is costly to consumers, or they simply can't afford signing up to yet another platform.

ing available on at least one streaming platform, does being available on multiple platforms affect piracy? And, if so can policies such as copyright and antitrust rules accommodate tensions? Ideally, policies will help redirect consumers to legitimate sources and continue to incentivize investment in quality content,<sup>4</sup> while, at the same time, they will want to keep online over-the-top (OTT) content markets competitive and contestable.

The contributions of the paper are the following ones. First, we estimate the piracy search effects from content exclusivity on the level of the individual title. Using google trends and justwatch.com data in a panel with movie fixed effects, we find that making available content online for the first time decreases annual piracy search volume by approximately 6 per cent. Making content available on more platforms decreases piracy levels further, with effects doubling magnitude once content is available on three or more platforms.<sup>5</sup>

Second, we provide causal evidence on the effect of exclusivity on investment in quality content deploying a quasi-natural experiment in Brazil. Using instrumental variable techniques and screenings data from the kinomatics project, we reveal that average movie budgets are likely to increase with more exclusive dealings around titles in SVOD, while they tend to fall in TVOD markets. The latter contradicts the standard notion in the literature that more exclusivity is a precondition for the supply of premium content by sellers. Arguably, this effect is due to the loss of financing opportunities when content is exposed on fewer platforms and when sellers are limited in their ability to ex ante transfer and license rights

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<sup>4</sup>Previous research on macro-levels argues that digital changes in production and consumption, while also inducing online piracy, have led to a growing supply of film [41], in particular a growing middle tail of movies by newcomers and independent studios [6]. In contrast, this research focuses on average investment per title more than effects on overall supply.

<sup>5</sup>The granularity of the data further allows to investigate differences in business models, i.e. we can distinguish subscription-video-on-demand (SVOD) from transactional-video-on-demand (TVOD) services and assess the heterogeneity of effects across individual platforms. TVOD and SVOD services have adopted the business models of the traditional windows they have come to disrupt. So, TVOD exists initially alongside the DVD/Blu-ray window, and SVOD co-occupies the window of traditional pay-TV operators. SVOD is typically based on a subscription fee that grants users access to the title catalogue, while in the TVOD case users pay per title (i.e. rental or purchase).

(so-called 'presales') intended for non-exclusive distribution in TVOD. In contrast, while the greater exclusivity favored by many SVOD platforms increases exposure to piracy, it also encourages investment.

Third, to the best of our knowledge, while there are numerous studies on US and European markets, there is no explicit academic/empirical study with a regional focus on Latin America (Brazil). This region is an interesting case because it can help better understand and reveal possible differences in the digital transitioning of media markets in developing economies. Moreover, the evolution of subscriptions and penetration levels of audiovisual OTT content services in Latin America has been growing at a rapid pace, with many new services entering and exiting competitive markets. Currently, there are approximately 60 million subscriptions in 2018 (from 43 million in 2016), with a penetration of 84 per cent of households with fixed broadband in all Latin America. In addition, SVOD 2018 revenues from subscriptions reached 3.2 billion USD (source: Business Bureau), while TVOD 2019 revenues reached 100 million USD in Latin America (source: PwC). Next to Mexico, Brazil is the largest OTT market in the region and one of the largest in the world.

Fourth, the approach exploits online search data in a novel and innovative way that is easy to replicate, adding another application to the growing body of publications building on google's search data and context ([34],[37],[39]).<sup>6</sup>

The paper structures as follows. Section 2 reviews the extensive literature on platform competition, unauthorized consumption of content online and the emerging literature using search traffic data. Section 3 presents data descriptives and outlines the empirical strategy. Section 4 and 5 give main results and discuss extensions and limitations of the approach.

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<sup>6</sup>Rather than having to rely on torrent uses, we approximate total demand for pirated titles via search volumes. In this way, we also capture the fraction of users that is willing to access content via unauthorized sources, but ultimately might not succeed because specific titles are not (yet) available on torrent sites, for example, when searching for less popular titles. Furthermore, in comparison to surveying users on their illegal activities and at the risk of prosecution, anonymously provided search data seems better suited to reveal true preferences and intentions of users and thus might be less subject to misreporting.

Section 6 concludes with policy implications.

## 2 Review of the literature and research questions

### **Exclusive content and unauthorized consumption**

Niche content is often not popular enough to be readily available legally from online sources. Next to the perception of IP laws, moral beliefs or social factors, sampling of such content is another important determinant of piracy activity because consumers want to learn about its unknown quality [42]. Establishing greater exclusivity via single- rather than multihoming content and thereby limiting availability around more standard and popular content artificially creates a similar situation. Moreover, increases of online piracy due to legally unavailable content are maintained even when the content becomes legally available, suggesting that some consumers do not transition back to legal sources and that some form of 'habit formation' takes place [11].

Previous studies on availability effects differ in terms of their research designs and underlying data sources. First, researchers have used different time windows around exogenous events changing availability as well as different levels of data aggregation. For example, Danaher et al. [13] use weekly torrent data for a panel of 12 countries, with a nine-months window around the megaupload shutdown, as well as monthly piracy data for 30 countries over an one-year window around changes of domestic availability on iTunes stores [35]. Other research on sequels made available on hulu.com uses daily data over a much shorter, two-months window [12], and on the effects from withdrawal and restoration events of NBC content on iTunes uses a one-month window [11], respectively. In a randomized experiment, Matos et al make available SVOD bundles of content to U.S. households who previously used BitTorrent [16]. While they find that internet downloads and uploads are reduced once households are assigned bundles, the likelihood of using BitTorrent does not change. This

seems due to the fact that fixed bundles are not perfectly matching heterogeneous preferences of households. In turn, the research suggests that anti-piracy measures based on increasing the availability of legal content alone might be limited in their ability to eliminate piracy activity in its entirety or prohibitively costly to suppliers. Furthermore, several papers highlight the negative effect on piracy by shortening release windows around content [15]. Danaher and Waldfogel show that longer time lags, facilitating more local pre-release piracy online, effectively lowering cinematic income in late-release countries.

Similar to our research approach and data source, other researchers have also used google search data and search context. In another experimental design using a customized search engine, Sivan et al find that reducing the prominence of infringing links in search results makes some users switch from infringing to paid legal services [34]. This even applies for those whose initial search queries express an explicit preference for infringing content and seems to make search engines useful partners in the effort to reduce piracy's impact. Shen [33] uses aggregate data on searches for Spotify's music streaming services and unauthorized sources for a panel of countries to identify the effect of service launches on piracy rates in music; Hardy [20] uses search data to validate piracy activity on title level after pre-release leaks of TV series which again supports the idea of habit formation around the use of unauthorized sources.

In general, a large number of papers have found that industry revenues decline with higher levels of online piracy in music, movies and other content industries ([25], [26]). The bigger questions are, however, which of the (costly) anti-piracy measures online are effective and how piracy redresses competition, investment and the supply of new content in longer-term [14]; ultimately, this will help assess welfare effects of thought and implemented measures and dynamic effects of piracy. To date, however, the empirical evidence on effects on sup-

ply in music and movie industries is limited ([38], [40]).<sup>78</sup> Moreover, there is quantitative evidence for other industries that piracy entry increases incumbents' investment in quality and in longer term due to the increases in (unauthorized) competition. In turn, this might compensate for some of the welfare decreases and revenue displacement effects from piracy right holders experience in short term ([5], [29]).

Ultimately, seller's and platform's decisions to distribute content exclusively might also turn out to be a question of which sources of competition to face online, i.e. competition from either authorized or unauthorized sources. While exclusivity can help soften (authorized) platform competition via pricing, it might also drive away some consumers and strengthen competition from unauthorized sources. The latter question is what we first test for in this paper when investigating the effects from exclusive distribution on title-level piracy demand.

## **Exclusive content, platform competition and investment**

There are situations where the exclusive provisioning and limited licensing of content online helps increase market power of platforms or content providers (legally speaking, so-called 'refusals to deal or license of dominant right holders or distributors'), and it may add to the levels of exclusivity established by granting IP rights once content is created.<sup>9</sup> In this way, incentives to invest in new content not only depend on the provisioning of rights but also depend on the level of competition in markets. Changing incentives to invest in quality due to exclusive distribution of content are the second main concern of the empirical analysis in this paper.

Typically, in audiovisual online markets, commercial platforms such as Netflix aggregate and

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<sup>7</sup>In a similar vein, recent research on piracy incidences in global trade flows found heterogeneous industry effects on firm-level investment in research and development (R&D), once static revenue displacement was controlled for ([30]).

<sup>8</sup>What complicates the analysis of supply effects is that, next to the effects on piracy distribution, digitization also affects cost structures of legal production and authorized distribution sources.

<sup>9</sup>Many of these situations can be addressed by more than one policy field such as antitrust, digital or related cultural policies and not in copyright frameworks alone [17].



curate content, and they bring together 'two sides', content 'sellers' such as film studios and online consumers, paying or charging them fees for participation and platform access. Activity 'upstream' commonly refers to seller markets and content production, while activity 'downstream' refers to platform sales and distribution services to end consumers. Lately, these roles are becoming harder to separate as, for example, sellers, by hosting other seller's content, can turn into platforms themselves [18].

Vertical foreclosure (over content 'inputs') can occur when a platform chooses to host only certain content owners and exclude other 'upstream' sellers, or charges the latter prohibitive access fees, thereby reducing upstream revenues. Vice versa, sellers can chose to privilege certain platforms over others, either by not licensing their content or by charging higher licensing fees for rival platforms [31]. Finally, further upstream markets, telcos provide the technical infrastructure for servicing that can be operated 'non-neutral', blocking, throttling or making sellers or distributors pay for priority in broadband traffic [9]. Foreclosure seems even more likely to occur when telcos, sellers and platforms are 'vertically integrated' and parties upstream and downstream have mutual commercial interest and control over strategic parameters such as pricing.<sup>10</sup> Here, future market share advantage from exclusive provisioning today can outweigh foregone sellers' licensing revenues in the presence of switching costs [43]. In some of these cases, the resulting exclusivity of content reflects a dominant position in platform or seller markets and might constitute an abuse of market power in certain jurisdictions.

Content exclusivity is not per se harmful as the welfare implications of vertical foreclosure are not straightforward in the presence of vertical integrated firms in the value chain. Under these circumstances, private and socially-optimal incentives will diverge when exclusivity is motivated by the exclusion of other parties [43]. Once again, when vertically integrated firms

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<sup>10</sup>In some countries such as the U.S., 'program access rules' regulate carrying of content on platforms in the presence of vertically integrated firms, rules aiming to promote competition in distribution markets [9].

raise rival platform costs and/or lower upstream revenues for sellers, this potentially also harms consumers. However, consumers might nevertheless benefit from stiffer price competition (lower prices) under exclusive dealings today. Moreover, from a dynamic perspective, when strategic entry to markets is based on offering exclusive content today, consumers could also benefit from tighter competition in longer-term.

On the demand side, the ability of *consumers* to multihome can counteract anti-competitive behavior and can help recover some competition in markets. Multihoming is limited by switching costs for consumers such as the possible loss of personal data when changing provider or the lack of interoperability between platforms. Notably, exclusive provisioning by sellers likely induces more multihoming consumers on platforms and is thus a source of bargaining power against platforms [22]. At the same time, however, more exclusivity will restrict distribution channels, in turn lowering again a seller's bargaining power. So, sellers' choices on (non-)exclusivity aim to balance well this trade-off, i.e. these opposing effects of exclusivity on bargaining power towards platforms.

In principle, 'bundling' of content in online catalogues operates against exclusivity and originates from heterogeneous consumer preferences in markets. In SVOD services such as Netflix, bundles of content are offered at a fixed fee (i.e. subscription), and the viewer's valuation of the whole bundle is often more predictable and less 'idiosyncratic' than valuations of the individual content ([4], [8]). This makes content bundles a less risky strategy for platforms compared to hosting a single asset/title as in TVOD. Bundling has two main effects on demand: First, it increases overall demand, and, second, demand becomes more elastic [21].

However, bundling can also extend market power and help deter entry [27], even though quantitative evidence is scarce [9]. For example, a seller with a larger content catalogue might be in a better position to also include less popular content in the overall 'bundle'

offered to a platform. Another seller with a smaller catalogue and less ability for 'tying' less with more popular/'essential' content, ultimately, might not enter and compete on the platform. When entry is deterred, platform markets may be less fragmented in the first place, i.e. they host a lower number of platforms, but also turn less contestable.

In general, seller preferences for different types of dealings with platforms also depend on the exact collaboration and contracting mechanisms [19]. With per-subscriber (variable) fees on premium content, the upstream rights' seller prefers exclusive contracts with the platform. With a lump sum transfer for all programming, sellers prefer non-exclusive ones. Under the latter, non-exclusive 'reselling' of content always increases consumer surplus and typically increases social welfare, but it is not privately profitable on a fixed fee basis. Under per-subscriber fees, welfare-enhancing 'premium' content is provided by markets and consumers would prefer a ban on non-exclusive contracts, even though this would typically reduce social welfare and deprive some consumers of premium programming access.

In addition, incentives to invest in content might also increase with exclusive dealings as these can ex ante fence returns from hold-up, i.e. cases in which content, ultimately, is not distributed by platforms for strategic reasons and the seller's investment cannot be amortized [36]. According to this theory, more exclusivity in markets may also lead to provisioning of more premium content. However, rather than through content quality, other research [3] suggests that the seller's ability to directly charge users for individual content (i.e. the seller maintaining price control and cash flow rights over content while on the platform) determines exclusivity. For example, if sellers keep control and 'affiliate' content, platform rent extraction increases in exclusivity, while sellers' rent extraction increases with multihoming, and it is this trade-off which ultimately defines levels of exclusivity in markets. If sellers relinquish control and 'outright sale' their content, exclusivity is preferable to sellers and platforms as it maximizes overall industry rents. Yet other research highlights the role

of superstars and their incentives to offer exclusive dealings [7].

Ultimately, contractual complexities in confidential dealings around content sometimes give rise to contradictory predictions in the various theoretical models. Accordingly, the overall effect of exclusive content distribution on investment in quality is an open empirical question which aims to help guide further theory development with robust data and analysis.

### 3 Data and sampling

The data is compiled from a number of sources. First, monthly information on availability of individual movie titles for each platform comes from Justwatch.com. This aggregator compiles extensive catalogue information from 17 different platforms operating in Brazil over the 45-months period from May 2015 to January 2019. This sample of platforms accounts for roughly 55 (45) or more than 76 per cent of the total SVOD (TVOD) market in Brazil based on subscription and user data from different industry studies [23],<sup>11</sup> and contains the largest platforms active before or launching in this period.<sup>12</sup> The rich justwatch sample covers close to 20,000 unique titles in total and also provides information on the type of business model (SVOD, TVOD), cinematic/online release date, as well as quality and pricing of individual content, where applicable. Next, we match and enrich the data with information from 'the movie database' (tmdb). This reference catalogue is comparable to Amazon's imdb service with few data caveats<sup>13</sup> and contains additional details around individual movies (title, language, production, budget, user ratings etc.). In the total justwatch data for Brazil, 41 (23)

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<sup>11</sup>Lower bound estimates based on author calculations and derived from 2018 Business Bureau data as cited in [23]. However, the underlying data cannot be validated. We removed platforms unrelated to movies and focused on kids, anime or sports entertainment from the initial list of SVOD services, namely Cartoon Network Ja!, Esporte Interativo, Playkids.tv, Planet Kids, Crunchyroll, Serie A, TVN Play, and Fanatiz. Estimates can be considered conservative as this list might still contain recently launched services and market entries.

<sup>12</sup>Platforms include Netflix, Netmovies, Clarovideo, Amazon Prime, HBO, Crackle, Fox, iTunes, Looke and Telecine, among several others. On SVOD, Netflix and Netmovies offer the largest catalogue by far, with around 3,000 titles per month on average. On TVOD, similar holds for iTunes and Looke catalogues.

<sup>13</sup>One minor caveat is that tmdb, even though comparable to imdb in terms of its size (total number of titles), is crowdsourced from users and thus more popular titles and those from user origins might be slightly more likely to be included. Another caveat is missing information on country of production and original language.

per cent of all titles are listed in SVOD (TVOD) catalogues only, 36 per cent are listed in both. Titles first released before 2000, from 2000 to 2009, from 2010 to 2014, and from 2015 to 2018 each account for roughly a quarter of all titles. Based on sample descriptives, most SVOD platforms weakly increase their share of exclusive titles in catalogues over time and for various reasons (figure 1 in the annex). One of them is that major studios seem to withdraw some of their titles from larger SVOD platforms, in particular Netflix (figure 10). In turn, this tends to increase fragmentation in these markets. In TVOD markets, notably, trends are reversed and this share is decreasing on most platforms (figure 2). In these markets, more and more content is becoming available on more than one platform.

Second, weekly information on piracy searches for individual titles is compiled from google trends.<sup>14</sup> Similar to previous research [34], we use the keywords 'title + torrent' for Portuguese and English movie titles to extract searches mostly targeting unauthorized sources and anonymously run by search engine users located in Brazil. Keywords such as 'streaming', 'full movie' or 'download' (and their Portuguese equivalents) are excluded because they are ambiguous terms which might also be associated with search for authorized sources. In a similar vein, we exclude movie titles that are sequels at later stages of the analysis because search data will not be able to clearly distinguish trends for each of these (same/similar) titles. For a number of movies, we cannot compile search data from google trends for neither English nor Portuguese titles of the movie because the source does not return data below a certain (unknown) minimum threshold of searches. We discuss implications from sampling below. Tables 3 and 4 in the annex give summary statistics for the two samples, SVOD and TVOD, by their availability on one or more platforms. At first sight, the average number of piracy searches declines with availability on more TVOD platforms, while in the SVOD case it tends to increase. More popular (vote count), more recent (release year), higher-revenue and higher-budget titles seem to be slightly more prominently featured when available on

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<sup>14</sup>We used the gtrends R package.

more platforms.

Third, we complement data from muso.com and the kinomatics project. The former is a private data provider tracking streaming and torrent site activity around various media on a global scale. They also provide information on the way these sites are accessed and which technologies are mostly used to access media content which can help validate the search data. As muso data on film for January 2017 to 2019 suggest that an increasing and large share of Brazilian consumers uses search engines to access unauthorized sources (figure 3 in the annex), and for those using search engines a majority of Brazilian users deploys torrenting technology (figure 4). Put differently, this means that neither technological shifts (for example, towards more streaming of unauthorized content) nor behavioral changes in accessing content (for example, rather than searching sites more consumers might directly access torrenting sites) negatively affect the general validity of our search indicators over time.<sup>15</sup> This is partly due to the fact that the way users will access unauthorized sources also depends on the quality of the underlying/technical infrastructure, for example, broadband speed requirements for streaming content. Kinomatics provides comprehensive data on the cinematic distribution of movies in Brazil and the global distribution of Brazilian and Portuguese production and language film. It serves as an 'offline' benchmark for the availability of content online we observe in the justwatch data.

In terms of the sampling, for various reasons, not all content becomes available online. When compared to the tmdb reference catalogue of globally produced movies, distribution of online film on platforms active in Brazil, on average, tends to be more dominated by English language film produced in the U.S. and the U.K. For example, where information

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<sup>15</sup>In other countries this might not be true, i.e. the search indicator might lose some validity because it would less well capture pirating demand via searches over time. For example, when comparing to users located in Argentina, figure 5 in the annex suggests that the fraction of accesses via search engines declines over the same period. Moreover, access using streaming technology in Brazil, as presented in figure 6, is also fairly stable over time and stays well below the fraction of visits using torrents.

on production origin is available, these films account for 37 (55) per cent in online SVOD (TVOD) catalogues, while it accounts for only about 20 per cent in tmdb.<sup>16</sup> When compared to titles screened in Brazilian cinemas between 2012-15,<sup>17</sup> and when excluding U.S. produced and other English language content from the sample, we find, for example, 29 per cent of movies in our online data to originate from Brazil (i.e. the first listed country of production), while for domestic content screened in Brazilian cinemas this rate stands only at 14 per cent. Minor data caveats apply to these sources.<sup>18</sup>

Moreover, we are unable to compile search data for all content available online (justwatch data) and also willingly restrict to titles becoming available for the first time during the observation period (research design criterion). Again, data from google trends is missing for specific titles when search volumes are too low. Accordingly, the sample favors titles with bigger budget, higher revenue, receive more user voting (as a proxy of popularity) and, again, U.S or U.K. produced film. Furthermore, where search data is available, titles in SVOD catalogues are more diverse than those in TVOD in terms of the country of production.

## 4 Empirical strategy

### FE model

The research design exploits exogenous timing and variation in first-time availability of content over time and across platforms active in Brazil. The treatment is initially set up as a binary variable, i.e. 1 if content is available on a single or more platforms at month  $t$ , 0 otherwise. As a second step, we segregate effects and distinguish multiple types of treatments,

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<sup>16</sup>However, for roughly half of all titles recorded in tmdb no information on production country is available.

<sup>17</sup>The kinomatics data is only available for the period right before data on online distribution becomes available.

<sup>18</sup>In the tmdb reference catalogue, some data for country of production and original language of content is missing. Moreover, this catalogue is based on crowdsourced data and thus might be slightly biased towards coverage of more popular titles.

namely, exclusive content hosted on a single platform versus non-exclusive content hosted across a specific number of platforms. However, arguably, first-time availability of content might not be fully exogenous. As some titles are more likely to become available online in the first place, treatment selection could bias estimates. For example, content providers and platforms might favor adding more popular titles to online catalogues (relative to content not or later released), i.e. titles that also tend to have a higher piracy demand. Descriptive evidence in figure 9 seems to support this view. Accordingly, there might be a time-specific component right at the time movies are released on a platform. Such positive correlation could lead to a positive bias in estimates. Still, it should operate in our favor since it makes it harder to identify a negative coefficient, and, put differently, the true causal estimates might be even larger - in absolute values – than the (lower-bound) estimates we obtain from models.

The empirical strategy deploys an individual fixed effect (FE) model on the panel data to carve out average availability effects on the demand for online piracy (search) once content becomes available on one or more platforms. We therefore monitor weekly searches around specific titles in a panel from one year before to one year after content first becomes available online. This strategy comes at the cost of titles first released online and not in cinemas ('online exclusives'), and titles released online within the first year after their cinematic release. Movie FE are intended to rule out any idiosyncrasies on the level of the individual title, i.e. time-invariant characteristics of titles. For example, a specific movie might be of higher baseline popularity compared to other titles which increases search volumes for this title throughout the observation period. To set up the standard FE model more formally, let  $y_{it}$  equal the (log) piracy searches for title  $i$  at time  $t$  and let  $D_{it}$  denote its general online availability

$$Y_{it} = \alpha_i + \lambda_t + \rho D_{it} + X_{it}\delta + \epsilon_{it}$$



where

$$\alpha_i \equiv \alpha + A'_i \gamma$$

and  $\rho$  is the causal effect of interest, with other observed covariates  $X_{it}$  and the unobserved  $A_i$ . With repeated observations on titles, the causal effect of availability on searches can be estimated by treating  $\alpha_i$ , the fixed effect, as a parameter to be estimated. The month effect  $\lambda_t$  is also treated as a parameter to be estimated.

As a second step, we segregate general availability effects, now also accounting for the total number of platforms  $n$  a title becomes available on at time  $t$ . Accordingly, the following interaction terms are inserted: Availability under exclusive dealings ( $n = 1$ ) is defined as 1 if singlehoming content becomes available at time  $t$ , 0 if content is not yet available. Availability under non-exclusive dealings ( $n > 1$ ) is a count variable for a specific number of platforms a multihoming title is becoming available, 0 otherwise. Furthermore, we distinguish and compare scale and direction of effects for different business model via a separate analysis of market segments, with platforms either operating a TVOD or SVOD model. Still, as appearance on SVOD and TVOD both affect piracy searches, we make sure that movies not yet available on one service but not yet available on another are equally accounted for in models and the way we match samples.

Moreover, we add controls to models for the 'vintage' of titles in catalogues (age dummies) accounting for content depreciation over time, i.e. the time elapsed between (first) release date as recorded in tmdb reference catalogue and first online release in Brazil as recorded in the justwatch data.<sup>19</sup> And, we experiment with various other covariates in order to account for seasonality effects, complementarities between SVOD and TVOD market segments, and time trends in overall online releases in the data. Moreover, we inspect whether baseline results are sensitive to the definition of time windows around content availability dates. We

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<sup>19</sup>Again, as with sequels, titles released online within the first year after their first (cinematic) release are excluded from samples in order to reduce potential noise from previous releases in the search data.

therefore rerun models with shrinking time windows (for example, four weeks before and after content becomes available online) compared to the initial, two-year window, in order to rule out confounding temporal trends in the data.

Given the bottom-censored nature of the search data (outcome), we also account for 'untrue' zeros in alternative tobit panel models. Some searches will be reported as zeros even though they are not, i.e. when volume is below a certain search activity threshold. Serial correlation and unobserved common factors are yet other potential confounders in an analysis using online search data. We thus also follow the procedure outlined in [39] using Mean Group (MG) estimators developed for large N, large T panel data [28]. Serial correlation is modeled via lags of the dependent variable while the effects of common factors are captured via lagged cross-section averages of all variables.

## **IV model**

In instances other than piracy, when it comes to financing film development and production, it seems probable that distribution choices are endogenous to models: Timing and coordination of decisions as well as the type of contracting matter. When the bulk of financing of a new title is based on the ex ante transfer and licensing of distribution rights, when content providers share sales risks downstream/on platforms via contracts, or when firms are vertically integrated in the first place, investment, production and distribution choices are coordinated ex ante and economic interests might end up aligned along the value chain. For example, so-called 'pre-sales' of foreign territory distribution rights to platform or a television network can be a collateral for a production loan from a bank. Notably, SVOD and TVOD business models and the way contracting commonly works there might differ in some of these aspects. For example, revenue and risk-sharing contracts seem more common in TVOD than SVOD dealings between sellers and platforms. From an empirical perspective, this likely introduces simultaneity bias and reverse causality issues when it comes to the

effects of exclusive distribution on initial investment levels.

We tackle the issue via an instrumental variable (IV) approach. In order to recover the causal effect for specific parts of the overall population of titles we use two different types of instruments.

First, in a quasi-natural experiment, we exploit a policy change in Brazilian regulation of audiovisuals online. Even though the Condecine tax regimes initially targeted platforms and their revenues, its introduction in 2011 effectively led to a restriction of multihoming of content and the exploitation of titles on multiple platforms [2], i.e. lowering 'intensive margins' around title uses. Under the Condecine regime each foreign and domestic service is charged a lump-sum for making an individual title available.<sup>20</sup> Because taxes makes provisioning of additional feature film titles in catalogues more costly for online services, both SVOD and TVOD platforms, potentially with adverse effects on the variety and size of catalogues [2]. In particular, the policy affects lower selling and less popular titles where the tax accounts for a larger fraction of potential revenues, lowering the likelihood of inclusion to catalogues. In turn, arguably, the regime also limits the producer/seller's ability to raise funds and finance new projects based on loans and rights pre-sales to more than one platform, or co-productions of platforms and predetermined co-distribution among them. In particular, this applies to movie production and cinema releases after the policy changed in 2011. Movies financed, produced and released before that cut-off date should not have been affected by these changes. Accordingly, investment volume for the latter titles should have benefited from unrestricted (multiple) homing and distribution opportunities.

Second, we instrument exclusive distribution via the total number of screenings a title

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<sup>20</sup>The tax regime is not limited to online services ("other services") but also covers other types of services such as Pay TV. Each service and content type is charged separately (even for a title already available elsewhere) and at a different fee under the regime. For example, film and video-phonographic productions with runtime longer than 50 minutes are charged BRL 3,000 (or approx. 600 US Dollars). Furthermore, the tax regime offers reduced fees for domestic productions and minority co-productions. In general, the tax is redistributed to support domestic production and distribution.

receives in Brazilian cinemas in the pre-period (2012-2015). Arguably, this logged count number is an important determinant when it comes to studios' and platforms' single- or multihoming decisions, in particular for new, incoming titles not yet tested with online audiences. When a title is an success in cinemas and gains some popularity, it might also be indicative for the value it has for online audiences. As budgets are determined well before the movie is screened in cinemas, the instrument will affect budget 'exclusively' through its effect on availability.

## 5 Results

### Effects on piracy search

For SVOD services, piracy searches drop once titles first become available across SVOD platforms as reported in table 1. Depending on the specific model (FE panels 3 & 4 or tobit panels 5 & 6), search declines by an annual two per cent or by more than six per cent, respectively. The tobit specification allows to correct for measurement bias due to the threshold in the underlying google trends data and significantly increases size of the effects. These figures are comparable to other estimates in the online piracy literature [14]. OLS models 1 & 2 allow to benchmark these estimates when unobserved correlation and movie FE is not controlled for. They seem to confirm the intuition discussed in the previous section that the true causal estimate might be even larger in absolute value. When we distinguish availability effects further into single- or multihoming first releases online,<sup>21</sup> we find that titles becoming available on more than one platform in Brazil can reduce piracy searches even further. The relative decline in searches when hosted on 3 or more platforms is roughly twice the magnitude compared to the exclusive content effect (i.e. content is available on 1 platform). All models include age FE aiming to control for content value depreciation

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<sup>21</sup>Again, platform availability is defined as  $n$  if content becomes available on  $n$  platforms and 0 if content is not yet available at panel time  $t$ .

Table 1: Effects on annual piracy search volume (DV), SVOD sample

|                            | 1: OLS                | 2: OLS                 | 3: FE                 | 4: FE                 | 5: Tobit               | 6: Tobit               |
|----------------------------|-----------------------|------------------------|-----------------------|-----------------------|------------------------|------------------------|
| availability dummy         | -3.6004***<br>(-9.06) |                        | -2.0944***<br>(-5.33) |                       | -6.1817***<br>(-12.34) |                        |
| availability x 1 platform  |                       | -3.9816***<br>(-8.35)  |                       | -2.1414***<br>(-3.94) |                        | -6.4093***<br>(-10.63) |
| availability x 2 platforms |                       | -5.4759***<br>(-5.41)  |                       | -3.7650***<br>(-3.62) |                        | -9.6034***<br>(-8.39)  |
| availability x 3 platforms |                       | -5.9990***<br>(-3.83)  |                       | -4.4990*<br>(-2.56)   |                        | -10.882***<br>(-4.04)  |
| availability x 4 platforms |                       | -6.6554***<br>(-11.50) |                       | -4.9448***<br>(-7.93) |                        | -13.515<br>(-1.55)     |
| tvod provider count        | 0.2079<br>(1.22)      | 0.1821<br>(0.98)       | 0.3653<br>(1.94)      | 0.3720<br>(1.77)      | 0.7393**<br>(2.80)     | 0.6286*<br>(2.22)      |
| constant                   | 37.938***<br>(101.24) | 38.345***<br>(82.28)   | -8.5044<br>(-0.38)    | -13.953<br>(-0.87)    | 39.988<br>(1.28)       | 40.326<br>(1.30)       |
| sigma_u                    |                       |                        |                       |                       | 30.081***<br>(33.84)   | 30.020***<br>(33.47)   |
| sigma_e                    |                       |                        |                       |                       | 37.746***<br>(203.30)  | 37.640***<br>(194.94)  |
| age FE                     | yes                   | yes                    | yes                   | yes                   | yes                    | yes                    |
| title FE                   |                       |                        | yes                   | yes                   |                        |                        |
| observations               | 57183                 | 51924                  | 57183                 | 51924                 | 57183                  | 51924                  |
| <i>AIC</i>                 |                       |                        | 509479.2              | 463125.6              | 296762.4               | 271901.2               |
| <i>BIC</i>                 |                       |                        | 509712.0              | 463382.5              | 297228.0               | 272388.4               |
| N_g                        |                       |                        | 748                   | 748                   | 748                    | 748                    |
| ll                         |                       |                        | -254713.6             | -231533.8             | -148329.2              | -135895.6              |

*t* statistics in parentheses

Age dummy coefficients not reported. FE models include clustered s.e.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

over time and another count variable on cross-platform availability on alternative TVOD services. Moreover, FE models include clustered standard errors. Results on simultaneous TOVD availability (provider count) suggest that there are complementarities in the availability and consumption between SVOD and TVOD services, as piracy searches are weakly increasing in TVOD availability of the same title. At first sight, this seems to contradict the notion that content running through multiple channels experiences lower rates of piracy. However, this effect/more searches might again capture the, arguably, higher average popularity of titles available on both types of services at their point of entry and thus this might also result from the endogeneity bias discussed before.

Further analysis reveals that effects on search are heterogeneous and also depend on the specific SVOD platform hosting titles. As table 5 in the Annex shows content becoming available on Hbogo or Looke leads to a stronger drop in searches of up to nine per cent, while for content available on Amazon prime, Telecineplay or Netmovies effects are lower or estimates even render insignificant.

Robustness checks and accompanying tests show that the search data is indeed subject to serial correlation and unobserved common factors.<sup>22</sup> For subsamples of the SVOD data, we rerun baseline models as documented in table 6 in the annex. Because mean-group estimators require balanced panels, we simplify models but still include lags for the search variable. Results suggest that, if anything, biases tend to lead to an underestimation of annual availability effects. Moreover, shrinking time windows do not systematically change these results (results not shown, upon request from the authors). Moreover, as data descriptives suggested (figure 9), once we shorten the window down to a two-month period of weekly searches around the online release of a title, the direction of effects is altered (table 7). Becoming available initially increases piracy search under these conditions. Again, positive effects are likely due to the endogeneity issue raised above, i.e. more popular titles with

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<sup>22</sup>Test results can be shared by the authors upon request. Implementation of test is based on the procedures outlined in [39].

higher piracy demand at the point of entry are more likely to be added to online catalogues. Longer-term (annual) estimates from previous models also capture these short-term effects.

For TVOD services, the sample yields similar, but slightly less pronounced estimates for FE and tobit panel models in table 8 in the annex. Again, the decline of annual searches ranges between around three and six per cent, depending on the model, and title availability on multiple platforms decreases piracy searches further, at least for tobit models. Furthermore, all models include additional controls relevant in TVOD services. They also include whether titles are available for rent, and whether titles are also available in (higher) HD quality. Interestingly, the latter control has a positive effect on piracy searches which seems to confirm anecdotal evidence that torrenting activity also responds to upgrades of quality becoming available on legal services (for example, title releases on blue-ray). Again, models accounting for the heterogeneity of availability effects on specific platforms (and content these typically host) suggest that much of the effect for TVOD originates from content first becoming available on the Claro video service.

## **Effects on investment in quality**

Arguably, exclusivity generates additional investment in quality and premium content in audiovisual markets. In turn, such an effect might compensate for some of the revenue and plausible welfare losses due to the greater exposure to piracy identified in the previous section. Table 2 presents results for effects on budget and the ex ante financing of movies when titles are single- or multihoming further downstream.

Different to the previous section, the baseline model here is a simple OLS cross-section with logged movie budget as the dependent variable. A treatment variable measures the time period content is singlehoming relative to the total window since its first release online (exclusive window). Furthermore, the total number of periods content has been available

Table 2: Effects on investment in quality, instrumental variable (IV) approach

|   | SVOD                  |                       |                        | TVOD                 |                       |                       |
|---|-----------------------|-----------------------|------------------------|----------------------|-----------------------|-----------------------|
|   | 7: 2SLS               | 8: 2SLS               | 9: OLS                 | 10: 2SLS             | 11: 2SLS              | 12: OLS               |
| exclusive window,<br>share (1 platform) | 3.0371<br>(1.89)      | -7.5354*<br>(-2.51)   | 0.8873***<br>(3.85)    | -3.1635**<br>(-3.21) | 1.3335<br>(1.48)      | -1.3616***<br>(-8.39) |
| total online window,<br>no. periods     | 0.03174**<br>(2.91)   | -0.03862<br>(-1.91)   | 0.01743***<br>(7.14)   | 0.005246<br>(1.38)   | 0.01776***<br>(4.69)  | 0.01026***<br>(4.06)  |
| release year                            | 0.02879***<br>(6.58)  | 0.05179***<br>(6.83)  | 0.03347***<br>(13.04)  | 0.01972**<br>(3.17)  | 0.04365***<br>(7.29)  | 0.02931***<br>(8.97)  |
| constant                                | -45.489***<br>(-6.23) | -79.123***<br>(-6.47) | -52.328***<br>(-10.34) | -22.176<br>(-1.72)   | -72.597***<br>(-5.85) | -42.380***<br>(-6.45) |
| Observations                            | 1010                  | 1010                  | 1010                   | 907                  | 907                   | 907                   |
| Adjusted $R^2$                          | 0.188                 | .                     | 0.252                  | 0.112                | .                     | 0.219                 |
| $AIC$                                   | .                     | .                     | 3824.7                 | .                    | .                     | 3546.8                |
| $BIC$                                   | .                     | .                     | 3849.3                 | .                    | .                     | 3570.9                |

$t$  statistics in parentheses

Movie sequel dummy coefficients not reported.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



online (total online window) is included as a control to all models. In a sense, both variables aim to recover some of the information lost when moving from the panel structure to the cross-section.<sup>23</sup>

As noted above, budget estimates are likely subject to reverse causality and simultaneity bias. For example, higher budget film might self-select into multihoming distribution, and multihoming channels might privilege titles with higher initial budget. We therefore first instrument the exclusive window share with the Condecine tax regime change which imposed cost restrictions on the non-exclusive distribution as of 2011 (2SLS estimates in models 8 & 11 in table 2). Next, we also instrument the treatment via title-level screenings in Brazilian cinema (2SLS estimates in models 7 & 10). Table 9 in the annex shows estimates for first-stage regressions. Models A17 & A18 there suggest for the SVOD sample that both instruments are positively linked to longer exclusive distribution of titles over time. In the screenings case (A17), more successful titles in cinemas are more likely to first enter online distribution on an exclusive deal before they enter other (more) platforms. In the Condecine case (A18), the new tax regime increases the relative costs for multihoming titles, in particular for niche content in catalogues, effectively making exclusive distribution more attractive for platform services.

Statistical tests reveal that the cinematic screenings and the policy change are both valid instruments as they are sufficiently correlated with the exclusive window variable. Further tests for the former instrument also confirm that the treatment is in fact endogenous to our model and the positive local average treatment effect (LATE) from model 7 will apply. For the Condecine instrument, endogeneity tests are rejected and thus OLS estimates will provide largely unbiased results for niche content (model 9 in table 2). Accordingly, in sum, more exclusive windowing of titles is linked to higher investment levels in the SVOD sample.

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<sup>23</sup>For example, titles enter panels at different times  $t$ . Accordingly, late entries might have less chance to enter (more often exclusive) SVOD distribution window after their initial online release on one or more TVOD service.

For the TVOD sample, instruments are again not weak and treatment variables are exogenous to models for any of the two instruments. We can therefore rely on the OLS estimates from model 12 in the same table. This implies that there is in fact a negative causal relationship, i.e. more exclusive content lowers initial investment levels for niche and other content in the TVOD sample. Arguably, lower average budget here seems to reflect seller’s limitations in raising funds via the ex ante trading of and loans backed by distribution rights across multiple platforms. Rather than helping investment, exclusivity in TVOD markets seems to limit average-title investment which might add to the increased exposure to piracy identified in the previous section when content is singlehoming.

## 6 Discussion and policy implications

Several caveats apply to the research approach and some of these are potential areas for future research. First, the general approach investigating the effects of exclusivity on piracy and investment does not allow for an assessment of overall welfare. For example, it is not clear whether the decreases in piracy and potential revenue gains due to more multihoming content can make up for lowering prices and access fees charged in tighter platform competition. Similarly, it remains an open issue how consumer surplus changes when fragmentation of content increases in exclusivity as in SVOD markets, and whether growing competition leads to an over- or under-provisioning of quality in these markets [10]. Still, this research can meaningfully inform the discussion on changes in the distribution of feature film, pirated consumption and investment in content quality in the digital era.

Second, measures of piracy and exclusivity ultimately serve as approximations of phenomena. We cannot directly monitor consumption on unauthorized sources, nor can we gather confidential information from legal contracts between sellers and platforms including

prices for licensing or transferring rights. In this way, the measure of platform availability can only approximate content exclusivity because (limited) demand rather than contracts might reduce online availability in some instances. Moreover, the approach does not explicitly take into account changes in the underlying "technical" availability and infrastructure SVOD and TVOD services operate on. For example, availability of services' software applications on different app stores as well as service availability on different video-game consoles might also affect general demand for and broader access to specific services over time. These are interesting areas for future research and might also provide an alternative research design. Still, we trust approximations via search and availability data are meaningful for our purposes and variations in service use due to the underlying infrastructure are minor.

Third, other exogenous shocks might affect results. For example, sudden changes in legal frameworks in Brazil and effective enforcement levels in online audiovisuals might bias piracy estimates, to the extent they do not affect all titles similarly. However, we are not aware of any such changes in laws or institutions in the observation period which would have systematically impacted torrenting search measures. Furthermore, a complementary increase in public funding of audiovisual content, when not crowding out private investors, might induce higher average budget per title too. Even though there is indeed an upsurge in public funds available in Brazil and distributed by ANCINE (Agência Nacional do Cinema) after 2012, this extra money is restricted to domestic productions and minority co-productions which only represent a small fraction in the total sample.

Fourth, from a policy perspective, results suggest that similar to the online piracy deterring effect of legal service availability showcased in much of the previous literature, this argument also applies and effects extend to two-sided markets when content is multihoming, i.e. content becomes available across more than one distributing platform. However, under certain conditions, this defence generates a coordination problem and potential market

failure: distributing platforms and sellers might benefit from a decline in online piracy as a substitute for legal consumption, but platforms, in particular on SVOD markets, might continue to compete over exclusive content in circumstances where multihoming would enhance social welfare. Arguably, there are various market mechanisms and legal institutions, for example, compulsory licensing regimes, rules for fair, reasonable and non-discriminatory (FRAND) licensing, or factoring in exclusive dealings in vertical or horizontal merger control or consumer policy enabling their multihoming, which can help competitors to more effectively coordinate and markets overcome the problem.

Fifth, the quantitative evidence further suggest that movie financing can be tied to singlehoming or multihoming, and increases in content exclusivity on platforms are not per se linked to higher average investment in content. In this way, current markets do not always meet core goals of copyright policy aiming to incentivize such investment by granting exclusive rights. However, there is reason to believe that some of the content exclusivity observed in online audiovisual markets originates from abuses of market power upstream and downstream which, ideally, antitrust policies should correct for. However, unfortunately, the research does not allow to tell one source of exclusivity from the other, and thus it cannot help much the decision which policy area will deliver more effective responses.

## 7 Conclusion

This research investigates the effects of exclusive dealings around feature film on online piracy and movie investment for titles available on SVOD and TVOD services in Brazil. We are able to quantitatively show that legal availability on a single platform or across platforms (multihoming) effectively deters online piracy, lowering annual search volume for torrenting titles by around six per cent. While differences for SVOD and TVOD are minor, effects are heterogeneous for individual platform services and they are robust against censoring, serial

correlation and unobserved common factor biases in the data. Results extend the standard claim on legal service availability effects on piracy established in the literature to two-sided markets and developing economies.

Similarly, the research further provides evidence that the financing of feature film can also be tied to multihoming distribution in certain market segments (TVOD). This results opposes the standard goal of copyright policy to incentivize investment and contradicts predictions in some of the theoretical literature on two-sided markets where exclusive dealings are associated with more premium content. However, the trend towards more multihoming titles in TVOD might effectively bring back some investment in content quality.

## References

- [1] L. Aguiar and J. Waldfogel. As streaming reaches flood stage, does it stimulate or depress music sales? *International Journal of Industrial Organization*, 57(C):278–307, 2018.
- [2] ANCINE. Video sob demanda: Análise de Impacto Regulatório. Technical report, Relatório de Análise de Impacto 001/2019/ANCINE/SAM/CAN, Aug. 2019.
- [3] M. Armstrong. Price discrimination by a many-product firm. *The Review of Economic Studies*, 66(1):151–168, 1999.
- [4] Y. Bakos and E. Brynjolfsson. Bundling information goods: Pricing, profits, and efficiency. *Management Science*, 45(12):1613–1630, 1999.
- [5] P. Belleflamme and P. Picard. Piracy and competition. *Journal of Economics Management Strategy*, 16:351 – 383, 06 2007.
- [6] M. J. Benner and J. Waldfogel. Changing the channel: Digitization and the rise of “middle tail” strategies. *Strategic Management Journal*, n/a(n/a).
- [7] E. Carroni, L. Madio, and S. Shekhar. Superstars in two-sided markets: exclusives or not? TSE Working Papers 20-1083, Toulouse School of Economics (TSE), 2020.
- [8] G. Crawford. The discriminatory incentives to bundle in the cable television industry. *Quantitative Marketing and Economics*, 6:41–78, 03 2008.
- [9] G. S. Crawford. The economics of television and online video markets. In *Handbook of media economics*, volume 1, pages 267–339. Elsevier, 2015.
- [10] G. S. Crawford, O. Shcherbakov, and M. Shum. Quality overprovision in cable television markets. *American Economic Review*, 109(3):956–95, March 2019.

- [11] B. Danaher, S. Dhanasobhon, M. D. Smith, and R. Telang. Converting pirates without cannibalizing purchasers: The impact of digital distribution on physical sales and internet piracy. *Marketing Science*, 29(6):1138–1151, 2010.
- [12] B. Danaher, S. Dhanasobhon, M. D. Smith, and R. Telang. Understanding media markets in the digital age: Economics and methodology. Working Paper 19634, National Bureau of Economic Research, November 2013.
- [13] B. Danaher and M. Smith. Gone in 60 seconds: The impact of the megaupload shutdown on movie sales. *International Journal of Industrial Organization*, 33, 03 2013.
- [14] B. Danaher, M. D. Smith, and R. Telang. Copyright enforcement in the digital age: Empirical evidence and policy implications. *Commun. ACM*, 60(2):68–75, Jan. 2017.
- [15] B. Danaher and J. Waldfogel. Reel piracy: The effect of online film piracy on international box office sales. *SSRN Electronic Journal*, 01 2012.
- [16] M. G. de Matos, P. A. Ferreira, and M. D. Smith. Effect of video-on-demand on piracy : Evidence from a household level randomized experiment. 2017.
- [17] J. Drexler. Copyright, competition and development, report to the world intellectual property organization. 2013.
- [18] A. Hagiu, B. Jullien, and J. Wright. Creating platforms by hosting rivals. *Management Science*, 0(0):null, 0.
- [19] D. Harbord and M. Ottaviani. Contracts and competition in the pay-tv market. *Regulation Initiative Working Paper Series, London Business School*, 06 2001.
- [20] W. Hardy. Pre-release leaks as one-time incentives for switching to unauthorised sources of cultural content. IBS Working Papers 03/2018, Instytut Badan Strukturalnych, Apr. 2018.

- [21] S. Hurkens, D.-S. Jeon, and D. Menicucci. Dominance and competitive bundling. *American Economic Journal: Microeconomics*, 11(3):1–33, 2019.
- [22] A. Ishihara and R. Oki. Exclusive content in two-sided markets. 2017.
- [23] R. Katz. Alteracoes nos mercados de audiovisual global e brasileiro. Technical report, Telecom Advisory Services, Oct. 2019.
- [24] B. Z. Khan. *The democratization of invention: patents and copyrights in American economic development, 1790-1920*. Cambridge University Press, 2005.
- [25] S. J. Liebowitz. The impacts of internet piracy. In R. Watt, editor, *Handbook on the Economics of Copyright*, Chapters, chapter 13, pages 225–240. Edward Elgar Publishing, March 2014.
- [26] F. Oberholzer-Gee and K. Strumpf. File sharing and copyright. *Innovation Policy and the Economy*, 10(1):19 – 55, 2010.
- [27] M. Peitz. Bundling may blockade entry. *International Journal of Industrial Organization*, 26(1):41 – 58, 2008.
- [28] M. H. Pesaran. Estimation and inference in large heterogeneous panels with a multi-factor error structure. *Econometrica*, 74(4):967–1012, 2006.
- [29] Y. Qian. Impacts of entry by counterfeiters. *Quarterly Journal of Economics*, 123(4):1577–1609, 2008.
- [30] Y. Qian and A. Cuntz. The impacts of counterfeiting on corporate investment. *WIPO Economics working paper*, 2020.
- [31] P. Rey and J. Tirole. A primer on foreclosure. *Handbook of industrial organization*, 3:2145–2220, 2007.



- [32] J.-C. Rochet and J. Tirole. Platform competition in two-sided markets. *Journal of the European Economic Association*, 1(4):990–1029, 2003.
- [33] J. Shen. Does the availability of music streaming products decrease rates of music piracy. *The Yale Journal of Economics*.
- [34] L. Sivan, M. D. Smith, and R. Telang. Do search engines influence media piracy? evidence from a randomized field study. *MIS Quarterly*, 43(4), 2019.
- [35] M. D. Smith, R. Telang, and Y. Zhang. I want you back: The interplay between legal availability and movie piracy. *International Journal of the Economics of Business*, 26(1):199–216, 2019.
- [36] J. Stennek. Exclusive quality – why exclusive distribution may benefit the tv-viewers. *Information Economics and Policy*, 26:42 – 57, 2014.
- [37] S. Stephens-Davidowitz. The cost of racial animus on a black candidate: Evidence using google search data. *Journal of Public Economics*, 118:26–40, 2014.
- [38] R. Telang and J. Waldfogel. Piracy and new product creation: A Bollywood story. *Information Economics and Policy*, 43(C):1–11, 2018.
- [39] G. von Graevenitz, C. Helmers, V. Millot, and O. Turnbull. Does Online Search Predict Sales? Evidence from Big Data for Car Markets in Germany and the UK. Working Papers 71, Queen Mary, University of London, School of Business and Management, Centre for Globalisation Research, Aug. 2016.
- [40] J. Waldfogel. Copyright protection, technological change, and the quality of new products: Evidence from recorded music since napster. *The Journal of Law and Economics*, 55(4):715–740, 2012.
- [41] J. Waldfogel. How digitization has created a golden age of music, movies, books, and television. *Journal of Economic Perspectives*, 31(3):195–214, August 2017.

- [42] S. Watson, D. Zizzo, and P. Fleming. Determinants of unlawful file sharing: A scoping review. *PLoS ONE*, 10:e0127921, 06 2015.
- [43] H. Weeds. Tv wars: Exclusive content and platform competition in pay tv. *The Economic Journal*, 126(594):1600–1633, 2016.

## 8 Annex

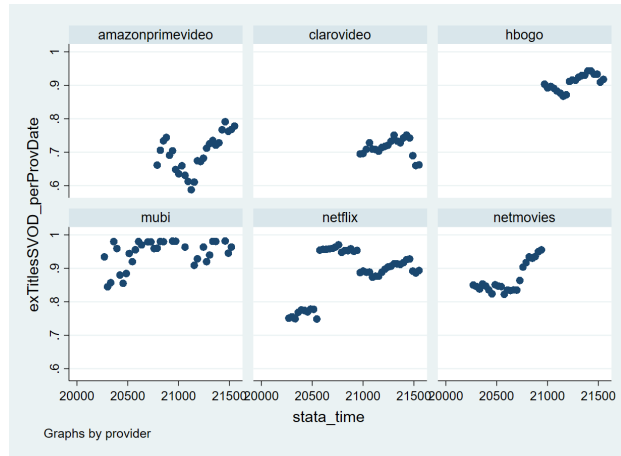


Figure 1: Share of exclusive titles in total catalogue by selected SVOD platforms, (source: justwatch.com). Note: data for Netmovies not reported as off June 2017.

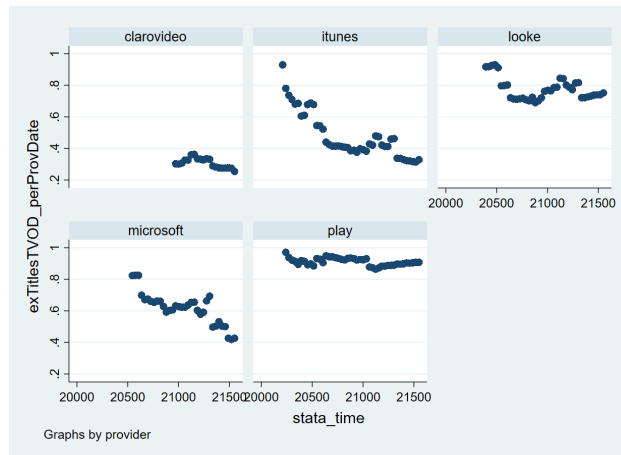


Figure 2: Share of exclusive titles in total catalogue by selected TVOD platforms, (source: justwatch.com)

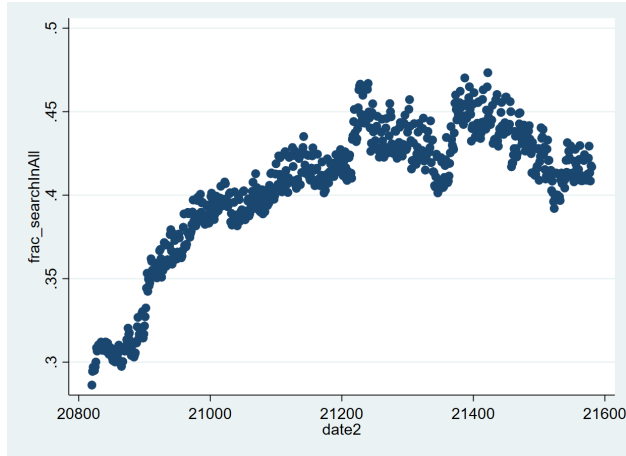


Figure 3: Fraction of visits to unauthorized online sources accessed by users in Brazil via search engines, (source: muso.com)

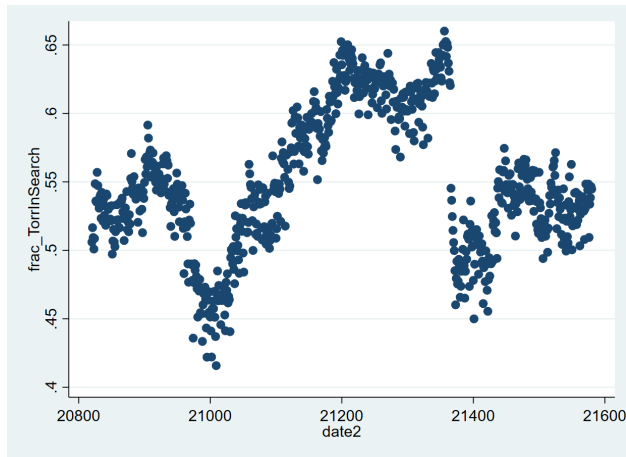


Figure 4: Fraction of visits to unauthorized online sources accessed by users in Brazil via search engines using torrents, (source: muso.com)

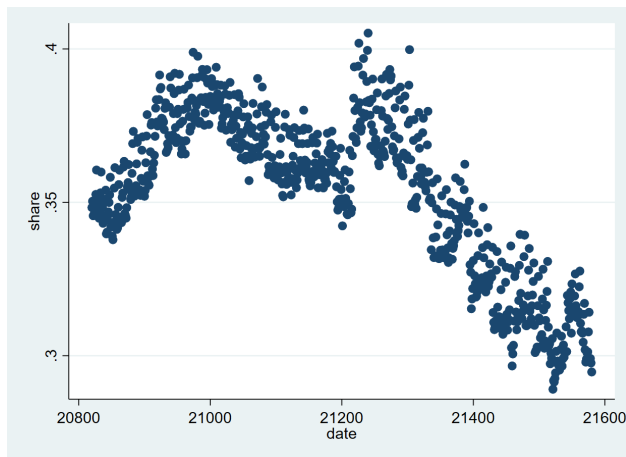


Figure 5: Fraction of visits to unauthorized online sources accessed by users in Argentina via search engines, (source: muso.com)

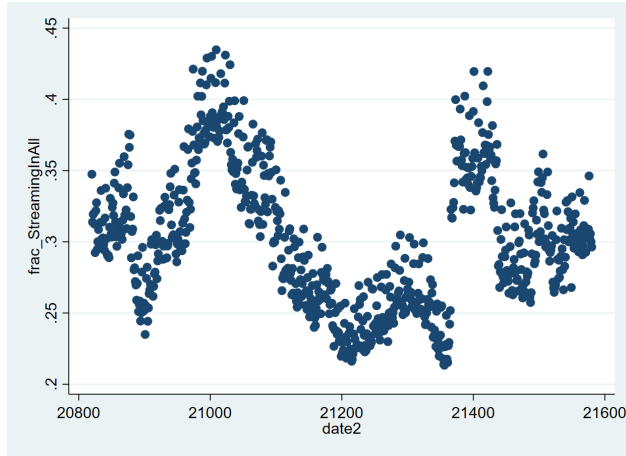


Figure 6: Fraction of visits to unauthorized online sources accessed by users in Brazil via search engines using streaming, (source: muso.com)

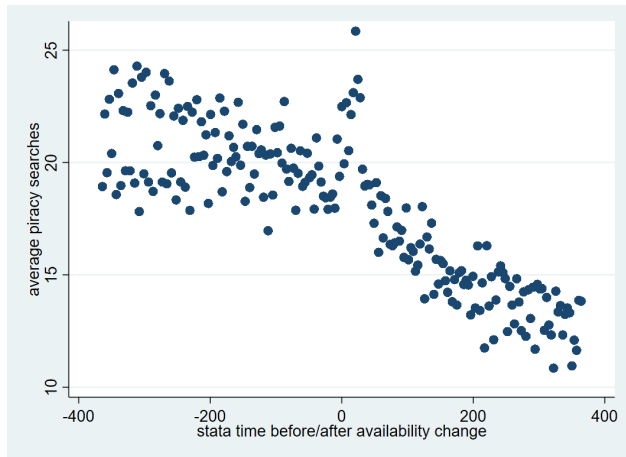


Figure 7: Average piracy searches around first title availability, SVOD sample (source: gtrends)

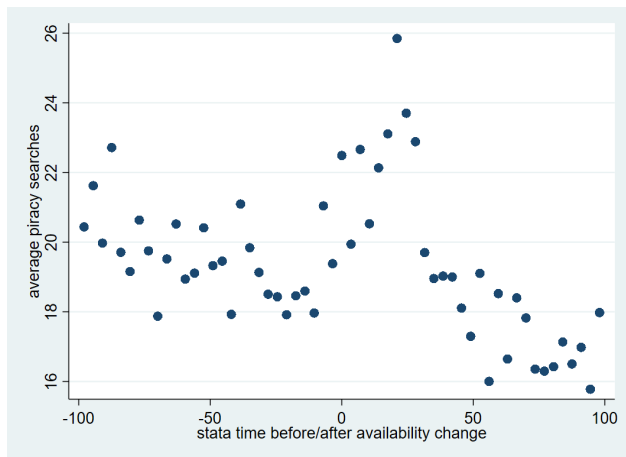


Figure 8: Average piracy searches around first title availability, SVOD sample, small window (source: gtrends)

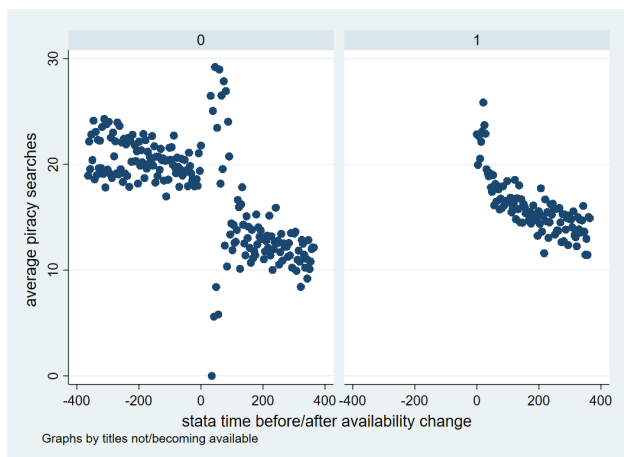


Figure 9: Average piracy searches around first title availability by group, SVOD sample (source: gtrends)

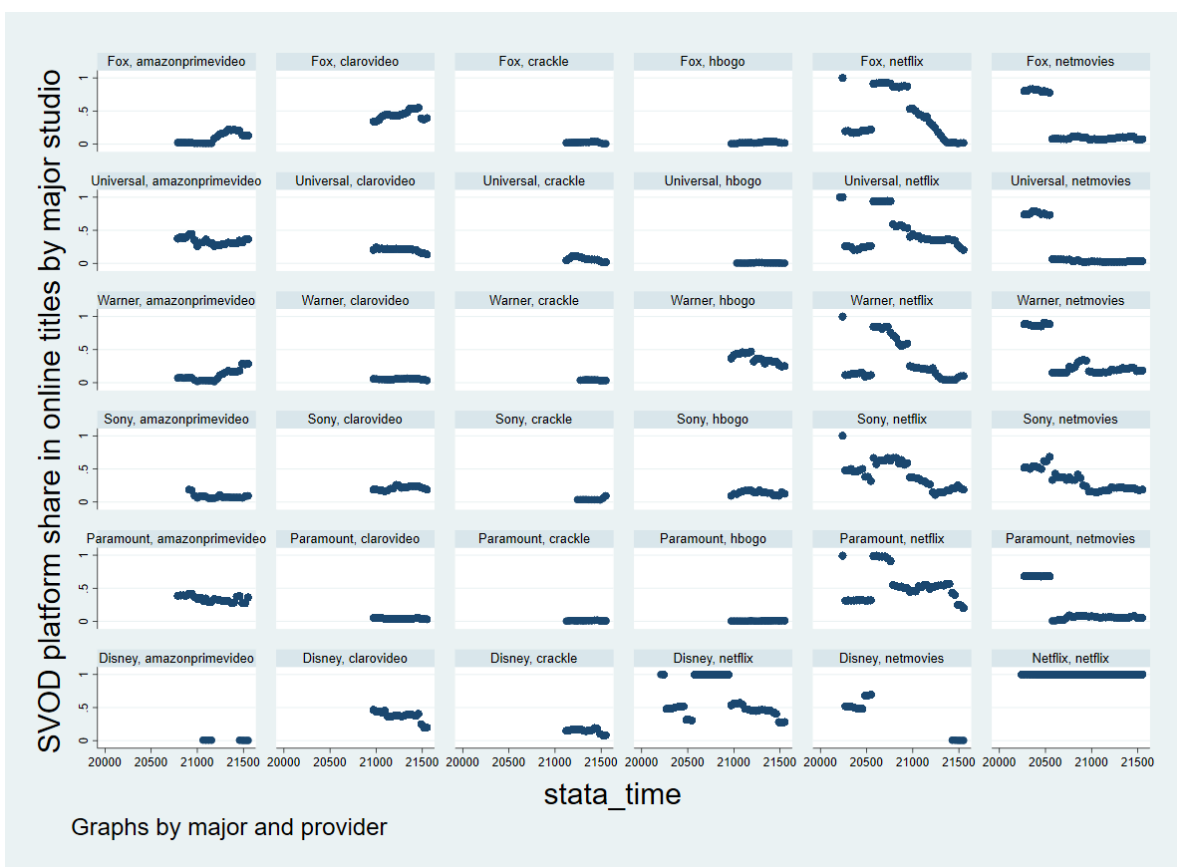


Figure 10: SVOD platform shares in total online titles by major studios (source: just-watch.com)

Table 3: Summary statistics, SVOD

| Variable                                    | Obs.   | Mean     | Std. Dev. | Min  | Max      |
|---|--------|----------|-----------|------|----------|
| <i>SVOD, total sample</i>                   |        |          |           |      |          |
| weekly piracy searches per title            | 57,183 | 18.13    | 24.61     | 0    | 100      |
| film budget                                 | 57,183 | 2.17e+07 | 3.71e+07  | 0    | 2.55e+08 |
| availability per title                      | 57,183 | 0.53     | 0.50      | 0    | 1        |
| tvod provider count per title               | 57,183 | 1.56     | 1.56      | 0    | 6        |
| film revenue                                | 57,183 | 5.08e+07 | 1.07e+08  | 0    | 8.58e+08 |
| first release                               | 57,183 | 2011.54  | 7.64      | 1925 | 2018     |
| tmdb vote count                             | 57,183 | 1257.68  | 2178.05   | 0    | 20113    |
| <i>SVOD, sample svod provider count = 0</i> |        |          |           |      |          |
| weekly piracy searches per title            | 26,601 | 20.21    | 26.37     | 0    | 100      |
| film budget                                 | 26,601 | 2.17e+07 | 3.70e+07  | 0    | 2.55e+08 |
| first release                               | 26,601 | 2011.14  | 8.37      | 1925 | 2018     |
| tvod provider count per title               | 26,601 | 1.23     | 1.52      | 0    | 6        |
| film revenue                                | 26,601 | 5.19e+07 | 1.13e+08  | 0    | 8.58e+08 |
| tmdb vote count                             | 26,601 | 1268.05  | 2294.55   | 0    | 20113    |
| <i>SVOD, sample svod provider count = 1</i> |        |          |           |      |          |
| weekly piracy searches per title            | 21,205 | 16.46    | 22.80     | 0    | 100      |
| film budget                                 | 21,205 | 2.03e+07 | 3.35e+07  | 0    | 2.50e+08 |
| first release                               | 21,205 | 2011.77  | 6.88      | 1925 | 2018     |
| tvod provider count per title               | 21,205 | 1.61     | 1.54      | 0    | 6        |
| film revenue                                | 21,205 | 4.50e+07 | 8.78e+07  | 0    | 5.67e+08 |
| tmdb vote count                             | 21,205 | 1161.35  | 1901.06   | 0    | 16859    |
| <i>SVOD, sample svod provider count = 2</i> |        |          |           |      |          |
| weekly piracy searches per title            | 3,545  | 18.07    | 23.34     | 0    | 100      |
| film budget                                 | 3,545  | 2.12e+07 | 4.52e+07  | 0    | 2.55e+08 |
| first release                               | 3,545  | 2009.83  | 8.20      | 1955 | 2016     |
| tvod provider count per title               | 3,545  | 1.71     | 1.03      | 0    | 5        |
| film revenue                                | 3,545  | 3.57e+07 | 8.78e+07  | 0    | 5.27e+08 |
| tmdb vote count                             | 3,545  | 887.48   | 1649.11   | 0    | 8967     |
| <i>SVOD, sample svod provider count = 3</i> |        |          |           |      |          |
| weekly piracy searches per title            | 521    | 18.22    | 26.37     | 0    | 100      |
| film budget                                 | 521    | 5.00e+07 | 6.29e+07  | 0    | 2.09e+08 |
| first release                               | 521    | 2012.30  | 1.27      | 2010 | 2014     |
| tvod provider count per title               | 521    | 2.64     | 1.04      | 1    | 5        |
| film revenue                                | 521    | 1.25e+08 | 1.19e+08  | 0    | 3.03e+08 |
| tmdb vote count                             | 521    | 2204.77  | 1886.63   | 0    | 5716     |

Table 4: Summary statistics, TVOD

| Variable                                    | Obs.   | Mean     | Std. Dev. | Min      | Max      |
|---|--------|----------|-----------|----------|----------|
| <i>TVOD, total sample</i>                   |        |          |           |          |          |
| weekly piracy searches per title            | 24,506 | 19.93    | 24.46     | 0.00     | 100.00   |
| film budget                                 | 24,506 | 2.91e+07 | 3.53e+07  | 0.00     | 1.80e+08 |
| availability per title                      | 24,506 | 0.54     | 0.50      | 0.00     | 1.00     |
| svod provider count per title               | 24,506 | 0.64     | 0.68      | 0.00     | 3.00     |
| film revenue                                | 24,506 | 6.98e+07 | 9.58e+07  | 0.00     | 6.58e+08 |
| first release                               | 24,506 | 2007.56  | 8.77      | 1936.00  | 2016.00  |
| tmdb vote count                             | 24,506 | 1446.63  | 1772.96   | 0.00     | 10795.00 |
| <i>TVOD, sample svod provider count = 0</i> |        |          |           |          |          |
| weekly piracy searches per title            | 11,263 | 21.11    | 25.63     | 0.00     | 100.00   |
| film budget                                 | 11,263 | 2.83e+07 | 3.45e+07  | 0.00     | 1.80e+08 |
| first release                               | 11,263 | 2007.26  | 8.88      | 1936.00  | 2015.00  |
| svod provider count per title               | 11,263 | 0.55     | 0.65      | 0.00     | 3.00     |
| film revenue                                | 11,263 | 6.79e+07 | 9.39e+07  | 0.00     | 6.58e+08 |
| tmdb vote count                             | 11,263 | 1424.10  | 1812.74   | 0.00     | 10795.00 |
| <i>TVOD, sample svod provider count = 1</i> |        |          |           |          |          |
| weekly piracy searches per title            | 5,360  | 20.07    | 23.63     | 0.00     | 100.00   |
| film budget                                 | 5,360  | 2.47e+07 | 3.44e+07  | 0.00     | 1.80e+08 |
| first release                               | 5,360  | 2005.16  | 11.06     | 1936.00  | 2014.00  |
| svod provider count per title               | 5,360  | 0.87     | 0.77      | 0.00     | 3.00     |
| film revenue                                | 5,360  | 5.26e+07 | 8.29e+07  | 0.00     | 4.63e+08 |
| tmdb vote count                             | 5,360  | 1037.81  | 1065.26   | 0.00     | 4786.00  |
| <i>TVOD, sample svod provider count = 2</i> |        |          |           |          |          |
| weekly piracy searches per title            | 4,247  | 19.19    | 23.34     | 0.00     | 100.00   |
| film budget                                 | 4,247  | 3.04e+07 | 3.55e+07  | 0.00     | 1.50e+08 |
| first release                               | 4,247  | 2008.78  | 6.85      | 1979.00  | 2016.00  |
| svod provider count per title               | 4,247  | 0.69     | 0.63      | 0.00     | 2.00     |
| film revenue                                | 4,247  | 7.18e+07 | 9.35e+07  | 0.00     | 6.24e+08 |
| tmdb vote count                             | 4,247  | 1660.49  | 2034.96   | 5.00     | 9835.00  |
| <i>TVOD, sample svod provider count = 3</i> |        |          |           |          |          |
| weekly piracy searches per title            | 2,294  | 19.50    | 23.33     | 0.00     | 100.00   |
| film budget                                 | 2,294  | 3.42e+07 | 3.34e+07  | 0.00     | 1.65e+08 |
| first release                               | 2,294  | 2010.64  | 3.87      | 1999.00  | 2016.00  |
| svod provider count per title               | 2,294  | 0.54     | 0.54      | 0.00     | 2.00     |
| film revenue                                | 2,294  | 1.14e+08 | 1.25e+08  | 0.00     | 6.58e+08 |
| tmdb vote count                             | 2,294  | 2010.84  | 2085.47   | 5.00     | 10795.00 |
| <i>TVOD, sample svod provider count = 4</i> |        |          |           |          |          |
| weekly piracy searches per title            | 341    | 7.19     | 15.72     | 0.00     | 100.00   |
| film budget                                 | 341    | 6.15e+07 | 5.63e+07  | 2.50e+06 | 1.63e+08 |
| first release                               | 341    | 2013.61  | 1.88      | 2011.00  | 2016.00  |
| svod provider count per title               | 341    | 0.25     | 0.47      | 0.00     | 2.00     |
| film revenue                                | 341    | 1.18e+08 | 9.37e+07  | 6.34e+06 | 4.34e+08 |
| tmdb vote count                             | 341    | 2040.87  | 1330.91   | 86.00    | 4500.00  |



Table 5: Effects on annual piracy search volume (DV), SVOD sample, by service platform

|                             | A1: FE                | A2: Tobit             |
|-----------------------------|-----------------------|-----------------------|
| availability x amazon       | -0.2238<br>(-0.26)    | -2.0336<br>(-1.20)    |
| availability x claro        | -2.5543***<br>(-3.69) | -6.4002***<br>(-4.68) |
| availability x crackle      | -5.9205**<br>(-3.05)  | -7.0102<br>(-1.86)    |
| availability x hbogo        | -4.4197***<br>(-4.23) | -9.1020***<br>(-4.38) |
| availability x looke        | -4.6757***<br>(-4.72) | -9.1553***<br>(-4.66) |
| availability x netflix      | -1.4355***<br>(-4.03) | -5.5511***<br>(-8.51) |
| availability x netmovies    | 0.2553<br>(0.32)      | -0.9162<br>(-0.60)    |
| availability x telecineplay | 3.2274<br>(1.46)      | 1.4328<br>(0.31)      |
| tvod provider count         | 0.2751<br>(1.49)      | -0.4544<br>(-1.28)    |
| constant                    | -46.356*<br>(-2.03)   | 35.916<br>(1.21)      |
| sigma_u                     |                       | 28.688***<br>(29.44)  |
| sigma_e                     |                       | 37.036***<br>(179.40) |
| age FE                      | yes                   | yes                   |
| title FE                    | yes                   |                       |
| observations                | 42863                 | 42863                 |
| <i>AIC</i>                  | 382235.9              | 228268.0              |
| <i>BIC</i>                  | 382625.9              | 228727.3              |
| N_g                         | 550                   | 550                   |
| ll                          | -191073.0             | -114081.0             |

*t* statistics in parentheses

Age dummy coefficients not reported. Coefficients for mubi, foxplay and foxpremium omitted.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 6: Effects on annual piracy search volume (DV), pooled mean-group model (PMG), balanced SVOD subsample

|                     | A3: OLS               | A4: PMG              |
|---------------------|-----------------------|----------------------|
| availability        | -3.2748***<br>(-3.95) | -5.2385**<br>(-3.07) |
| age, continuous     | 1.4981*<br>(2.39)     | 0.9842<br>(0.91)     |
| tvod provider count | -0.2935<br>(-0.51)    | 2.0220<br>(1.76)     |
| search, lag (t-8)   | 0.06702***<br>(4.62)  |                      |
| search, lag (t-12)  | 0.008074<br>(0.55)    | 0.1920<br>(0.33)     |
| search, lag (t-15)  | 0.03231*<br>(2.23)    | -0.4950<br>(-0.41)   |
| linear prediction   |                       | 0.005350<br>(0.22)   |
| constant            | 13.576***<br>(3.76)   | 18.481<br>(1.75)     |
| title FE            | yes                   |                      |
| Observations        | 4806                  | 4806                 |
| <i>AIC</i>          | 42239.3               | 40761.5              |
| <i>BIC</i>          | 42284.7               | 40806.9              |
| ll                  | -21112.7              | -20373.8             |

*t* statistics in parentheses

Age dummy coefficients not reported.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 7: Effects on first-month piracy search volume (DV), SVOD sample, two-months window

|                              | A5: FE              | A6: FE              | A7: FE              | A8: Tobit            | A9: Tobit            | A10: Tobit            |
|------------------------------|---------------------|---------------------|---------------------|----------------------|----------------------|-----------------------|
| availability                 | 3.5019***<br>(6.62) |                     |                     | 7.9832***<br>(7.83)  |                      |                       |
| availability x exclusive     |                     | 3.8808***<br>(5.90) |                     |                      | 7.7603***<br>(6.29)  |                       |
| availability x non-exclusive |                     | 2.7761**<br>(3.03)  |                     |                      | 8.4023***<br>(5.06)  |                       |
| availability x amazon        |                     |                     | -0.9354<br>(-0.26)  |                      |                      | 4.9093<br>(0.98)      |
| availability x claro         |                     |                     | 4.2858<br>(1.36)    |                      |                      | 5.9664<br>(1.18)      |
| availability x crackle       |                     |                     | 11.250<br>(0.70)    |                      |                      | 20.528<br>(0.85)      |
| availability x hbogo         |                     |                     | 3.2716<br>(0.93)    |                      |                      | 2.9407<br>(0.53)      |
| availability x looke         |                     |                     | 0.2736<br>(0.06)    |                      |                      | 6.1882<br>(0.90)      |
| availability x mubi          |                     |                     | 0<br>(0.00)         |                      |                      | -1.140e-13<br>(-0.00) |
| availability x netflix       |                     |                     | 3.8400***<br>(4.46) |                      |                      | 7.4288***<br>(5.33)   |
| availability x netmovies     |                     |                     | -1.3769<br>(-0.61)  |                      |                      | -1.5499<br>(-0.42)    |
| tvod provider count          | -0.06261<br>(-0.18) | -0.05716<br>(-0.16) | 1.7086<br>(1.14)    | 1.0339*<br>(2.24)    | 0.9998*<br>(2.11)    | -1.7719*<br>(-2.09)   |
| constant                     | 9.6507<br>(0.40)    | 7.4072<br>(0.31)    | -16.004<br>(-0.63)  | 49.258<br>(1.65)     | 49.370<br>(1.65)     | 53.250<br>(1.74)      |
| sigma_u                      |                     |                     |                     | 27.059***<br>(28.50) | 27.062***<br>(28.50) | 24.880***<br>(21.67)  |
| sigma_e                      |                     |                     |                     | 35.850***<br>(86.58) | 35.849***<br>(86.58) | 35.550***<br>(59.78)  |
| age FE                       | yes                 | yes                 | yes                 | yes                  | yes                  | yes                   |
| title FE                     | yes                 | yes                 | yes                 |                      |                      |                       |
| observations                 | 10295               | 10295               | 4270                | 10295                | 10295                | 4270                  |
| AIC                          | 90747.8             | 90748.8             | 38217.8             | 54939.6              | 54941.5              | 26385.7               |
| BIC                          | 90928.8             | 90937.0             | 38357.7             | 55221.9              | 55231.1              | 26627.3               |
| N_g                          | 762                 | 762                 | 529                 | 762                  | 762                  | 529                   |
| ll                           | -45348.9            | -45348.4            | -19086.9            | -27430.8             | -27430.8             | -13154.8              |

*t* statistics in parentheses

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Age dummy coefficients not reported. Coefficients for telecineplay, foxplay and foxpremium omitted.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 8: Effects on annual piracy search volume (DV), TVOD sample and by service platform

|                            | A11: FE              | A12: FE            | A13: FE            | A14: Tobit            | A15: Tobit            | A16: Tobit            |
|----------------------------|----------------------|--------------------|--------------------|-----------------------|-----------------------|-----------------------|
| availability               | -2.6964<br>(-1.24)   |                    |                    | -6.1611**<br>(-2.72)  |                       |                       |
| availability x 1 platform  |                      | -2.8270<br>(-1.39) |                    |                       | -5.2752*<br>(-2.35)   |                       |
| availability x 2 platforms |                      | -2.5747<br>(-1.24) |                    |                       | -5.4475*<br>(-2.11)   |                       |
| availability x 3 platforms |                      | -1.9355<br>(-0.82) |                    |                       | -4.0393<br>(-1.38)    |                       |
| availability x 4 platforms |                      | -4.4962<br>(-1.23) |                    |                       | -18.755***<br>(-3.40) |                       |
| availability x itunes      |                      |                    | -0.1343<br>(-0.10) |                       |                       | -1.2094<br>(-0.82)    |
| availability x claro       |                      |                    | -1.5637<br>(-0.84) |                       |                       | -4.9008*<br>(-2.57)   |
| availability x looke       |                      |                    | 0.6816<br>(0.59)   |                       |                       | 0.1083<br>(0.08)      |
| availability x microsoft   |                      |                    | -0.4197<br>(-0.35) |                       |                       | -1.3573<br>(-0.96)    |
| availability x google play |                      |                    | 0.1784<br>(0.15)   |                       |                       | -1.1844<br>(-0.81)    |
| availability x playstation |                      |                    | 1.6133<br>(1.19)   |                       |                       | 1.0478<br>(0.58)      |
| rental dummy               | 0.4589<br>(0.25)     | 0.6526<br>(0.38)   | -1.3690<br>(-0.86) | -0.4243<br>(-0.22)    | -0.9968<br>(-0.51)    | -3.2620*<br>(-2.05)   |
| hd quality dummy           | 2.7823<br>(1.71)     | 2.5097<br>(1.46)   | 1.4654<br>(0.74)   | 4.7408**<br>(3.20)    | 4.3066**<br>(2.61)    | 2.5709<br>(1.45)      |
| svod provider count        | -0.003866<br>(-0.01) | -0.1945<br>(-0.36) | -0.4899<br>(-0.92) | 0.2177<br>(0.40)      | -0.1519<br>(-0.27)    | -0.8269<br>(-1.39)    |
| constant                   | 8.9462<br>(0.31)     | 9.2572<br>(0.31)   | 18.008<br>(0.61)   | 10.375<br>(0.38)      | 10.438<br>(0.38)      | 11.640<br>(0.44)      |
| sigma_u                    |                      |                    |                    | 26.578***<br>(21.66)  | 26.579***<br>(21.65)  | 25.991***<br>(20.52)  |
| sigma_e                    |                      |                    |                    | 36.041***<br>(140.82) | 36.041***<br>(140.82) | 35.349***<br>(134.04) |
| age FE                     | yes                  | yes                | yes                | yes                   | yes                   | yes                   |
| title FE                   | yes                  | yes                | yes                |                       |                       |                       |
| observations               | 24506                | 24506              | 21723              | 24506                 | 24506                 | 21723                 |
| AIC                        | 219379.0             | 211171.4           | 194205.4           | 137714.4              | 133640.2              | 123662.1              |
| BIC                        | 219638.4             | 211999.9           | 194492.9           | 138136.0              | 134084.1              | 124109.3              |
| N_g                        | 278                  | 278                | 251                | 278                   | 278                   | 251                   |
| ll                         | -109657.5            | -105833.7          | -97066.7           | -68805.2              | -66765.1              | -61775.1              |

*t* statistics in parentheses

Age dummy coefficients not reported. Models A11-13 include clustered s.e.

\*  $p < 0.05$ . \*\*  $p < 0.01$ . \*\*\*  $p < 0.001$

Table 9: Instrumental variable (IV) approach, first-stage regressions

| DV: exclusive window, share                               | SVOD                     |                          | TVOD                    |                         |
|---|--------------------------|--------------------------|-------------------------|-------------------------|
|   | A17                      | A18                      | A19                     | A20                     |
| cinematic screenings in Brazil,<br>2012-2015 logged total | 0.009781***<br>(4.78)    |                          | -0.01740***<br>(-5.34)  |                         |
| policy change dummy,<br>post 2010 cinematic releases      |                          | 0.06745***<br>(3.73)     |                         | -0.1982***<br>(-6.30)   |
| total online window,<br>no. periods                       | -0.006830***<br>(-26.36) | -0.006640***<br>(-25.77) | -0.002774***<br>(-5.52) | -0.003190***<br>(-6.33) |
| release year  | 0.001537***<br>(4.21)    | 0.001103*<br>(2.47)      | -0.003853***<br>(-5.56) | -0.001633<br>(-1.89)    |
| constant  | -1.9311**<br>(-2.66)     | -1.0709<br>(-1.21)       | 8.3456***<br>(6.03)     | 3.9665*<br>(2.32)       |
| Observations  | 1010                     | 1010                     | 907                     | 907                     |
| Adjusted $R^2$  | 0.412                    | 0.407                    | 0.151                   | 0.161                   |
| $AIC$   | -217.14                  | -208.34                  | 644.92                  | 634.16                  |
| $BIC$   | -192.55                  | -183.75                  | 668.97                  | 658.21                  |

$t$  statistics in parentheses

Movie sequel dummy coefficients not reported.

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$