

Self-regulation vs state regulation: Evidence from cinema age restrictions*

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September 26, 2019

Abstract

This paper studies the effect of self-regulation on the leniency of cinema age restrictions using cross-country variation in the classifications applied to 1,922 movies released in 31 countries between 2002 and 2011. Our data show that restrictive classifications reduce box office revenues, particularly for movies with wide box office appeal. These data also show that self-regulated ratings agencies display greater leniency than state-regulated agencies when classifying movies with wide appeal. However, consistent with theoretical models of self-regulation, the degree of leniency is small because it is not costly for governments to intervene and regulate ratings themselves.

*We wish to thank Brian Adams, Jin Choi, Nik Kohrt, Anthony Niblett, Christian Peukert, and seminar participants at the Center for Advanced Study in the Behavioral Sciences at Stanford University, California State University, East Bay, DePaul University, 2014 International Industrial Organization Conference, 2013 Mallen Economics of Filmed Entertainment Conference, Northern Illinois University, Purdue University, the University of California Santa Cruz, and the University of Missouri for helpful comments. McRae gratefully acknowledges financial support from the Asociación Mexicana de Cultura, A.C. Nicholas Jasinski, Shatakshi Shandilya, Matthew Sido, and Josh Wagner provided excellent research assistance. All errors are our own.

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1 Introduction

Self-regulation, in which an industry-level organization determines and enforces the rules and standards of conduct for firms in the industry, is an important feature of many sectors including advertising, financial services, legal services, and industrial chemicals. In recent years, self-regulatory organizations have been created for crowdfunding and the emerging virtual currency economy. While the European Union recently passed legislation to regulate data protection and privacy for all citizens, technology firms in the U.S. currently rely on self-regulation to prevent data breaches and manage the sharing of user information. Opponents of privacy legislation believe America's self-regulatory approach to data protection is preferred to the imposition of rules that might hinder innovation (*The Economist* 2018). Other potential benefits of self-regulation over government-level regulation include greater speed, flexibility, and lower costs (Gunningham and Rees, 1997).

However, since self-regulatory organizations are formed to benefit their members, critics argue they may have inadequate incentives to protect the public (e.g., DeMarzo et al., 2005). For example, the three major trade associations in the alcohol industry adopted voluntary standards designed to limit youth access to alcohol marketing. However, a 1999 Federal Trade Commission report criticized the industry's requirement that more than half of the audience for its advertisements be over 21 since this far exceeded the proportion of the U.S. population under 21, which was 30 percent (FTC, 1999).¹ The industry's current standards require that 71.6 percent or more of the audience are 21 years or older.² More recently, the Securities and Exchange Commission questioned whether U.S. exchanges should be responsible for monitoring and policing their own trading activities. As self-regulatory organizations, exchanges write market rules and are shielded from legal challenges from traders that lose money due to technical problems, including those from the contentious initial public offering of Facebook (Ackerman et al., 2013).

Self-regulation has been extensively studied in theory (Maxwell et al., 2000; Núñez, 2001; DeMarzo et al., 2005; Grajzl and Murrell, 2007). But despite the prevalence and importance of self-regulation, few empirical analyses have assessed the performance of self-regulatory organizations, and existing analyses have been limited to case studies

1. The report also noted that only half of the companies could demonstrate that "nearly all of their ads were shown to a majority legal-age audience" and data for one quarter of companies showed "weeks when a large portion of ads were shown to a majority underage audience" (FTC, 2003, p. 12).

2. A follow-up study in 2014 found that more than 93.1 percent of all measured advertising media met the industry's placement standard at the time of 70 percent or more of the audience viewing advertisements be 21 years or older (FTC, 2014).

without cross-sectional variation in the source of regulation. In financial markets, historical accounts show that self-regulation of commodity exchanges between 1865 and 1922 was not an efficient means to reduce the exercise of monopoly power (Pirrong, 1995). For the chemical industry, studies of the Responsible Care program of 1989 find that membership in the program was a poor predictor of whether prescribed environmental standards were followed (Howard et al., 2000), and member firms did not improve their environmental, health and safety performance as fast as non-members (King and Lenox, 2000). However, empirical evidence indicates that the threat of government regulation induced U.S. firms to voluntarily reduce emissions from 17 toxic chemicals between 1988 and 1992 (Maxwell et al., 2000).

In this paper, we analyze the performance of self-regulation using the example of motion picture rating systems.³ Motion picture rating systems are designed to protect children from unsuitable material by issuing certifications that classify a movie's violent and sexual content, and, in some cases, impose restrictions that require theater owners to refuse entry to minors. The existence of rating systems is motivated by a purported link between media content and the emotional and behavioral development of children. In 2000, the American Medical Association and five public-health organizations noted that research points "overwhelmingly to a causal connection between media violence and aggressive behavior in some children" (Anderson et al., 2003).⁴ Research into the effects of media violence also finds that exposure to media violence leads children to become desensitized to violence, and to believe the world around them is cruel (Robinson et al., 2001). Related research into the effects of sexual content suggests that depictions of sex in the media promote a belief that promiscuity is the norm (e.g., Zillmann, 2000; Escobar-Chaves et al., 2005).⁵

3. Throughout the paper, we use the terms "ratings," "certifications," and "classifications" interchangeably.

4. After mass shootings in Colorado and Connecticut in 2012, the White House urged the movie industry to implement a stricter rating system for movie violence. The MPAA responded in April 2013 by expanding the content descriptions that accompany film ratings. However, they did not add any new certifications or make existing certifications more stringent.

5. Evidence of a causal link between media violence and aggressive behavior, however, remains inconclusive. Studies that establish a correlation between television penetration and violent crime have been criticized for not adequately controlling for spurious factors (Savage, 2004). For example, Centerwall (1992) reports a link between South Africa's government-imposed delay on television broadcasting and that country's stagnant homicide rate, but this result cannot explain similar stagnation or declines in European homicide rates (Zimring and Hawkins, 1997). Longitudinal studies that track minors' consumption of television and later criminal convictions have been criticized for relying on aggression levels measured by a subject's peers (Savage, 2004).

The film industry is an ideal setting for studying self-regulation due to cross-country variation in the source of regulation for the same product. In the United States, movie ratings are issued by the motion picture industry's trade association, the Motion Picture Association of America (MPAA). Its most common ratings are PG-13 and R. Movies rated R are restricted to audiences 17 years and over unless they are accompanied by a parent or legal guardian while movies rated PG-13 are recommended for ages 13 and over but impose no restrictions. Ratings in five other countries (Germany, Iceland, Japan, the Netherlands, and United Kingdom) are also issued by agencies created and administered by the film industry. In the majority of other countries, ratings for the same movies are issued by state-regulated agencies. In Australia, for example, certifications are issued by the Australian Classification Board, formed by the Australian government in 1970.

To assess the performance of self-regulated movie rating systems, we have assembled an extensive data set of 1,922 movies released between 2002 and 2011 across 31 countries. Our data include classifications, box office revenue and admissions, and measures of violence, sex, and profanity for 29,004 movie-country pairs. Since we observe the same movie in multiple countries, we can include movie fixed effects to control for a wide range of privately observed movie characteristics that are correlated with ratings but are unavailable in our data.

Using these data, we first establish that restrictive ratings reduce box office revenues. A one-year reduction in the minimum age required for entry is estimated to increase box office revenue by 4.6 percent on average. These findings are robust to alternative controls for violent and sexual content, edits made across countries, alternative measures of a movie's availability to minors, and to using attendance instead of revenues to measure box office performance. We also find that implied revenue losses are greatest for big-budget films targeted at wide audiences and for films targeted at teenage audiences. For example, coefficient estimates indicate that the average revenue loss from a restrictive classification in the U.S. is \$19.8 million for a high-budget movie and \$6.9 million for a low-budget movie.

We next review theoretical models of self-regulation to construct testable predictions about the behavior of self-regulated ratings agencies. Having established that restrictive ratings reduce box office revenues, particularly for movies appealing to wide and teenage audiences, two implications immediately follow. First, classifications issued by self-regulated ratings agencies will be more lenient than state-regulated agencies. Second, ratings will be particularly lenient on movies with larger box office potential and on movies

targeted at teenage audiences. A third prediction is that the degree of leniency will be small. This is because the taxes required to fund a state classification system are not large, which makes the threat of government action credible.

To test these predictions, we first examine a 2006 regulatory change in Iceland. Difference-in-differences estimates reveal that Iceland's change from state to self-regulation increased the leniency of classifications by 3.0 months on average. We then examine cross-country differences in the relative leniency of classification decisions issued by self- and state-regulated agencies. Estimates reveal the difference in leniency between wide and narrow appeal movies is 3.1 months larger on average in countries with self-regulated ratings agencies. The corresponding difference in leniency between movies targeted at teenagers and those not targeted at teenagers is 3.5 months. The direction and magnitude of leniency exhibited by self-regulated agencies therefore provides strong support for our predictions.

The remainder of this paper is organized as follows. Section 2 describes the regulation of rating systems around the world. Section 3 describes our data on movie ratings, revenue, and violent and sexual content. Section 4 examines the impact of restrictive ratings on box office performance. In Section 5, we review theoretical models of self-regulation and develop testable predictions. In Section 6, we compare the leniency of movies ratings issued by self- and state-regulated agencies to test these predictions. A final section concludes.

2 Institutional background

Rating systems around the world differ in two important dimensions: the structure of certifications (the number of different certifications, the restrictions they impose, and their frequency of use), and the type of regulation (self- or state-regulation). In Section 4, we exploit variation in the structure of classifications to analyze the impact of restrictive ratings on box office performance. In Section 6, we use variation in the identity of the regulator (industry or state) to determine how regulation affects the issuance of restrictive certifications.

2.1 Structure of certifications

There is considerable variation across countries in the number of classifications and the restrictions they impose. For the 31 countries in our data set, the number of certifications ranges from two (Belgium) to nine (South Africa) with a median of five (Figure A1).

Certifications are one of three types: (1) a minimum recommended age that does not impose any restrictions on admission, (2) a minimum unaccompanied age, below which minors are only admitted with an adult guardian, and (3) a minimum restricted age, below which minors are not admitted. For example, in Sweden, the classifications are Universal, 7, 11, and 15. All ages are permitted to watch movies rated Universal. Children under 7 and 11 years are allowed to watch movies rated 7 and 11 if they are accompanied by an adult guardian. However, theater owners are required to refuse entry to all minors under 15 years for movies rated 15, even if an adult guardian is present. In the United States, classifications G, PG, and PG-13 carry no restrictions. Children under 17 years are admitted to movies rated R only if they are accompanied by a guardian, while children 17 years or lower are not admitted to movies rated NC-17.⁶

Cultural factors, particularly attitudes towards censorship, vary across countries and influence the number of movies issued restrictive ratings. Many European countries, in particular, maintain a more liberal attitude toward censorship than the U.S. and Asian countries, and restrict a much smaller share of movies. Spain, for example, does not issue any restrictive ratings, except for pornographic movies, meaning that ratings function as a recommendation system for parents and teachers. The one movie in our data set to be issued a restrictive rating (X) in Spain is the horror film *Saw VI*. This extreme stance reflects a reaction to heavy censorship before 1975 under General Francisco Franco. Censorship in France was also abolished in the 1975, and bans were only maintained on movies that were deemed “offensive to human dignity” (Green and Karolides, 2005, p. 182). The share of movies issued restrictive ratings (that prohibit at least some minors from entry) in France is 16.6 percent compared to 38.2 percent in the United States.

2.2 Type of regulation

There is also variation across countries in the regulation of classification systems (Table A1). In 25 of the 31 countries in our data set, the ratings system is state-regulated, and certifications are determined by statutory agencies. In Australia, for example, ratings are issued by the Australian Classification Board, formed by the government in 1970. The country’s classification scheme is defined by the Classification (Publications, Film and Computer Games) Act of 1995. In the majority of countries with state-regulated ratings agencies, the agency is housed within the Ministry of Culture. The stated aim of the agency

6. A Federal Trade Commission study finds that 76 percent of underage children were not able to purchase tickets to R-rated movies in 2012 (FTC, 2013).

usually involves the protection of youth and/or society.⁷

In six countries (Germany, Iceland, Japan, the Netherlands, the United Kingdom, and the United States), the practice of classifying films is self-regulated. Either ratings are issued by the film industry directly, or membership of the board that issues ratings is determined by the film industry. In the United States, movie ratings are issued by the Classification and Rating Administration, which is part of the Motion Picture Association of America (MPAA), a self-regulatory organization and trade group formed by Hollywood's largest studios. In the Netherlands, the classification system, Kijkwijzer, is implemented by the Netherlands Institute for the Classification of Audio-visual Media (NICAM). NICAM's board consists of representatives of film distributors, cinema operators, distributors, and both public and commercial broadcasters. Classifications are determined by a computer program based on answers that film distributors themselves provide to a 60-part online questionnaire (NICAM, 2017). The Kijkwijzer system has also been used in Iceland since 2007 under the direction of SMÁÍÐ, the Association of Film-Rights Holders in Iceland (NICAM, 2007).⁸ In Germany, movie ratings are issued by an independent board, the Voluntary Self-Control of the Film Industry (Freiwillige Selbstkontrolle der Filmwirtschaft), created by the Head Organization of Film Industry (SPIO).

Ratings systems in two countries, the United Kingdom and Japan, were created by film studios but have evolved to establish greater independence from the film industry. Nevertheless, board membership and policy are still determined by the film industry. The British Board of Film Classification (BBFC), first established by the British Film Industry in 1913, is currently managed by a council of six members from the manufacturing and servicing sections of the film industry, as well as other industries. The members are not involved in classification decisions but are responsible for appointing the President and two Vice Presidents, who are consulted on difficult classification decisions (BBFC, 2019).

7. There are very few examples of regulatory capture of state-regulated ratings agencies. One explanation is that examiners tasked with classifying movies do not possess sophisticated technical knowledge relevant to movie studios, and do not possess close ties to the industry. In Australia, Hong Kong, and New Zealand, for example, no particular qualifications are required to be an examiner with the exception of a university degree for the latter. The reasons for classification decisions are also communicated to film studios so there is little reason for studios to employ ex-examiners. Though many European countries employ examiners based on a knowledge of the film sector, they also require a large share of examiners to be experts in child development and other areas not tied to the cinema industry. For example, in Denmark, three of seven members of the Media Council for Children and Young People are child experts, and only two members have knowledge of the film industry. In Italy, the Revision Commission contains law, pedagogy, and psychology professors in addition to three members related to the cinema industry.

8. Since 2014, FRÍSK, which also represents rights holders in the Icelandic film industry, is responsible for film classification, having taken over from SMÁÍÐ after the latter's bankruptcy (Júlíusson, 2015).

Japan's Film Classification and Rating Committee, Eiga Rinri Iinkai (EIRIN), was first established in 1949 as a self-regulatory organization patterned after the MPAA. Its policy, classification guidelines, and management regulations are provided by Japan's major and independent producers, distributors, and exhibitors, as well as foreign representatives of the film industry (EIRIN, 2016).

Unlike in the U.S., however, ratings agencies in Germany, Iceland, Japan, the Netherlands, and the United Kingdom are subject to legislation. In Britain and Japan, the law requires distributors to obtain certifications before release. In the former, the Licensing Act of 2003 requires local authorities to only grant operating licenses to cinemas on the condition that they follow BBFC classification decisions. Similarly, Japan's Healthy Environmental Law of 1957 establishes that EIRIN certifications are required for domestic releases. In Germany, the Netherlands, and Iceland, it is illegal for minors to be shown disturbing imagery that might harm their well-being. The operation of Germany's self-regulation system is subject to the Law for the Protection of Youth in Public Places of 2002, which, in addition to specifying age categories, requires that media with "extremely realistic, cruel and sensational presentations of violence for its own purpose and dominant of the given scene" must not be available to children or adolescents. In the Netherlands and Iceland, Article 240a of the Criminal Code and the Act on the Monitoring of Children's Access to Films and Computer Games No. 62/2006 imposes similar stipulations on the ratings agency. The existence of legislation in these five countries means their ratings systems might be more accurately described as "co-regulated" (Senden, 2005).⁹

3 Data

This section describes our data set on country-specific classifications, box office performance (revenue and attendance), and three measures of content (violence, sex, profanity) for 1,922 movies released in 31 countries between 2002 and 2011. Additional summary statistics, details on data construction, and information on sources are provided in Appendix B.

9. Our categorization of ratings agencies is largely consistent with groupings by other researchers. For example, Albosta (2009) groups Denmark, Germany, Iceland, Japan, and the U.K. as the systems closest to the U.S. The key differences are the inclusion of Denmark and the exclusion of the Netherlands. Alternatively, a study on self-regulation of digital media by the Programme in Comparative Media Law & Policy (2004) categorizes film classification in the Netherlands as self-regulated and Denmark as state-regulated. Other countries closer to self-regulation include Belgium, Germany, and the United Kingdom. Iceland and Japan are not considered in the study.

3.1 Classifications

Data on 29,004 movie-country classifications come from systematic searches of online rating agency databases, cinema sites, and the Internet Movie Database (IMDb, 2017). We begin with classifications available on IMDb. Missing classifications are then obtained from ratings agency websites (27 countries) and cinema websites (4 countries). Several countries have very few classifications on IMDb, e.g. Austria, Belgium, Italy, and South Africa, so we rely primarily on the latter sources for these countries. Since classifications on IMDb are based on user contributions, and certifications frequently differ between theatrical and DVD releases, classifications that impose restrictions are verified (and replaced if need be) using data from agency databases, which list a classified film’s format. Our sources are listed in Table B2.

To measure cross-country variation in age restrictions, we construct the variable *Teen availability*_{ij}, which is the share of teenagers aged between 12 and 17 years in country *j* who can see movie *i* without an accompanying parent or guardian.¹⁰ The baseline measure assumes a uniform distribution of teenagers aged between 12 and 17 years. Therefore, a movie rated R in the U.S. has an unaccompanied availability of $1/6 = 0.167$, because teenagers aged 17 (1 of 6 age categories) can watch the movie unaccompanied, while teenagers between 12 and 16 (i.e. 5 of 6 age categories) are only admitted with an accompanying adult.

Though classifications for movie *i* are correlated across countries, there is still considerable variation in *Teen availability*_{ij}. Figure 1 demonstrates this variation for two franchises and two movies. Movies in the *Saw* franchise are typically restricted across countries (low values of *Teen availability*) due to their graphic violence, but for certain entries and countries, they are available to teenagers aged between 12 and 17 years. The *Matrix* franchise demonstrates the opposite picture. While the movies are generally available to teenagers (high values of *Teen availability*), restrictions on younger teens exist in some countries. Restrictions applied to adult-oriented movies *Black Swan* and *Shutter Island* are more uniformly distributed.

To assess the robustness of our results, we modify our baseline measure of availability

10. These categories are chosen to reflect patterns in the classification schemes across countries. The upper bound of 17 years is chosen because 26 of 31 countries include a classification restricting or recommending the film to audiences 18 years or older (Figure A1). The lower bound of 12 years is chosen because 17 countries include a classification restricting or recommending the film to 12-year-olds (compared to 4 countries with an ‘11’ rating and 7 countries with a ‘13’ rating). The 12–17 age group is also one of the frequent moviegoer demographic groups that the MPAA tracks in their Annual Report (MPAA, 2019).

in two ways. First, we create an alternative measure of *Teen availability*, which is the share of teenagers aged between 12 and 17 years who are admitted to movie i in country j with (or without) a parent or guardian. We denote this alternative measure “accompanied availability,” and denote our baseline measure “unaccompanied availability.” For example, a movie rated R in the U.S. has an accompanied *Teen availability* of 1 because all teenagers are admitted when accompanied by an adult. However, a movie rated NC-17 has an accompanied *Teen availability* of 0 because teenagers 17 years or younger are not admitted, even if they are accompanied by an adult. For 16 of the 31 countries in our sample, all restrictive ratings applied to minors 12 years or older prohibit admission, even with an adult guardian (Figure 2). For Austria and Hungary, unaccompanied *Teen availability* is 1 for every movie, meaning that a teenager aged 17 years or younger in these two countries can watch any movie in our sample, even without an accompanying adult. For four countries in our data (Austria, Denmark, Hungary, and Portugal), accompanied *Teen availability* is 1 for every movie in our sample.¹¹

As a second robustness check on our results, we use data from the World Bank (2019) to generate alternative availability measures based on population counts. One measure defines availability as the proportion of teenagers aged between 12 and 17 that are admitted to a movie (*Exact proportion*). Another defines availability as the proportion of all residents 12 years and older that are admitted to a movie (*Population measure*). Population counts are country and year specific.

3.2 Box office revenues and additional controls

Data on domestic and international box office revenue (in nominal U.S. dollars), genre categories, release dates, and theater counts (screens) come from Box Office Mojo (2019).¹² Data on admissions for 17 European countries and the U.S. for 1,839 movies come from the LUMIERE database compiled by the European Audiovisual Observatory (2019). Data on country-specific edits, home countries of production companies, languages in the movie, and additional data on international release dates come from IMDb (2017). Supplementary

11. There are only 24 movies in our sample for which accompanied *Teen availability* is less than 1 in the United States. Three of these movies (*The Dreamers*, *Lust*, *Caution*, and *Shame*) are rated NC-17, and 21 are unrated. Spain has one movie, *Saw VI*, which is rated X.

12. Box Office Mojo, which is owned by IMDb (itself owned by Amazon), receives its data from a variety of sources including film studios, production companies, and distributors from around the world (IMDb, 2019). For example, Australian box office data is provided by the Motion Picture Distributors Association of Australia, while box office data for Iceland is provided by the Icelandic trade organization FRISK. The U.S. revenue data from Box Office Mojo is used in Gilchrist and Sands (2016).

data on production budgets come from The Numbers (Nash Information Services, 2019). Budget information is unavailable for 306 (16.0 percent) of the movies in our sample. To avoid dropping these movies from the sample, we estimate their budgets using coefficient estimates from a regression of budget on genre, content, and U.S. opening screens for the 1,616 movies in our data with production cost information.

3.3 Measures of violent and sexual content

Data on movie content come from Kids-In-Mind (2019b), a nonprofit organization that assigns a 0 to 10-point rating to the level of sex and nudity, violence, and profanity in movies.¹³ Content scores are assigned by volunteers who follow objective guidelines. A content score depends on both quantity and context. Therefore, two movies may receive different scores for violence even if they contain the same frequency of violence. For example, *Batman Begins* has a lower violence score than its sequel *The Dark Knight* (6 versus 7), because the latter includes more intense violence. However, both movies contain comparable quantities of violent scenes.¹⁴ A robustness check uses measures of violence, sex, and language (on a 4-point scale) for 1,337 movies from Ireland’s state-regulated ratings agency, the Irish Film Classification Office (2019).

3.4 Construction of the sample

Violent, sexual, and profane content scores are available on Kids-In-Mind for 1,922 movies released theatrically in the U.S. between 2002 and 2011.¹⁵ These movies are also released internationally, and revenue data is available for 30,639 movie-country observations (Table B1).¹⁶ Our final sample consists of 29,004 of these observations (94.7 percent) for which we can identify the film’s country-specific classification. For 4 of 31 countries (Australia, Spain,

13. These data are also described in Dahl and DellaVigna (2009) who find that the incidence of violent crimes between 1995 and 2004 was lower on days when theater attendance at violent movies was larger.

14. Despite a high correlation between content ratings and U.S. movie classifications, the website notes that “while the current [rating] system does not serve consumers well, it works perfectly for the filmmakers, the studios and the theater chains. It is based on a cozy relationship between the MPAA, the film industry, and the theater chains. It is a malleable system that can be altered at will to accommodate changes in the market” (Kids-In-Mind, 2019a).

15. Total U.S. box office revenue for the 1,922 movies in our data set is \$93.3 billion. Total box office revenues for all 5,590 U.S. releases between 2002 and 2011 is \$96.5 billion. Therefore, the movies in our sample account for 96.7 percent of U.S. box office revenues.

16. To avoid biasing our results in favor of larger movies, we only include a country’s revenue data after Box Office Mojo began to report consistent weekly box office data in that country (Table B1). Data is available for all 31 countries in our sample from 2009 to 2011. There are 13,217 country-movie combinations before consistent reporting of Box Office Mojo data that are dropped from our sample.

the U.K., and the USA), our data include box office revenues for 1,500 or more movies. Our data include revenues for 1,000 or more titles for 13 countries, and revenues for more than 500 titles for 25 countries. Further details on sample construction are provided in Appendix B.

4 Evidence on the impact of restrictive ratings

In this section, we exploit cross-country variation in the restrictiveness of certifications issued to the same movie to test if restrictive ratings reduce box office revenues. We also test whether the impact of restrictive certifications varies with the target audience.

4.1 Empirical strategy

Estimating a causal relationship between restrictive ratings and box office performance requires adequate controls for a movie’s underlying box office appeal.¹⁷ Movie certifications are not assigned randomly. Therefore, if a movie’s box office performance is affected by its rating, studios may modify the movie’s content during production to target a specific classification. The breadth of the movie’s appeal will therefore be correlated with its rating and box office potential.

Our baseline regression addresses this concern by including movie fixed effects to absorb all characteristics of a movie that do not vary across countries:

$$\log(\text{sales}_{ijt}) = \beta_0 + \beta_1 \text{Teen availability}_{ij} + \mathbf{x}'_{ij} \boldsymbol{\delta} + \mathbf{z}'_i \boldsymbol{\gamma}_j + \rho_{jt} + \omega_i + \varepsilon_{ijt} \quad (1)$$

where sales_{ijt} is the box office revenue of movie i released in country j in year-of-first-release t , $\text{Teen availability}_{ij}$ is the share of teenagers aged between 12 and 17 years in country j who are able to view movie i without restriction, and ω_i is the fixed effect for movie i .

The coefficient of interest is β_1 . Positive estimates of β_1 provide evidence that restrictive classifications reduce revenue. The coefficient β_1 is identified because we observe the performance of the *same* movie in multiple countries with *different* age restrictions. The estimated percentage change in revenues from lowering restrictions by one year is $\% \widehat{\Delta \text{sales}}_{ijt} = [e^{\hat{\beta}_1 \cdot \frac{1}{6}} - 1] \cdot 100$.

There are two vectors of movie-specific covariates in our regression model. The vector \mathbf{x}_{ij} contains characteristics of movie i that are specific to country j . These include a dummy

17. The absence of adequate controls is a weakness of previous studies of restrictive ratings (e.g. Terry et al., 2004; Leenders and Eliashberg, 2011; Palsson et al., 2013).

variable that is equal to 1 if one of the languages spoken in movie i is an official language of country j (*Same language* $_{ij}$). We also include a dummy variable that is equal to 1 if country j is home to one of movie i 's production companies (*Same country* $_{ij}$). This allows for the possibility that movies perform better in their country of origin, particularly if the country is featured in the movie.¹⁸ Finally, we control for release date differences between countries by including a variable counting the number of months separating a film's release in country j from its earliest release date in another country (*Release delay* $_{ijt}$).¹⁹

The movie-specific covariate vector z_i contains characteristics of movie i that are common across all countries. These include measures of a movie's violent, sexual, and profane content, as well as dummy variables representing its genre.²⁰ We allow the coefficients on z_i to vary by country, allowing for country-specific preferences for movie content and genre that might be driven by cultural, religious, or political factors. Specifically, we include interactions between country indicators and (i) violent, sexual, and profanity content levels, and (ii) indicators for each genre. The baseline regression model includes country-year fixed effects, ρ_{jt} . These allow for flexible trends in the overall size of the market for movies as well as changes in the enforcement of ratings over time. For example, if the enforcement of restrictive ratings in country j declines during our sample period then box office revenues may increase, particularly if the majority of ratings in country j impose restrictions.

The error term, ε_{ijt} , includes characteristics of movie i other than genre, production country, content, and language, that have a differential effect on box office revenue in country j . Our identifying assumption is that the rating assigned to movie i in country j is uncorrelated with these country-movie-specific unobservables. For example, suppose movies featuring Russell Crowe perform better in Australia and New Zealand than in other countries, after controlling for country-specific preferences for observable movie characteristics. Our assumption is that the ratings agencies in Australia and New Zealand do not consider these local preferences and assign more lenient ratings to Russell Crowe

18. For example, Australian box office revenues for the film *Australia* (\$26.5 million) were more than double United Kingdom revenues (\$11.4 million) despite Australia's smaller population.

19. For example, the action-thriller *Taken* was released in France on February 27, 2008 but was not released in the U.S. until January 30, 2009. Films that are released later in international markets may be prone to increased piracy that limits their box office potential (Danaher and Waldfogel, 2012), or may not be released at all.

20. The 17 genres categories are: action, adventure, animated, comedy, crime, documentary, drama, family, foreign, historical/period, horror, musical/concert, romance, science-fiction/fantasy, sports, thriller, and war/western. A movie can have more than one genre. The genre classification is from Box Office Mojo (2019).

movies.

4.2 Sample selection correction

Movie i will only be released in country j if distributors expect its revenues will exceed distribution costs. In our data set, the average movie is only released in 15.1 countries, compared to a theoretical maximum of 31 countries. If the characteristics of a movie that determine whether it is released theatrically are correlated with the right-hand side variables in (1), then our estimates will be affected by selection bias. In particular, the estimated coefficient on *Teen availability* $_{ij}$ will be biased if distributors systematically forgo releasing films they expect will receive restrictive classifications that might harm box office revenue.

To correct for possible sample selection bias, we apply the sample selection correction for panel data models with fixed effects from Wooldridge (1995). In our setting, rather than observing the same movie in different periods, we observe the same movie in different countries. We first estimate a standard probit model for each country $j = 1, 2, \dots, 30$, where the dependent variable equals 1 if movie i is released in country j .²¹ In addition to x_{ij} , z_i , and year fixed effects, the selection equation includes an additional variable $other_{ij}$, which is equal to the number of neighboring countries to j where movie i is released. Countries are categorized into regions based on Box Office Mojo definitions.²² For the calculation of $other_{ij}$, we include data for 23 additional countries for which we have revenue data from Box Office Mojo, but which we do not include in our estimation sample for the reasons discussed in Appendix B. The variable $other_{ij}$ should not affect the sales of movie i in country j , but it should be correlated with factors determining whether movie i is released in country j .

From each country-specific probit regression, we obtain the inverse Mills ratio, $\hat{\lambda}_{ij}$, for the 1,922 observations. We then stack the inverse Mills ratios from each country and include this variable as an additional regressor in (1). Because of the two-step estimation procedure, our results tables present clustered bootstrap standard errors based on 1,000 replications, where each replication resamples with replacement from the 1,922 movies and repeats the above procedure. Standard errors are calculated as the standard deviation of the coefficients from the bootstrap replications.

21. We do not estimate this model for the United States, because every movie in our sample is released there. In the second-stage regression, we set the inverse Mills ratio for the U.S. observations equal to 0.

22. The regions are Africa, Asia, Europe, Latin America, and Oceania (Australia and New Zealand).

4.3 Baseline estimates

Baseline regression results reveal that restrictive ratings decrease box office revenues. Estimates that incorporate movie fixed effects and country-specific controls for content and genre indicate that a one-year reduction in the minimum age required for admission increases box office revenue by 4.6 percent (significant at 1 percent, Table 1, Column 4).²³ This estimate is smaller than the estimates without fixed effects and country-content controls (Columns 1–3), which demonstrates that unobserved movie quality and country-specific preferences for content are correlated with classification decisions. Results using the accompanied definition of availability are similar to the baseline estimates (Table 1, Column 5). Intuitively, the smaller coefficient on accompanied *Teen availability* indicates that a one-year reduction in the minimum age required for entry has a smaller effect when the new restriction might still require the presence of a parental guardian.

Estimates without movie fixed effects reveal that a movie’s violent content is positively correlated with box office revenues while sexual content and profanity are negatively correlated with revenue (Table 1, Column 1). Incorporating data on production budget reduces the coefficient on violent content, though it remains economically significant. A one-point increase in violent content is now associated with revenues that are 9.4 percent higher (significant at 1 percent, Table 1, Column 2). The reduction in the coefficient implies a positive correlation between production budgets and violent content.

Other results from Table 1 are of interest. Movies produced domestically perform 74.9 percent better than movies produced in foreign countries (significant at 1 percent, Table 1, Column 4). Revenue decreases by 7.8 percent for each month separating a film’s release and its earliest release in another country (significant at 1 percent, Table 1, Column 4). Finally, revenue is 16.0 percent higher in countries where the official language is used in the movie (significant at 1 percent, Table 1, Column 4). Estimated coefficients on the inverse Mills ratio are statistically significant across all models, which indicates the presence of selection bias without sample selection correction. The estimated coefficients on *other_{ij}* are strongly significant in first stage regressions (unreported).

4.4 Robustness checks

Box office revenues for movies that cater to senior citizens may underestimate attendance because this group is often able to purchase tickets at a discount. If restrictive ratings are

23. The effect is calculated as follows: $\% \Delta sales = [e^{0.271 \times 1/6} - 1] \cdot 100 = 4.6\%$.

disproportionately applied to movies aimed at this group, then the impact of restrictive ratings may be biased upward. Estimates that use data on box office attendance from 17 European countries and the U.S., rather than box office receipts, confirm the negative impact of restrictive classifications on box office performance. A one-year reduction in the minimum age required for entry increases admissions by 5.1 percent (significant at 1 percent, Table 2, Column 1).

Our findings are also robust to alternative controls for movie content, and to excluding movies that were subject to country-specific edits for content. Estimates using content measures from Ireland's state-regulated ratings agency, instead of content measures from Kids-In-Mind, indicate that a one-year reduction in the minimum age required for admission increases revenues by 4.3 percent (significant at 1 percent, Table 2, Column 2). Movies are sometimes edited in particular countries, typically to secure more lenient ratings. Results are robust to excluding all 341 movies that were edited in at least one country. Estimates reveal that a one-year reduction in the minimum age required for admission increases sales by 4.2 percent (significant at 1 percent, Table 2, Column 3).

Though we correct for selection in the above specifications, we consider a balanced panel of the 131 movies that were released in all of the 18 countries for which we have revenue data from 2002. Estimates indicate that a one-year reduction in the minimum age required for admission increases revenue by 4.5 percent (significant at 1 percent, Table 2, Column 4).

Our findings are also robust to a range of alternative specifications, including modifications to our baseline availability measure, *Teen availability_{ij}*. We first replace the variable with the proportion of country *j*'s total population aged 12 and over that are admitted to movie *i* without a parent.²⁴ Results indicate that a 1 percent increase in the population that are admitted unaccompanied increases revenues by 2.8 percent on average (significant at 1 percent, Table 2, Column 5). The baseline *Teen availability_{ij}* measure assumes uniformity of age groups between 12–17. Results that weight each age group by the proportion of 12–17-year-olds in that group are quantitatively similar to baseline estimates (significant at 1 percent, Table 2, Column 6). Disaggregating *Teen availability_{ij}* into separate availability measures for 12–14- and 15–17-year-olds indicates that restrictive classifications are more costly if they affect the availability of films to older teenagers. A one-year reduction in the minimum age requirement for 15–17-year-olds is estimated to increase box office revenue

24. In 2011, the proportion of 12–17-year-olds is largest in the Philippines (17.5 percent) and smallest in the United Arab Emirates (4.9 percent).

by 7.7 percent, while a one-year reduction in the age requirement for 12–14-year-olds is estimated to increase revenue by 3.0 percent (significant at 1 percent, Table 2, Column 7).

4.5 Variation by target audience

An additional set of estimates examine how the effect of restrictive ratings varies by a movie’s target audience. We consider two categories of target audience: a wide audience and a teenage audience. To identify films targeting a wide audience, we use a film’s production budget as well as its fixed effect estimate from (1), $\hat{\omega}_i$. Movies aimed at wide audiences have larger production budgets on average. They also have larger fixed effect estimates on average because they are crafted to be high-grossing (Einav, 2007). To identify films aimed specifically at teenagers, we use data on plot keywords from IMDb (2017) as well as demographic information on the IMDb users that evaluated the movies in our sample. In our data set, 153 movies are tagged with plot keywords such as “teen movie” that are indicative of movies aimed at teenagers.²⁵ The second approach identifies movies aimed at teenagers using the proportion of votes (ratings of movie quality on a 10-point scale) from users under 18 years.²⁶

Plots of the mean residuals from a regression of $\log(\text{sales}_{ijt})$ on movie fixed effects and country-year fixed effects suggest that the relationship between classifications and revenues does not vary with target audience. Average residuals increase with availability, which is consistent with the negative impact of restrictive classifications and revenues we identify above (Figure 3). However, this relationship does not vary systematically with production budgets (top-left panel) or the share of voters on IMDb under 18 (top-right panel).

Regression results that incorporate additional controls for country-specific preferences for content and genre reveal that the percentage impact of restrictive ratings is smaller for films targeting wider audiences. A one-year reduction in the minimum age required for admission to films with budgets in the upper tercile increases revenue by 3.1 percent less

25. The full list of keywords is: teen movie, teenage hero, teen romance, teenage love, teen comedy, teen horror, teenage superhero, teenage romance, teenage protagonist, teen sex comedy, and teen drama.

26. The other demographic groups in the voting data are: 18–29, 30–44, and 45+. The mean share of voters under 18 years on IMDb for our sample of movies is 5.2 percent. To avoid the problem of movies having a different demographic distribution of votes because of differences in the time since they were released, we use the Internet Archive (2019) to view the IMDb rating pages for each movie, approximately one year after the date the movie was first released. The archived IMDb voting data was not available for 78 movies in our sample. For these movies, we fill in the missing values using a linear regression of the under-18 voting share on the Kids-In-Mind content variables, log budget, and the number of opening screens, with the latter two variables fully interacted with genre dummies.

than a one-year reduction in the minimum age for films with budgets in the lower tercile (significant at 5 percent, Table 3, Column 1). However, the impact of restrictive ratings for movies in the upper tercile remains negative and large. Estimates using interactions with fixed effect estimates are quantitatively similar to estimates using budget terciles but are not statistically significant. A one-year reduction in the minimum age required for admission to films with fixed effects in the upper tercile increases revenue by 1.9 percent less than a one-year reduction in the minimum age for films with fixed effect estimates in the lower tercile (Table 3, Column 2). Interaction terms are insignificant when accompanied availability is used as the dependent variable (Table 3, Column 5).

Regression results also reveal that restrictive classifications have a larger effect on movies aimed at teenage audiences. A one-year reduction in the minimum age required for admission increases revenues by 3.6 percent more for movies tagged with teen film keywords compared to movies not tagged with these keywords (not significant, Table 3, Column 3). The larger impact of ratings on teen movie revenues is also evident using the share of votes from IMDb users under 18. A one-year reduction in the minimum age required for admission increases revenues by 2.8 percent more for movies in the top and middle terciles of voter share compared to movies in the bottom tercile of voter share (significant at 5 percent, Table 3, Column 4).

4.6 Implied effects on box office revenue

Discussing the impact of restrictive classifications in terms of percentage changes obscures their effect on revenues measured in dollars. Though the proportional change in revenues is smaller for films with wide appeal compared to films with narrow appeal, films with wide appeal generate larger box office revenues on average. Therefore, restrictive ratings may lead to larger revenue losses for movies targeting wide audiences compared to movies targeting more narrow audiences. Back-of-the-envelope calculations using coefficient estimates from Column 1 of Table 3 support this claim. Scaling revenues by the implied proportional increase of adjusting *Teen availability_{ij}* from 0 to 1 reveals that restrictive ratings decrease revenues by \$19.8 million on average for high budget movies in the U.S. compared to \$11.1 million and \$6.9 million for medium and low budget movies (Table 4). Revenue differences are also larger for high budget movies in other countries that have self-regulated ratings agencies. Implied revenue losses from restrictive ratings are also larger for movies in the upper tercile of under-18 voter share.

The differential effects of restrictive ratings on revenues are also demonstrated in the

lower panel of Figure 3. Average market shares rise with increases in (unaccompanied) availability for high budget movies but not for low and medium budget movies. The figure also shows that market shares for movies in the middle and upper tercile of under-18 voter share increase with availability but market shares of movies in the lower tercile do not. In summary, our results demonstrate that restrictive ratings are particularly costly for movies targeting wide or teenage audiences.

5 Theoretical framework

In this section we review the theoretical models of self-regulation in Maxwell et al. (2000) and DeMarzo et al. (2005) to develop testable predictions about the behavior of self- and state-regulated ratings agencies.

5.1 Theoretical insights

In the models of self-regulation developed in Maxwell et al. (2000) and DeMarzo et al. (2005), individual firms or members of an SRO have an incentive to choose actions that, in the absence of self- or government regulation, lower the utilities of their consumers. In Maxwell et al. (2000), firms have an incentive to choose a lower level of pollution control than is socially optimal since abatement technologies are costly. In DeMarzo et al. (2005), members facilitate transactions for their customers and have an incentive to under-report the payoff from those transactions in order to pocket the difference.

The role of the SRO in these models is to choose an optimal policy that maximizes the welfare of its members, while preempting political action that might lead to more stringent regulation. A key insight is that the spectre of government intervention induces a greater level of (self) regulation compared to the case of no government oversight. In Maxwell et al. (2000), self-regulating firms choose a level of voluntary pollution control, which consumers observe before deciding whether to lobby for stricter regulations. When the chosen level of control is sufficiently large, consumers will not proceed to lobby for changes. In DeMarzo et al. (2005), the SRO chooses how frequently to investigate its members and what penalty to levy if it uncovers fraudulent under-reporting. The prospect of government oversight induces the SRO to increase the frequency of investigations to a level that deters the government from choosing to conduct its own investigations.

Though the level of regulation adopted by SROs is more favorable to consumers when the spectre of government regulation looms, economic theory predicts that SROs will not

maximize consumer welfare. This is because SROs are able to exploit a wedge between their own regulation costs and the higher costs of a state regulator. (Lower regulatory costs for SROs can be justified if members are more informed, and possess greater expertise, than the government.) Since consumers must pay for government regulation through taxation, the SRO need only regulate to a point in which additional regulation performed by the government would not improve consumer welfare net of taxes. In a similar vein, if consumers must pay a fixed cost to successfully lobby for new regulation, then the existence of modest losses in consumer surplus from self-regulation will be permitted. Nevertheless, the SRO's chosen level of regulation will be close to consumers' preferred level if the regulatory costs of the SRO and state regulator are similar or if the costs required for consumers to organize their lobbying efforts are small.

5.2 Testable predictions

The results in Section 4 show that restrictive classifications reduce box office revenues. This finding establishes an important precondition for the theoretical insights in Maxwell et al. (2000) and DeMarzo et al. (2005). Hollywood studios, like the polluters and financial intermediaries above, have an incentive to choose actions that lower the utilities of their customers. In our case, they have an incentive to assign less stringent ratings to reach the widest possible audiences. Since exposure to harmful content may be detrimental to the development of children, if ratings are too lenient then studio actions impose costs on young filmgoers and their parents.

Another precondition for the theoretical insights discussed above is the threat of government regulation. Historical analyses of self-regulatory agencies suggest this condition is also met. For example, the 1968 U.S. ratings system, which is still in effect with modifications today, was established to avoid the creation of government classification agencies (Vaughn, 2006, p. 11):

Certainly throughout the twentieth century the threat of government intervention (often coupled with economic boycotts) was one of the most effective means of convincing entertainment makers to police themselves. It was a powerful factor in the adoption of both the 1930 Code and the 1968 rating system.

After the collapse of previous self-regulation during the 1960s, a number of violent pictures, such as *Bonnie and Clyde* and *The Dirty Dozen*, emerged that prompted calls for a

movie classification system. Jack Valenti, the MPAA's president, believed that a voluntary system of restraint would help to preempt state censorship (Vaughn, 2006, p. 14). In a similar vein, the BBFC's members are considered unlikely to nominate a President without government approval for "fear of being made redundant by the creation of an official body" (Clarke, 2002).

The role of the self-regulatory ratings agencies in our setting is to create and operate a classification system that maximizes the welfare of film studios given the potential for more stringent government oversight. The theoretical insights summarized above, coupled with results from Section 4, yield three predictions about the behavior of self-regulatory systems, which we test in Section 6:

1. *Classifications issued by self-regulated ratings agencies will be more lenient than state-regulated agencies.*

This follows from the finding in Section 4 that restrictive ratings reduce box office revenues, which creates an incentive for self-regulatory ratings agencies to issue more lenient classifications.

2. *Compared to classifications issued by state-regulated agencies, classifications issued by self-regulated agencies will be relatively lenient on movies aimed at wide and teenage audiences.*

This follows from our findings in Section 4 that restrictive ratings lower revenues most for movie targeting wide and teenage audiences. Therefore, to maximize industry revenues, self-regulatory ratings agencies will have an incentive to create and operate classification schemes that are relatively lenient on these types of movies.

3. *The relative leniency exhibited by self-regulatory agencies will not be large.*

This prediction follows from the absence of large costs to develop and operate a film classification system. Prior to the adoption of the 1968 U.S. ratings system, a film classification board had been established in Dallas in 1965, and Valenti believed that up to 40 local rating boards were ready to form (Vaughn, 2006, p. 13).²⁷ Data from a Department of Communica-

27. Though the U.S. government has the power to establish an independent rating agencies, such an agency would not have the power to censor or ban a movie. In 1965, the United States Supreme Court ruled that government ratings boards can only approve a movie in *Freedman v. Maryland*, 380 U.S. 51 (1965). The ruling invalidated a Maryland law that required films to be submitted to the Maryland State Board of Censors before being shown theatrically. Consistent with this ruling, in 2011 the Supreme Court invalidated a California law that would have banned the sale of violent video games to anyone under the age of 18, and required more extensive content labels than those issued by the Entertainment Software Rating Board (ESRB), a self-regulatory organization (*Brown v. Entertainment Merchants Association* (564 U.S. 08-1448 (2011))). Age restrictions are only enforced at theaters because theater owners have the right to refuse entry, and the National Association of Theater Owners cooperates to administer the MPAA ratings (Gershman, 2013).

tions and the Arts (2018) review of the costs involved in administering the (state-regulated) Australian Classification Board reveal that the costs to issue classifications are not large. The total cost estimate for classifying 509 movies for public exhibition is AU\$1.7 million or AU\$3,267 per movie. The Board currently charges fees that cover AU\$1.2 million, and the difference is subsidized by the government if it is not eliminated by fees for other classification services, e.g. video games or publications. In 2018, the implied shortfall in rating theatrical movies required a subsidy of 1.9 cents per person per year. In the U.S. and U.K., where ratings are administered by self-regulated ratings agencies, fees are roughly equivalent or larger so that the agencies can maintain their independence. For a 120 minute feature, the fees in the U.S. vary from US\$3,000 to US\$25,000 (depending on the film's production budget) compared to an equivalent fee of US\$1,477 in the U.K. and US\$1,492 in Australia.²⁸ In summary, the taxpayer costs to operate a government system are small, and historical evidence indicates that citizens are willing to organize in the absence of an effective classification system. This implies that self-regulated ratings agencies are constrained in their ability to influence the ratings in favor of industry revenues.

6 Examining the issuance of restrictive ratings

In this section we examine if, and to what extent, classifications issued by self-regulatory agencies are more lenient than classifications issued by state-regulated agencies. Note that we cannot compare differences in the leniency of classifications *across* countries to test the predictions from Section 5. This is because any systematic differences could be driven by cultural factors, particularly attitudes towards censorship, which vary across countries and influence the number of movies issued restrictive classifications. Therefore, our tests exploit a regulatory change in one country, Iceland, as well as differences in the relative leniency of classifications issued within countries.

6.1 Natural experiment in Iceland

On July 1, 2006, a law change transferred responsibility for age classifications from the state-regulated Icelandic Board of Film Classification to SMÁÍŚ, the association of Icelandic film, video, DVD, television content and video game distributors. The legislation was enacted to counter criticisms of censorship, and also to allow classifications to apply to

28. The classification fee in Australia for a 120-minute theatrical feature is AU\$2,180 and the exchange rate on September 8, 2019 is 0.6846. The classification fee in the U.K. is £1202.60, and exchange rate is 1.2283.

television stations and computer games (Einarsson, 2014). Under the new law, minors from the age of 14 are admitted to films with a 16 or 18 rating provided they are accompanied by an adult. This was not true previously for the 16 and 18 ratings.²⁹ SMÁÍS entered into an arrangement with NICAM the following year to use their Kijkwijzer classification software to rate movies (NICAM, 2007). Iceland is the only country during our sample period to experience a regulatory change.

To assess the impact of Iceland’s regulatory change on the availability of films to minors, we estimate the following difference-in-differences specification:

$$\begin{aligned}
\text{Teen availability}_{ij} = & \alpha_0 + \alpha_1 \text{Iceland}_{ij} \times \text{Self-reg}_{ij} \\
& + \alpha_2 \text{Iceland} \times \text{Self-reg}_{ij} \times \text{Low budget}_i \\
& + \alpha_3 \text{Iceland} \times \text{Self-reg}_{ij} \times \text{Medium budget}_i \\
& + \mathbf{x}'_{ij} \boldsymbol{\delta} + \mathbf{z}'_i \boldsymbol{\varphi} + \rho_{jt} + \epsilon_{ijt}
\end{aligned} \tag{2}$$

where Iceland_{ij} is a dummy variable equal to one if country j is Iceland, and Self-reg_{ij} is another dummy variable equal to 1 if movie i is released in Iceland after 2006. The baseline regression includes other Nordic countries: Denmark, Finland, Norway, and Sweden. We include data for all movies between 2002 and 2011 for which we have ratings information for Iceland, even if they are not included in our revenue sample (1,226 movies). The vectors \mathbf{x}_{ij} and \mathbf{z}_i , as well as variables ρ_{jt} and ω_i , are defined as above.³⁰

A positive estimate of α_1 provides evidence that Iceland’s regulatory change increased the leniency of ratings. The estimated change in average availability is equal to $\frac{\hat{\alpha}_1}{1/6} \cdot 12$ months. The coefficient is identified because we observe classification decisions before and after the regulatory change. The inclusion of content measures controls for any systematic changes in movie content across time that might contribute to an upward or downward trend in the issuance of restrictive ratings across Nordic countries. Negative estimates of α_2 and α_3 indicate that, compared to movies with production budgets in the top tercile, Iceland issued more restrictive ratings after its ratings agency became self-regulated.

Data on average availability by year and budget category provide support for predictions 1 and 2. These data reveal an increase in unaccompanied availability for high budget movies after the regulatory change but no discernible differences for medium and low

29. Additionally, the ‘10’ classification was replaced with a ‘7’ classification, and a classification used to ban films was replaced with an ‘18’ classification.

30. To provide additional flexibility in our controls for movie content, our \mathbf{z}_i in Equation (2) includes separate dummies for each value of the Kids-In-Mind content scores, interacted with each of the five countries in the data.

budget movies (Figure 4). Between 2007 and 2011, average unaccompanied availability for high budget movies is 0.86, compared to 0.81 before the change. Crucially, there is no evidence of an upward trend in availability preceding 2006 that might explain the increased leniency of classifications following the change in regulation.

Difference-in-differences estimates confirm the increase in availability and provide support for all three testable predictions. Coefficient estimates using only observations from Iceland, without time controls, show that the regulatory change increased the leniency of ratings across all movies by 3.0 months (significant at 1 percent, Table 5, Column 1). Including year fixed effects, we see that compared to high budget movies, classifications are less lenient on medium budget (significant at 5 percent) and low budget (insignificant) movies after the change (Table 5, Column 2). By including the data from other countries that did not change their regulatory status, we can estimate the effect of self-regulation while also including year fixed effects to flexibly control for changes over time in availability in the Nordic region. Our findings are robust to incorporating data from other Nordic countries (Table 5, Columns 3–4). Estimates of α_2 remain statistically insignificant when we control for unobservable movie characteristics with movie fixed effects, but the estimates of α_1 and α_3 remain significant (Table 5, Column 5). The magnitudes of the estimates means that Iceland's regulatory change led to a statistically significant increase in the leniency of classifications for movies with the largest production budgets only, which is consistent with both predictions 1 and 2. The small increase in leniency of 2.4 months on average is consistent with prediction 3.

6.2 Comparing the relative leniency of classifications within countries

A second set of regressions uses data from all 31 countries to test predictions 2 and 3. As mentioned above, we cannot directly compare differences in the leniency of classifications across countries to test prediction 2 because any systematic differences could be driven by cultural or political factors. For example, high budget movies might be issued more lenient ratings in self-regulated countries compared to state-regulated countries because self-regulated countries are disproportionately averse to censorship. Therefore, we seek to test predictions 2 and 3 by examining *differences* in self- and state-regulated ratings agencies' observed leniency toward high budget and high teen appeal movies.

Comparisons of ratings issued to movies with the same level of violent content but different budget levels indicate that self- and co-regulated agencies display greater relative leniency toward movies with higher budgets than state-regulated agencies do (Figure

5). In the U.S., movies with violent content scores between 6 and 8 have an average unaccompanied availability of 0.76 if they are in the upper budget tercile compared to averages of 0.51 and 0.36 if they are in the medium and lower budget terciles. In co-regulated countries, the mean availability scores are 0.82, 0.65, and 0.58 for high, medium, and low budget movies. In state regulated countries, the mean availability scores are 0.89, 0.80, and 0.72. Therefore, the differences in average availability between high and low budget movies with the same level of violence is 0.4 for the United States, 0.24 for co-regulated countries, and 0.17 for state-regulated countries.³¹ Note that the differences for the United States and co-regulated countries are larger than the difference for the state-regulated countries.

6.2.1 Empirical strategy and estimates

Our baseline regression examines whether these differences in relative leniency are robust to controlling for country-invariant movie characteristics and country-specific preferences for genre and content:

$$\text{Teen availability}_{ijt} = \text{Self-reg}_j * \mathbf{X}'_i \boldsymbol{\kappa} + \mathbf{x}'_{ij} \boldsymbol{\delta} + \mathbf{z}'_i \boldsymbol{\gamma}_j + \rho_{jt} + \omega_i + \varepsilon_{ijt} \quad (3)$$

where Self-reg_j is a dummy variable that equals 1 if ratings in country j are issued by a self-regulatory agency (Germany, Iceland, Japan, the Netherlands, the United Kingdom, and the United States). The vector \mathbf{X}_i contains variables related to the characteristics examined in Section 4.5: dummies for budget terciles, dummies for movie fixed effect terciles, a dummy for the presence of a teen movie keyword, or dummies for the proportion of teenage voter terciles. We study each of these variables as a separate regression. In each case, all but one of the dummies in the group is included in \mathbf{X}_i . Controls \mathbf{x}_{ij} , \mathbf{z}_i , and ρ_{jt} are defined as in Section 4.3.

Our specification does not allow us to identify a coefficient on Self-reg_j , because there is no within-country variation in the type of regulation in our sample.³² This means that the effect of the regulation type is absorbed by the country-year fixed effects, ρ_{jt} . However,

31. Comparisons based on the share of IMDb voters aged under 18 years reveal a similar pattern. Though state and co-regulated countries do not appear to issue more lenient ratings to movies with a larger share of teenage voters, the U.S. is noticeably lenient on movies aimed at teenagers (Figure 6).

32. As discussed in Section 6.1, Iceland switched from state- to self-regulation in 2006. This change does not appear in the data used for estimating Equation (3), because we use the revenue data sample that only has data for Iceland from 2008. Furthermore, even if it had been in the data, this change would have been absorbed by the Iceland-specific year fixed effects. For that reason, we study the regulatory change in Iceland separately in Section 6.1.

we can compare movies grouped on the basis of their characteristics, and identify the differential effect of self-regulation on availability across these groups. For example, for the “teen movie keyword” dummy, the coefficient κ measures the average difference in availability for teen movies in a self-regulated country, compared to non-teen movies released in that country in the same year, after controlling for (i) the average difference in availability between teen movies and non-teen movies for all the countries in our sample (which is captured through the movie fixed effect ω_j), and (ii) the country-specific effect of genre and content on availability (captured through γ_j). In other words, although we cannot say whether self-regulators are more lenient overall than state regulators, we can say whether self-regulators are relatively more lenient for movies that have wide appeal or that are targeted at teenagers.

Regression results provide strong support for predictions 2 and 3. Compared to countries with state-regulated ratings agencies, the difference in leniency between wide and narrow appeal movies is larger in countries with self-regulated agencies. In countries with self-regulated ratings agencies, the difference in leniency between high and low budget movies is $\frac{0.043}{1/6} \cdot 12 = 3.1$ months larger on average (significant at 1 percent, Table 6, Column 1).³³ This result is consistent with the sign and magnitude of the increase in leniency for high budget movies in Iceland after its switch to self-regulation (Section 6.1), even though the dataset and econometric methodology are different. The difference in leniency between movies with the highest fixed effect estimates and those with the lowest fixed effects estimates is 1.7 months larger on average (significant at 5 percent, Table 6, Column 2).

Compared to countries with state-regulated ratings agencies, the difference in leniency between movies targeted at teenagers and those not targeted at teenagers is also larger in countries with self-regulated agencies. The difference in leniency between movies tagged on IMDb with teen movie keywords is 1.9 months larger on average (significant at 1 percent, Table 6, Column 3). The difference in leniency between movies with the largest teenage voter shares and the smallest teenage voter share is 3.5 months larger on average (significant at 1 percent, Table 6, Column 4).³⁴

To summarize, consistent with prediction 2, these results indicate that self-regulators

33. These results are robust to using accompanied availability as the dependent variable instead. Using this measure, the difference in leniency between high and low budget movies is 1.6 months larger on average (significant at 1 percent, Table 6, Column 5).

34. Coefficients on the inverse Mills ratio are not significant so we do not correct our regressions for sample selection bias in this section.

exhibit greater relative leniency toward movies with wide and teenage audience appeal than state-regulators do. Consistent with prediction 3, estimated differences in relative leniency (1.7–3.5 months) are not large.

6.2.2 Robustness checks

An alternative explanation for the comparatively lenient ratings issued in self-regulated countries is that box office or teenage appeal is correlated with other movie characteristics that affect ratings. An obvious candidate is sexual content. The U.S. rating system, for example, is often criticized for being overly lenient toward violence and overly restrictive toward sexual content (e.g. Dick, 2006). Our baseline specification includes country-specific controls for the level of violence, sex, and profanity. Additionally, estimates are qualitatively similar when using alternative content measures from Ireland’s state-regulated ratings agency for a smaller sample of movies (Table 7, Column 1).

Another explanation is that studios edit their movies to obtain desired ratings, and this is more likely for movies with wide or teenage appeal, which are harmed most by a restrictive rating. Specifically, studios may edit movies in ways that are imperceptible to the econometrician and do not affect the (discrete) violence score. We address this concern by excluding those 341 movies that were edited for content in at least one country. In countries with self-regulated ratings agencies, the difference in leniency between high and low budget movies is 3.9 months larger on average (significant at 1 percent, Table 7, Column 2).

An additional robustness check uses a balanced panel of 131 movies released in all 18 countries with revenue data from 2002. Coefficient estimates are very similar in magnitude but standard errors are larger (Table 7, Column 3). Two final robustness checks use alternative measures of unaccompanied availability. The difference in leniency between high and low budget movies is 0.3 percent of the population larger on average (significant at 1 percent, Table 7, Column 4). Estimates using an availability measure that weights each age group by the proportion of 12–17-year-olds in that group are indistinguishable from the baseline estimates (significant at 1 percent, Table 7, Column 6).

6.2.3 Distinguishing between self- and co-regulation

An additional specification differentiates between those self-regulated agencies that are impacted by applicable legislation (Germany, Iceland, Japan, the Netherlands, and the

United Kingdom) and the United States, which operates in a legislative vacuum:

$$\text{Teen availability}_{ijt} = \text{USA}_j * \mathbf{X}'_i \boldsymbol{\theta}_1 + \text{Co-reg}_j * \mathbf{X}'_i \boldsymbol{\theta}_2 + \mathbf{x}'_{ij} \boldsymbol{\delta} + \mathbf{z}'_i \boldsymbol{\gamma}_j + \rho_{jt} + \omega_i + \varepsilon_{ijt} \quad (4)$$

where USA_j is a dummy variable equal to one for the United States, and Co-reg_j is a dummy equal to one for the five co-regulated ratings agencies.

Regression results reveal that, compared to countries with state-regulated ratings agencies, the difference in leniency between movie types is larger in countries with self- or co-regulated agencies. These results also reveal that differences in leniency are larger for the United States, which operates the ratings system closest to pure self-regulation. In the United States, the difference in leniency between high and low budget movies is 5.5 months larger on average than it is in countries with state-regulated agencies (significant at 1 percent, Table 8, Column 1). In countries with co-regulated ratings agencies, the difference in leniency is 2.2 months larger on average than it is in countries with state-regulated agencies (significant at 1 percent, Table 8, Column 1).³⁵ The corresponding differences using movie fixed effect estimates to proxy for box office appeal are 3.2 and 3.0 months for the United States and co-regulated countries (Table 8, Column 2).

Compared to countries with state-regulated ratings agencies, the difference in leniency between movies targeted at teenagers and those not targeted at teenagers is also larger in countries with self- or co-regulated agencies. In the United States, the difference in leniency between movies with the largest teenager voter shares and the smallest teenage voters share is 9.2 months larger on average (significant at 1 percent, Table 8, Column 4). In countries with co-regulated ratings agencies, the difference in leniency is 1.4 months larger on average (significant at 5 percent, Table 8, Column 4). The corresponding differences using the presence of teen movie keywords on IMDb to proxy for movies targeted at teenagers are 4.2 and 1.2 months for the United States and co-regulated countries (Table 8, Column 3).

7 Conclusion

This paper analyzes the performance of self-regulation using the example of motion picture rating systems. This setting is particularly attractive due to the existence of cross-sectional

35. These findings are robust to using accompanied availability at the dependent variable for co-regulated countries (significant at 1 percent, Table 8, Column 5). For the United States, the signs are reversed because there are only 24 of 1,922 films that are unrated or have an NC-17 rating for which the dependent variable (accompanied availability) is not equal to 1.

variation in the source of regulation. Using data on 1,922 movies across 31 countries, we find that restrictive ratings impose a large penalty on box office performance. Controlling for unobserved characteristics with movie fixed effects, we find that a one-year reduction in the minimum age required for entry increases revenues by 4.6 percent. This finding is robust to alternative controls for violent and sexual content, controlling for edits made across countries, using attendance instead of box office receipts to measure box office performance, and alternative measurements of a movie's availability to minors. Additional results demonstrate that restrictive ratings impose a greater economic penalties on films with wide appeal or films targeting a teenage demographic.

To examine whether self-regulatory organizations assign more lenient classifications to movies targeted toward wide or teenage audiences, we examine a regulatory change in Iceland, and investigate differences in the relative leniency of classifications issued within countries. Difference-in-differences estimates reveal that the change from state- to self-regulation in Iceland increased the leniency of classifications across all movies by 3.0 months on average. Additionally, the difference in leniency between wide and narrow appeal movies that favors the former is larger in countries with self-regulated agencies than it is in countries with state-regulated ratings agencies. In countries with self-regulated ratings agencies, the difference in leniency between high and low budget movies is estimated to be 3.1 months larger on average.

These findings are consistent with theoretical models in which self-regulation preempts government action. Although self-regulatory ratings agencies are lenient toward those movies most affected by restrictive classifications, the credible threat of government regulation constrains this leniency. Therefore, in industries where the costs of government regulation do not far exceed the costs of self-regulation, as in movie classification, self-regulation appears to be an effective alternative to state regulation.

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Table 1: Country-level movie revenue estimation results

	(1) No Movie FE	(2) Include Budget	(3) Movie FE	(4) Country × content	(5) Accomp. ratings
Teen availability (0–1)	0.594 (0.034)	0.338 (0.021)	0.409 (0.028)	0.271 (0.031)	0.225 (0.020)
Violent content	0.193 (0.019)	0.090 (0.021)			
Sexual content	-0.045 (0.023)	-0.029 (0.024)			
Profanity content	-0.229 (0.029)	-0.112 (0.027)			
Same country (0/1)	0.483 (0.035)	0.546 (0.037)	0.605 (0.031)	0.559 (0.029)	0.563 (0.029)
Same language (0/1)	0.209 (0.053)	0.176 (0.057)	0.216 (0.034)	0.148 (0.022)	0.150 (0.022)
Release delay (months)	-0.122 (0.007)	-0.097 (0.007)	-0.088 (0.005)	-0.081 (0.005)	-0.081 (0.005)
Log budget		0.416 (0.035)			
Inverse Mills Ratio	-2.060 (0.053)	-1.674 (0.060)	-0.476 (0.027)	-0.395 (0.022)	-0.393 (0.022)
Teen availability	Unacc.	Unacc.	Unacc.	Unacc.	Accomp.
Country-year FE	Y	Y	Y	Y	Y
Movie FE	.	.	Y	Y	Y
Country-content FE	.	.	.	Y	Y
Observations	29,004	29,004	29,004	29,004	29,004
No. of movies	1922	1922	1922	1922	1922

Note: Each observation is a country-movie. The dependent variable in all regressions is the log of the total box office revenue earned by the movie in that country. Country-content effects in Columns 4 and 5 include full interactions of each country with three measures on a 10-point scale of violent, sexual, and profanity content, as well as interactions of each country with 17 genre categories. Teen availability is defined using the unaccompanied measure in Columns 1–4 (the proportion of teenagers who can see the movie without a parent) and the accompanied measure in Column 5 (the proportion of teenagers who can see the movie, even with a parent). Bootstrap standard errors in parentheses are clustered by movie.

Table 2: Robustness checks for country-level movie revenue estimation results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Log admissions	Irish content	No cut anywhere	Balanced panel	Population measure	Exact prop.	Disagg. avail.
Teen availability (0-1)	0.297 (0.053)	0.254 (0.024)	0.248 (0.028)	0.266 (0.089)	2.751 (0.246)	0.275 (0.031)	
Availability 12-14 yrs							0.090 (0.028)
Availability 15-17 yrs							0.222 (0.030)
Same country (0/1)	0.362 (0.031)	0.545 (0.034)	0.608 (0.035)	0.118 (0.079)	0.559 (0.029)	0.559 (0.029)	0.558 (0.029)
Same language (0/1)	0.101 (0.028)	0.140 (0.026)	0.158 (0.022)	-0.033 (0.061)	0.148 (0.022)	0.148 (0.022)	0.149 (0.022)
Release delay (months)	-0.086 (0.006)	-0.091 (0.007)	-0.082 (0.005)	-0.106 (0.022)	-0.081 (0.005)	-0.081 (0.005)	-0.081 (0.005)
Inverse Mills Ratio	-0.204 (0.045)	-0.379 (0.013)	-0.419 (0.030)		-0.395 (0.022)	-0.395 (0.022)	-0.394 (0.022)
Dependent variable	Log Rev. Unacc.	Log Rev. Unacc.	Log Rev. Unacc.	Log Rev. Unacc.	Log Admit Population	Log Rev. Exact	Log Rev. Unacc.
Teen availability	Y	Y	Y	Y	Y	Y	Y
Country-year FE	Y	Y	Y	Y	Y	Y	Y
Movie FE	Y	Y	Y	Y	Y	Y	Y
Country-content FE	Y	Y	Y	Y	Y	Y	Y
Observations	17,161	23,890	23,826	2,358	29,004	29,004	29,004
No. of movies	1839	1337	1581	131	1922	1922	1922

Note: Each observation is a country-movie. The dependent variable in Column 1 is the log of total admissions for the movie in that country. In all other regressions the dependent variable is the log of the total box office revenue. Column 2 uses country interactions with the Irish content classifications. Column 3 drops all movies that were cut in any country. Column 4 includes only movies released in every one of the 18 countries in the data from 2002. Column 5 uses the percentage availability of the movie, out of the entire population aged 12 and over. Column 6 uses the exact percentage availability based on each country's population distribution of 12-17-year-olds. Column 7 splits the availability coefficient into two age categories. Bootstrap standard errors in parentheses are clustered by movie.

Table 3: Heterogeneity in movie revenue estimation results

	(1) Budget groups	(2) Movie appeal	(3) Teen plot keyword	(4) IMDb ratings	(5) Accomp. avail.
Teen availability (0–1)	0.377 (0.078)	0.296 (0.077)	0.263 (0.027)	0.141 (0.044)	0.246 (0.095)
× medium budget	-0.097 (0.087)				0.038 (0.105)
× high budget	-0.191 (0.090)				-0.105 (0.113)
× medium appeal		0.055 (0.080)			
× high appeal		-0.114 (0.094)			
× teen keyword			0.214 (0.166)		
× medium teen rating				0.166 (0.058)	
× high teen rating				0.167 (0.068)	
Inverse Mills Ratio	-0.420 (0.028)	-0.386 (0.025)	-0.397 (0.021)	-0.397 (0.023)	-0.420 (0.030)
Teen availability	Unacc.	Unacc.	Unacc.	Unacc.	Accomp.
Country-year FE	Y	Y	Y	Y	Y
Movie FE	Y	Y	Y	Y	Y
Country-content FE	Y	Y	Y	Y	Y
Observations	29,004	29,004	29,004	29,004	29,004
No. of movies	1922	1922	1922	1922	1922

Note: Each observation is a country-movie. The dependent variable in all columns is the log of the total box office revenue. All regressions include the same country, same language, and release delay variables (not shown). Columns 1 and 5 show interactions of teen availability (unaccompanied and accompanied) with tercile indicators for the production budget. Column 2 shows the interaction of availability with tercile indicators for the box office appeal, where this is calculated as the movie fixed effect from a regression of log revenue on country-year indicators, the language, country, and release delay variables, and movie fixed effects. Column 3 shows the interaction of availability with an indicator for the presence of “teenage movie” keywords in the IMDb plot keyword lists. Column 4 shows the interaction of availability with tercile indicators for the share of user reviews for the movie provided by IMDb users aged 18 or under. Bootstrap standard errors in parentheses are clustered by movie.

Table 4: Mean effect on box office revenue of increasing teen availability from 0 to 1, by country, budget, and teen rating categories

Country US\$ million	Budget categories			Teen rating categories		
	Low	Medium	High	Low	Medium	High
Germany	0.82	0.88	2.17	0.48	2.29	2.55
Iceland	0.02	0.02	0.03	0.01	0.03	0.04
Japan	1.32	1.40	3.10	0.97	3.95	4.37
Netherlands	0.23	0.23	0.48	0.12	0.52	0.65
UK	1.46	1.64	3.49	0.66	3.56	4.42
USA	6.90	11.11	19.80	3.90	19.97	22.52

Note: The table shows, for the six self-regulated countries, the mean effect on revenue of an increase in the unaccompanied teen availability measure from 0 to 1. The first three columns show the mean effect for the terciles of production budget, based on the results in Column 1 of Table 3. The second three columns show the mean effect for the terciles of the teen rating measure, based on Column 4 of Table 3.

Table 5: Differences-in-differences analysis for introduction of self-regulation in Iceland

	(1) Iceland only	(2) Budget interact	(3) Nordic countries	(4) Country specific	(5) Movie FE
Iceland \times Self-Regulation	0.041 (0.010)		0.040 (0.014)	0.036 (0.014)	0.034 (0.015)
\times low budget		-0.044 (0.030)	-0.047 (0.029)	-0.050 (0.031)	0.007 (0.038)
\times medium budget		-0.046 (0.022)	-0.047 (0.021)	-0.047 (0.022)	-0.047 (0.024)
Sample	Iceland	Iceland	Nordic	Nordic	Nordic
Content controls	Y	Y	Y	Y	Y
Release year FE	.	Y	Y	Y	Y
Country \times budget groups	.	.	Y	Y	Y
Country \times content	.	.	.	Y	Y
Movie FE	Y
Observations	1,226	1,226	4,965	4,965	4,965
No. of movies	1226	1226	1226	1226	1226

Note: Each observation is a country-movie. The dependent variable is the unaccompanied teen availability of the movie in each country. Models 1 and 2 only contain data for Iceland. Models 3, 4, and 5 contain data for Iceland, Denmark, Norway, Sweden, and Finland. The variable “Iceland \times Self-Regulation” is 1 for observations for Iceland with a release date in 2007 or later. This variable is also interacted with tercile indicators for “Low” and “Medium” budget. Standard errors in parentheses are clustered by movie.

Table 6: Teen availability by type of regulation

	(1) Budget groups	(2) Movie appeal	(3) Teen plot keyword	(4) IMDB ratings	(5) Accomp. avail.
Self-regulation (0/1)					
× medium budget	0.025 (0.009)				0.007 (0.007)
× high budget	0.043 (0.010)				0.022 (0.008)
× medium appeal		-0.002 (0.009)			
× high appeal		0.024 (0.011)			
× teen keyword			0.027 (0.010)		
× medium teen rating				0.026 (0.009)	
× high teen rating				0.048 (0.009)	
Dep. var. (availability)	Unacc.	Unacc.	Unacc.	Unacc.	Accomp.
Country-year FE	Y	Y	Y	Y	Y
Movie FE	Y	Y	Y	Y	Y
Country-content FE	Y	Y	Y	Y	Y
Observations	29,004	29,004	29,004	29,004	29,004
No. of movies	1922	1922	1922	1922	1922

Note: Each observation is a country-movie. The dependent variable in Models 1 to 4 is the unaccompanied teen availability of the movie in each country. This is measured on a scale from 0 to 1, where 0 means that no teenagers aged 10–17 can see the movie unaccompanied, and 1 means that all can. The dependent variable in Model 5 is the accompanied teen availability, measured as the proportion of teenagers who can see the movie, even with a parent. Model 4 uses the sample of country-movie observations from Table 1 for which we have revenue data. Standard errors in parentheses are clustered by movie.

Table 7: Robustness checks for teen availability by type of regulation

	(1) Irish content	(2) No cut anywhere	(3) Balanced panel	(4) Population measure	(5) Exact prop.
Self-regulation (0/1)					
× medium budget	0.009 (0.009)	0.030 (0.010)	0.041 (0.033)	0.002 (0.001)	0.025 (0.009)
× high budget	0.015 (0.011)	0.054 (0.011)	0.049 (0.040)	0.003 (0.001)	0.043 (0.010)
Dep. var. (availability)	Unacc.	Unacc.	Unacc.	Population	Exact
Country-year FE	Y	Y	Y	Y	Y
Movie FE	Y	Y	Y	Y	Y
Country-content FE	Y	Y	Y	Y	Y
Observations	23,890	23,826	2,358	29,004	29,004
No. of movies	1337	1581	131	1922	1922

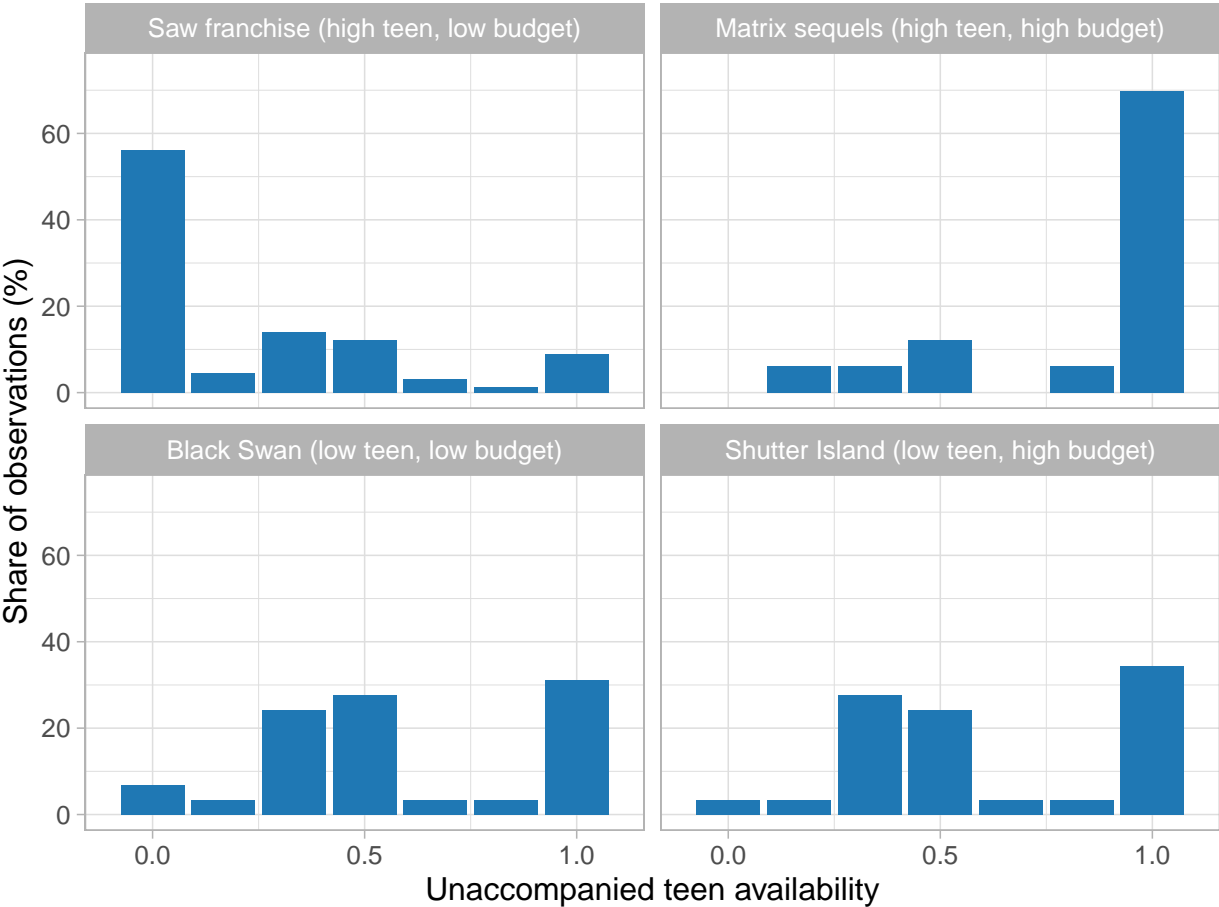
Note: See notes to Tables 2 and 6.

Table 8: Teen availability by type of regulation, with split of self-regulation category

	(1) Budget groups	(2) Movie appeal	(3) Teen plot keyword	(4) IMDB ratings	(5) Accomp. avail.
United States (0/1)					
× medium budget	0.054 (0.018)				-0.011 (0.007)
× high budget	0.077 (0.019)				-0.019 (0.008)
× medium appeal		0.057 (0.017)			
× high appeal		0.044 (0.020)			
× teen keyword			0.059 (0.018)		
× medium teen rating				0.061 (0.017)	
× high teen rating				0.128 (0.018)	
Co-regulation (0/1)					
× medium budget	0.013 (0.009)				0.014 (0.009)
× high budget	0.031 (0.010)				0.037 (0.010)
× medium appeal		0.026 (0.009)			
× high appeal		0.042 (0.011)			
× teen keyword			0.017 (0.010)		
× medium teen rating				0.014 (0.008)	
× high teen rating				0.019 (0.009)	
Dep. var. (availability)	Unacc.	Unacc.	Unacc.	Unacc.	Accomp.
Observations	29,004	29,004	29,004	29,004	29,004
No. of movies	1922	1922	1922	1922	1922

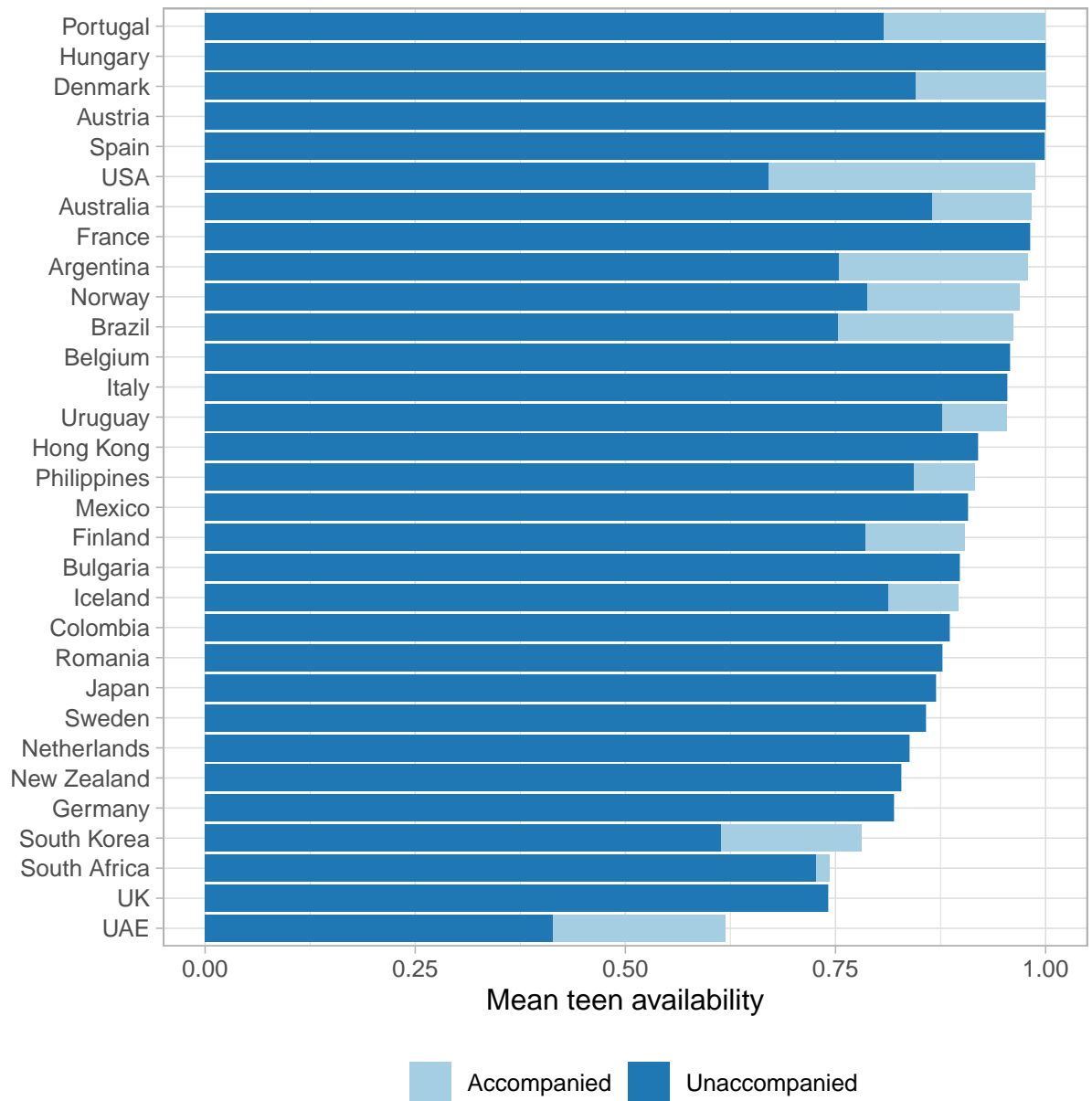
Note: See notes to Table 6. All regressions include movie fixed effects, country-year fixed effects, and country-content interactions.

Figure 1: Distribution of teen availability across countries, for selected franchises and movies



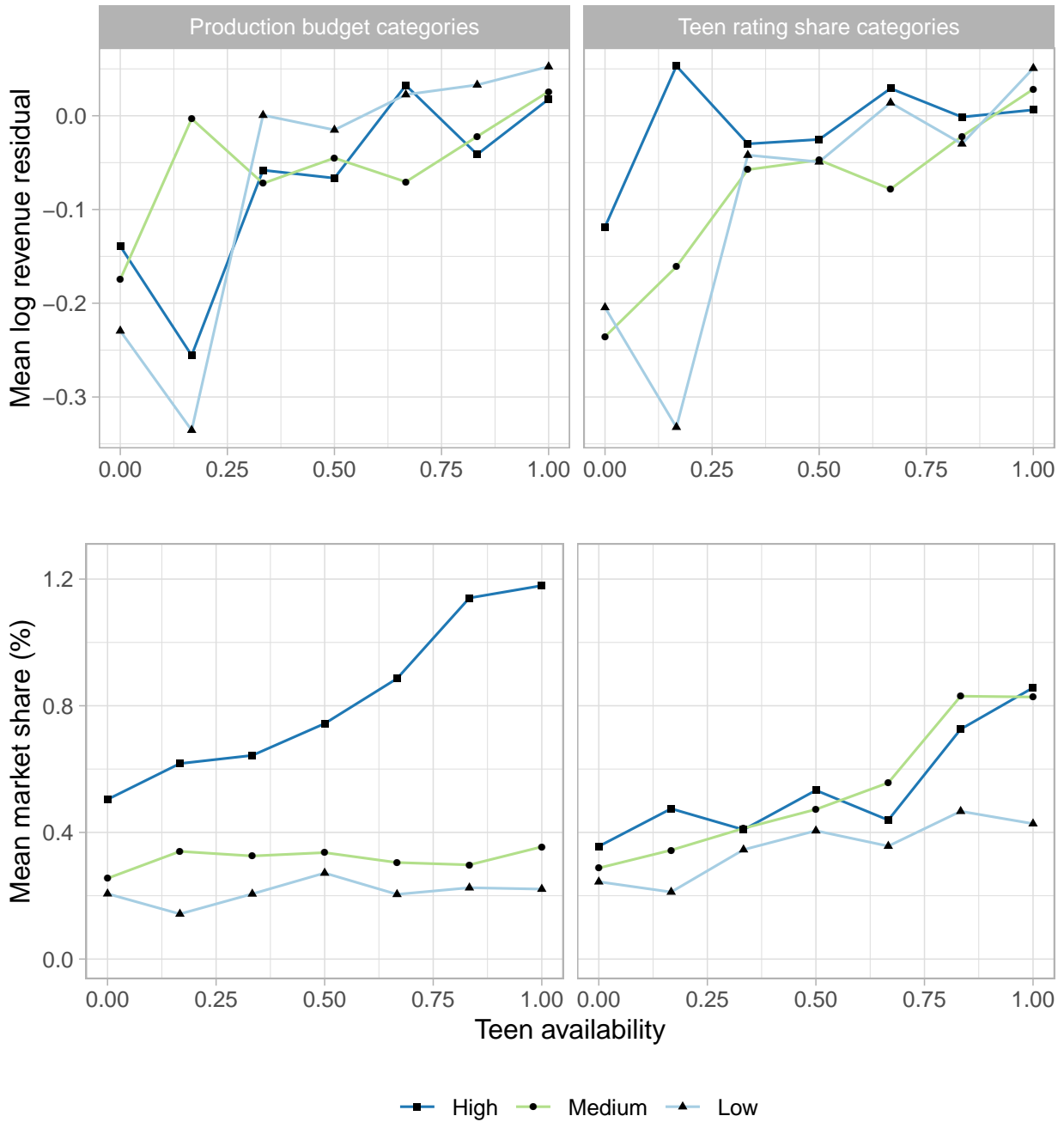
Note: The graphs show the distribution of the unaccompanied teen availability measure for the 31 countries in our data, for all movies in each franchise (*Saw* or the two *Matrix* sequels) or the movies *Black Swan* and *Shutter Island*. These four movies or franchises are representative of the combinations of low and high production budget terciles and low and high teen rating terciles.

Figure 2: Mean teen availability across countries



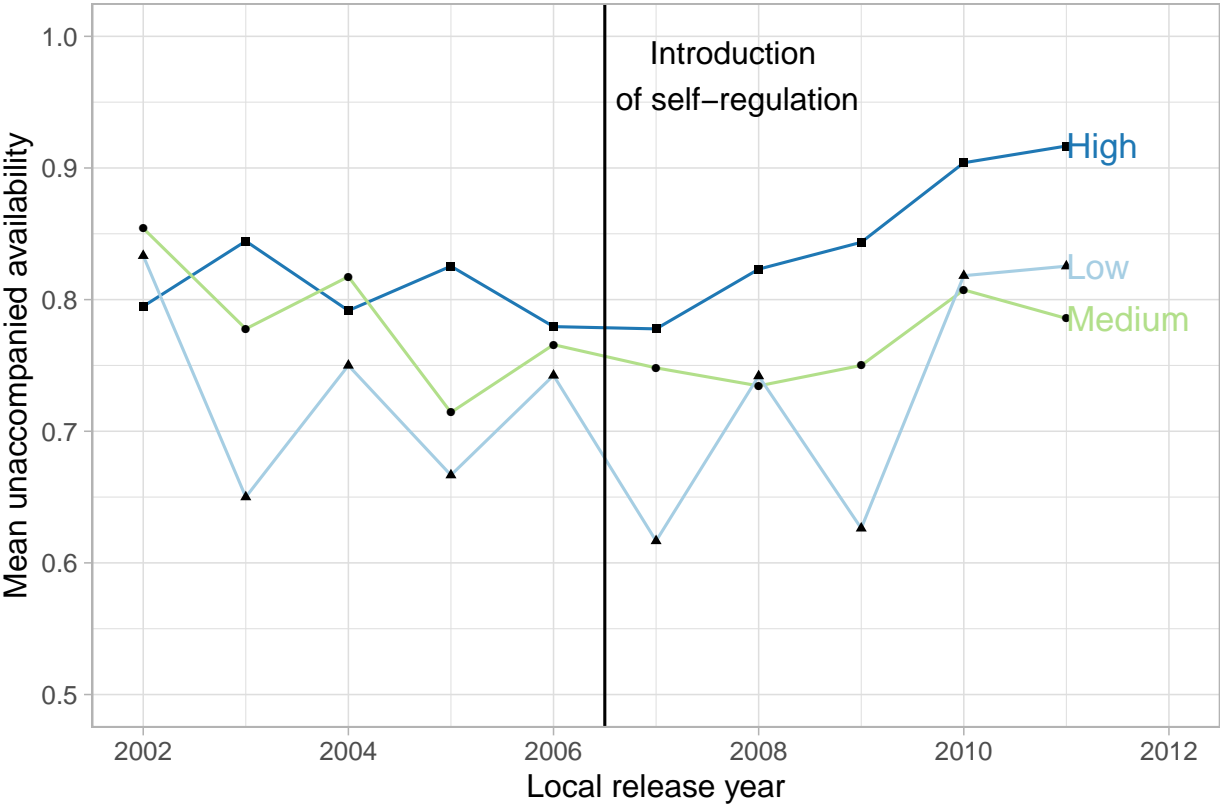
Note: The figure shows the mean for each country of the teen availability measures, for the observations in our estimation sample. Unaccompanied teen availability measures the proportion of age groups between 12 and 17 years that are permitted to watch a movie without a parental guardian. Accompanied teen availability (represented by the total length of the bar) measures the proportion permitted to watch a movie with or without a parental guardian. Data on classifications for each movie are from IMDb (2017), rating agency websites, and cinema websites.

Figure 3: Teen availability and box office performance



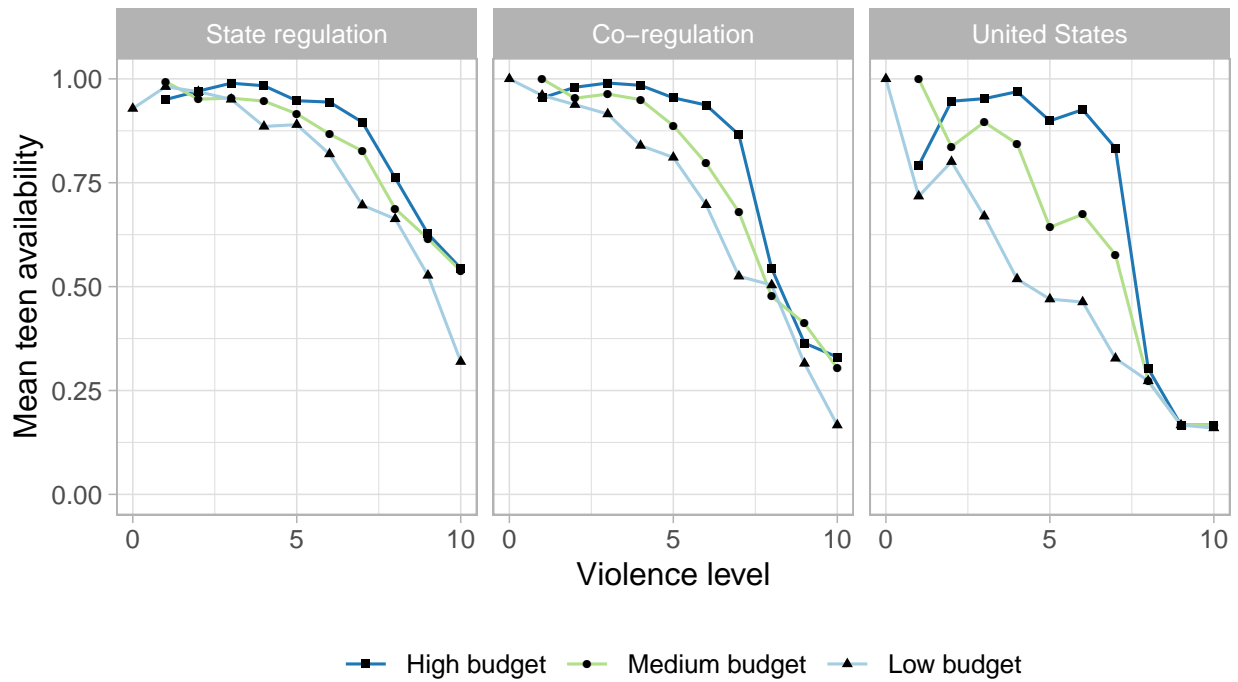
Note: The top two panels show the mean residuals for each level of teen availability, by production budget group (left) and share of IMDb ratings by users aged under 18 (right), from a regression of log total revenue on (i) movie fixed effects and (ii) country-by-year effects. The bottom two panels show the mean market shares for each level of teen availability. Market share is the total revenue of the movie in a country, divided by the total revenue for all movies in that country and year (including revenue for those movies not in our estimation sample).

Figure 4: Availability to teenagers in Iceland, before and after the introduction of self-regulation, by production budget category



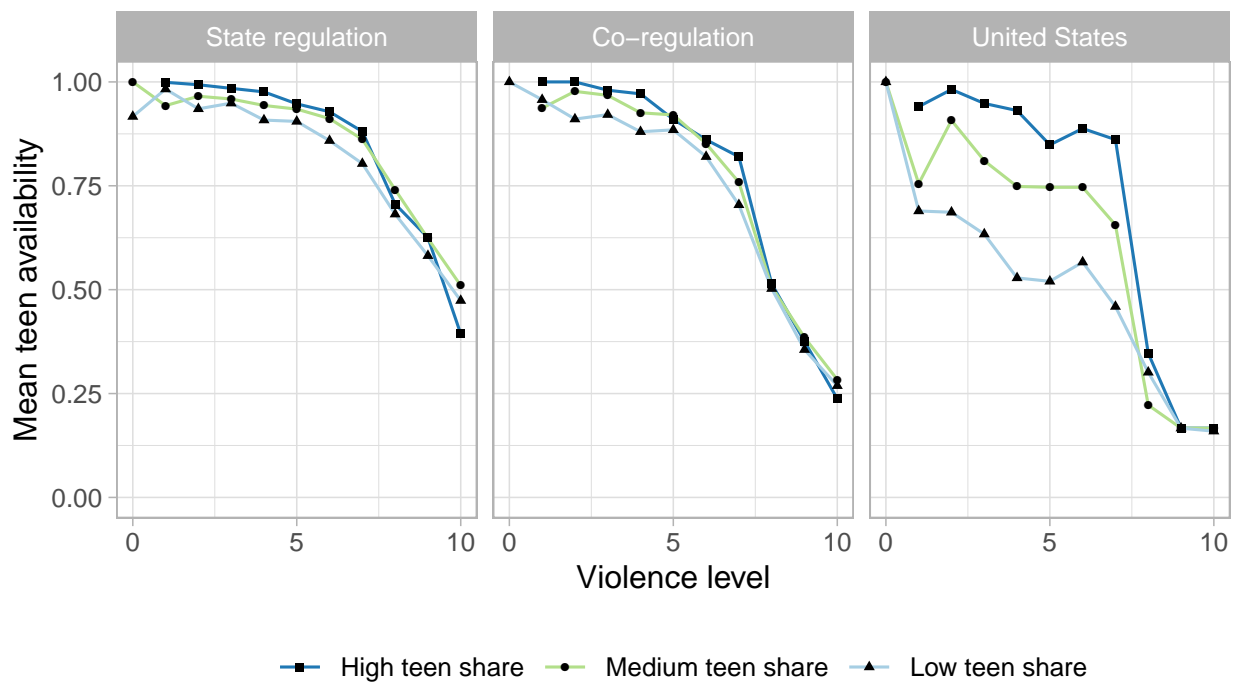
Note: Each line shows the mean teen availability of movies released in Iceland each year, split by the terciles of the production budget.

Figure 5: Availability to teenagers by violence level and production budget categories, by type of regulation



Note: Each panel shows the mean teen availability, for each level of violent content, split by the production budget categories. The three graphs show the mean availability for state-regulated countries, for co-regulated countries (Germany, Iceland, Japan, the Netherlands, and the United Kingdom), and for the United States. A larger gap between the high and low budget lines suggests relatively more lenience towards high budget movies.

Figure 6: Availability to teenagers by violence level and teen rating share categories, by type of regulation



Note: Each panel shows the mean teen availability, for each level of violent content, split by the IMDb teen rating share categories. See also notes to Figure 5.

A Supplemental information about rating systems

Table A1: Countries and regulation

Country	Regulation	Ratings Agency	Parent Organization	Parent type	Legislation
United States	Self	Classification and Rating Administration	Motion Picture Association of America	Trade	
Germany	Self	Voluntary self-regulation board of the film industry	Head Organization of Film Industry (SPIO)	Trade	Yes
Iceland	Self	Organization of Photographers in Iceland (SMÁÍS)		Trade	Yes
Japan	Self	Film Classification and Rating Committee		Trade	Yes
Netherlands	Self	NICAM		Trade	Yes
United Kingdom	Self	British Board of Film Classification		Trade	Yes
Argentina	State	Cinematographic Exhibition Advisory Commission	Ministry of Culture of the Nation	Govt.	Yes
Australia	State	Australian Classification Board	Department of Communication and the Arts	Govt.	Yes
Austria	State	Austrian Board of Media Classification	Federal Ministry of Education, Science and Culture	Govt.	Yes
Belgium	State	Intercommunity Commission of Film Control	(Agreement b/w different communities)	Govt.	Yes
Brazil	State	Department of Justice, Rating, Titles and Qualification	Ministry of Justice	Govt.	Yes
Bulgaria	State	National Commission of Film Classification	Ministry of Culture	Govt.	Yes
Colombia	State	Film Classification Committee	Ministry of Culture	Govt.	Yes
Denmark	State	Media Council for Children and Young People	Ministry of Culture	Govt.	Yes
Finland	State	Finnish Board of Film Classification	Ministry of Education and Culture	Govt.	Yes
France	State	Film Classification Committee	Ministry of Culture and Communication	Govt.	Yes
Hong Kong	State	Film Censorship Authority	Office for Film, Newspaper and Article Administration	Govt.	Yes
Hungary	State	National Media and Infocommunications Authority	Ministry of National Cultural Heritage	Govt.	Yes
Italy	State	Revision Commission	Ministry of Cultural Heritage and Activities	Govt.	Yes
Mexico	State	Director General of Radio, Television & Cinematography	Ministry of the Interior	Govt.	Yes
New Zealand	State	Office of Film & Literature Classification	Department of Internal Affairs	Govt.	Yes
Norway	State	Norwegian Media Authority (Medietilsynet)	Ministry of Culture and Church Affairs	Govt.	Yes
Philippines	State	Movie and Television Review and Classification Board	Office of the President	Govt.	Yes
Portugal	State	Performance Classification Committee	Ministry of Culture	Govt.	Yes
Romania	State	National Center of Cinematography	Ministry of Culture and Religious Affairs	Govt.	Yes
South Africa	State	Film and Publication Board	Department of Communications	Govt.	Yes
South Korea	State	Korea Media Rating Board	Ministry of Culture, Sports and Tourism	Govt.	Yes
Spain	State	Commission for Film Classification	Ministry of Education, Culture and Sport	Govt.	Yes
Sweden	State	Swedish Media Council	Ministry of Culture	Govt.	Yes
UAE	State	National Media Council	Ministry of Information and Cultural Affairs	Govt.	Yes
Uruguay	State	Institute for Children and Adolescents of Uruguay	Ministry of Social Development	Govt.	Yes

Note: Agencies and legislation are shown as of 2013. Legislation refers to laws that require distributors to obtain certifications or make it illegal to show disturbing content to minors. Compiled from a variety of sources, including ratings agency websites and European Commission (2003). A list of sources is available upon request.

Figure A1: Rating systems for the 31 countries in our sample

Country	Age																						
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20			
Argentina	ATP												<u>13</u>				<u>16</u>						<u>18</u>
Australia	G									PG			M/MA			<u>R</u>							
Austria	U					6				10	12		14		16								
Belgium	KT															<u>KNT</u>							
Brazil	L									10	12		14		16			18					
Bulgaria	A / B											C			D			<u>X</u>					
Colombia	ATP						7						12	15			18						
Denmark	A						7	11					15										
Finland			3				<u>7</u>				11	13		15			18						
France	U									10			12			16			18				
Germany	FSK 0					<u>FSK 6</u>					FSK 12					FSK 16			FSK 18				
Hong Kong	I / IIA / IIB																	<u>III</u>					
Hungary	I											II			III			IV / V					
Iceland	L						7						12	14		16			18				
Italy	T												VM14			VM18							
Japan	G											PG12			R15			R18					

Note: Data on ratings from individual rating agency websites. A single underline indicates audiences under specified age require an adult guardian. A double underline indicates audiences under specified age not admitted.

Figure A1 (Cont.): Rating systems for the 31 countries in our sample

Country	Age																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Mexico	AA						A					B			B15			<u>C / D</u>		
Netherlands	AL					6			9			12				<u>16</u>				
New Zealand	G / PG									M			<u>R13</u>		<u>R15</u>	<u>R16</u>		<u>R18</u>		
Norway	A						<u>7</u>				<u>11</u>				<u>15</u>			<u>18</u>		
Philippines	G / PG												<u>R13</u>			<u>R16</u>		<u>R18</u>		
Portugal				M4		M6						M12				M16		M18		
Romania	AG											AP12			N15			<u>IM18</u>		
South Africa	A / PG										<u>10 / 10M</u>			<u>13 / 13M / 13PG</u>	<u>16</u>			<u>18</u>		
South Korea	ALL											12			15			<u>18</u>		
Spain	APTA						7					12				16		<u>18 / X</u>		
Sweden	BTL						<u>7</u>				<u>11</u>				<u>15</u>					
United Arab Emirates	G												PG13		PG15 / <u>15+</u>			<u>18+</u>		
United Kingdom	U							PG				12A			<u>15</u>			<u>18 / R</u>		
Uruguay	ATP								9			12			15			<u>18</u>		
United States	G										PG			PG-13			R	<u>NC-17</u>		

Note: Data on ratings from individual rating agency websites. A single underline indicates audiences under specified age require an adult guardian. A double underline indicates audiences under specified age not admitted.

B Construction of the data set

B.1 Movie sample

The criteria for a movie to be included in our sample are:

1. Released for the first time between January 1, 2002 and December 31, 2011;
2. Wide theatrical release in the United States, with revenue data for the United States listed in Box Office Mojo (2019); and
3. Content ratings provided by Kids-In-Mind (2019b).

There are 2,332 movies listed on Kids-In-Mind (2019b) for the years 2001 to 2012. We drop 410 movies from this list for the following reasons:

1. Thirteen movies that had only limited releases in the United States (such as film festivals) and that have no United States revenue listed on Box Office Mojo (2019).
2. Two movies that have separate entries on Kids-In-Mind but have combined revenue on Box Office Mojo. These were the movies *Che: Part One* and *Che: Part Two*. They were initially released theatrically in the United States as a single movie and their box office data is only reported as a single movie.
3. Twenty movies that are listed on Kids-In-Mind as 2002 movies but that were released for the first time during 2001.
4. Seven movies that are listed on Kids-In-Mind as 2010 or 2011 movies but that were released for the first time during 2012.
5. 159 movies that are listed on Kids-In-Mind as 2001 movies and were released for the first time in 2001 or earlier.
6. 209 movies that are listed on Kids-In-Mind as 2012 movies and were released for the first time in 2012 or later.

After these deletions we have a sample of 1,922 movies. These include nine movies that were listed on Kids-In-Mind as 2012 movies but were released for the first time during 2011. They also include two movies that were listed on Kids-In-Mind as 2001 movies but were released during 2002.

B.2 Country sample

To construct our sample of countries, we begin with a list of 50 countries with the most movie-revenue observations during our sample period (2002–11) on Box Office Mojo (2019) (400+ observations). We then eliminate countries for which:

1. We could not locate a source for ratings during our sample period, either an official ratings website with a database of classifications or a cinema website with information on classifications (10 countries: Chile, Croatia, Czech Republic, Lithuania, Malaysia, Russia, Slovakia, Taiwan, Thailand, and Turkey)
2. An official ratings agency website could not be found (6 countries: Bolivia, Greece, Lebanon, Peru, Serbia, and Ukraine)
3. The country issues multiple ratings for different versions of the same movie (1 country: Singapore)
4. Ratings are not set by an official agency (1 country: Poland)
5. Different regions/municipalities assign different ratings (1 country: Venezuela)

The resulting sample of 31 countries includes all 10 countries with the largest number movie-revenue observations (1,250+ observations), and 17 of the 20 countries with the most revenue observations (931+ observations).

B.3 Country-movie sample

With 31 countries and 1,922 movies, the theoretical maximum number of country-movie observations in our estimation sample is 59,582. However, we do not observe box office revenue and/or the certificates for all movies in all countries.

For the early part of our sample period, Box Office Mojo does not report revenue data for many countries. For each country, we identified the first year for which Box Office Mojo began to report consistent weekly box office data for all (or nearly all) the movies released in the country.³⁶ Box Office Mojo has sporadic reports of box office revenues for some movies in the country before the first year of consistent reporting. However, these

36. There is some variation across countries in the lower cutoff for reporting the box office data. In some countries, data for all movies is reported, even if there are only a handful of tickets sold in a week. In other countries, only data for the 10 or 20 highest-grossing movies are reported each week.

observations will not be representative of the industry in that country and year, because they are only a selected sample of the largest movies.

We drop all observations in each country from before the first year of consistent reporting. Movies are dropped based on the first year that they are released anywhere in the world. For example, the first year of consistent reporting for Colombia was 2009. All movies released for the first time in 2008 or earlier are excluded from the Colombian sample, even if revenue data is available. Moreover, a movie released in the United States in 2008, and in Colombia in 2009, will also be dropped from the Colombian sample.

Data is available for all 31 countries in our sample from 2009 to 2011 (Figure B1). There are 18 countries in our sample between 2002 and 2005. Out of the theoretical maximum 59,582 observations in our data, we drop 13,217 country-movie combinations for the years before the consistent reporting of Box Office Mojo data (Column 3, Table B1).

Not every movie is released in every country, where we define a movie as being released if it has revenue data reported on Box Office Mojo. This definition of “released” is also why we dropped country-years without consistent reporting of revenue data on Box Office Mojo. By definition, all of the movies in our sample were released in the United States. The number of movies that were not released in a country varies from 201 (for the four years of data for South Africa) to 1,074 (for the ten years of data for Japan). In total, we drop an additional 15,726 country-movie combinations where the movie was not released in that country (Column 4, Table B1).

Finally, even for the movies that were released, in some cases we were unable to find rating information for the movie in that country. We found the ratings for every movie in Argentina, Australia, Germany, Norway, South Korea, the United Kingdom, and the U.S. There were six countries with more than 100 missing ratings: Austria, Bulgaria, Finland, Japan, South Africa, and the United Arab Emirates. We drop 1,635 country-movies combinations due to the lack of a rating (Column 5, Table B1).

After dropping observations for these three reasons—lack of consistent reporting on Box Office Mojo, movie unreleased in a country, and lack of rating information—we are left with an estimation sample of 29,004 observations. For more than half of the movies in the sample (1,013 movies), we have data for at least 15 countries (Figure B2). The data for these movies represents 75.7 percent of the country-movie observations in our estimation sample (Figure B3). There are approximately 2,000 observations per year for 2002–2006, and about 3,800 observations per year for 2007–2011 (Figure B4).

Table B1: Decomposition of the number of sample observations, by country

Country	First year	Observations				
		Max.	Pre-period	No release	No rating	Final
Argentina	2002	1922	0	(773)	0	1149
Australia	2001	1922	0	(387)	0	1535
Austria	2002	1922	0	(714)	(171)	1037
Belgium	2007	1922	(936)	(249)	(14)	723
Brazil	2007	1922	(936)	(321)	(4)	661
Bulgaria	2002	1922	0	(992)	(226)	704
Colombia	2009	1922	(1345)	(257)	(9)	311
Denmark	2007	1922	(936)	(456)	(9)	521
Finland	2002	1922	0	(901)	(172)	849
France	2002	1922	0	(486)	(13)	1423
Germany	2001	1922	0	(460)	0	1462
Hong Kong	2002	1922	0	(937)	(33)	952
Hungary	2002	1922	0	(991)	(7)	924
Iceland	2008	1922	(1146)	(268)	(14)	494
Italy	2002	1922	0	(484)	(96)	1342
Japan	2002	1922	0	(1074)	(441)	407
Mexico	2002	1922	0	(479)	(74)	1369
Netherlands	2002	1922	0	(673)	(2)	1247
New Zealand	2002	1922	0	(584)	(10)	1328
Norway	2002	1922	0	(806)	0	1116
Philippines	2007	1922	(936)	(418)	(5)	563
Portugal	2007	1922	(936)	(267)	(1)	718
Romania	2007	1922	(936)	(480)	(1)	505
South Africa	2008	1922	(1146)	(201)	(128)	447
South Korea	2007	1922	(936)	(439)	0	547
Spain	2002	1922	0	(348)	(14)	1560
Sweden	2006	1922	(736)	(470)	(7)	709
UAE	2008	1922	(1146)	(220)	(164)	392
UK	2002	1922	0	(296)	0	1626
Uruguay	2008	1922	(1146)	(295)	(20)	461
USA	2000	1922	0	0	0	1922
Total		59582	(13217)	(15726)	(1635)	29004

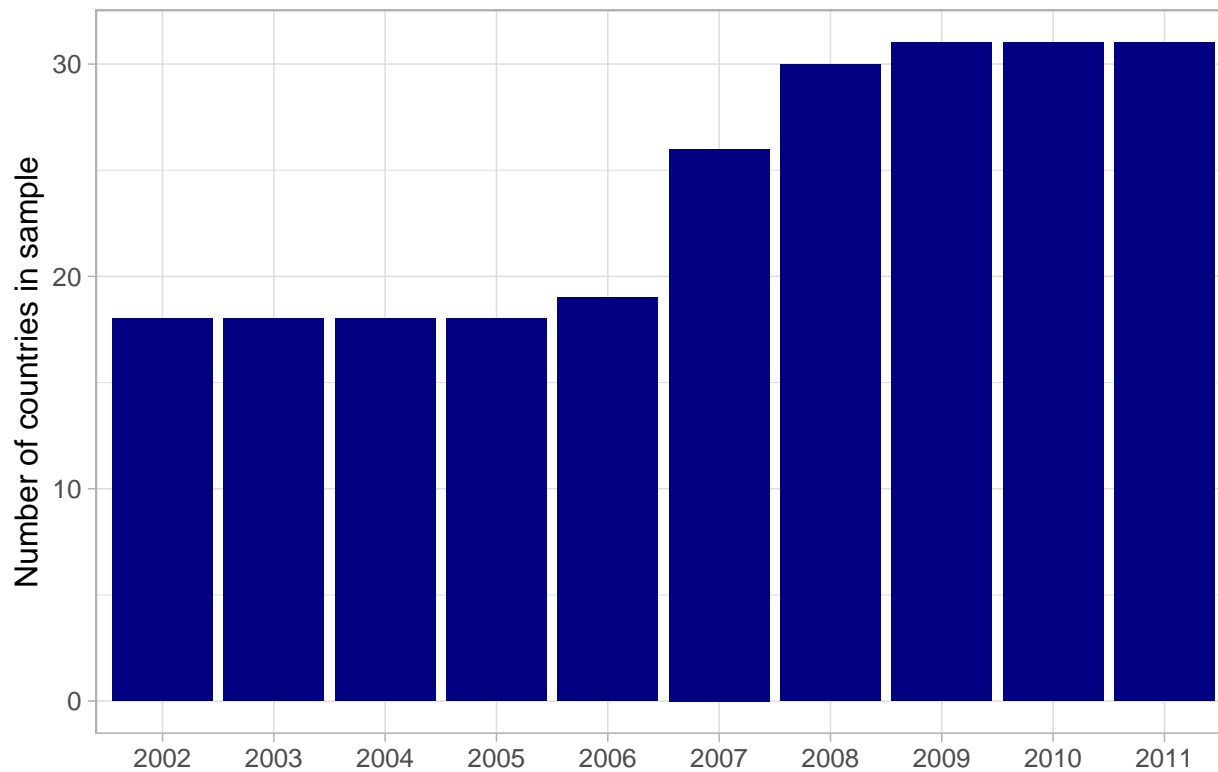
Note: "First year" is the first full year with complete box office information for the country on Box Office Mojo (2019). "Max" is the theoretical maximum number of observations for each country (one observation per movie in the sample). "Pre-period" are the movies that were released before the first full year in that country. "No release" are movies that were not released in the country. "No rating" are movies that were released but for which we do not have rating information.

Table B2: Sources for ratings data

Country	Classifications source	Type
Argentina .	http://calificaciones.incaa.gob.ar/	R
Australia	http://www.classification.gov.au/	R
Austria	https://jmkextern.bmb.gv.at/	R
Belgium	https://kinepolis.be/nl/	C
Brazil	http://portal.mj.gov.br/ClassificacaoIndicativa/	R
Bulgaria	https://www.nfc.bg/en/	R
Colombia	http://www.proimágenescolombia.com/	C
Denmark	https://www.dfi.dk/en/viden-om-film/filmdatabasen/film	R
Finland	https://kavi.fi/en/	R
France	https://www.cnc.fr/professionnels/visas-et-classification	R
Germany	https://www.spio-fsk.de/	R
Hong Kong	https://www.ofnaa.gov.hk/eng/service/film_search.htm	R
Hungary	http://nmhh.hu/	R
Iceland	http://www.kvikmyndaskodun.is/	R
Italy	http://www.cinema.beniculturali.it/	R
Japan	http://www.eirin.jp/english/	R
Mexico	http://www.rtc.gob.mx/	R
Netherlands	http://www.kijkwijzer.nl/	R
New Zealand	http://www.fvlb.org.nz/	R
Norway	https://medietilsynet.no/filmdatabasen/	R
Philippines	http://www.mtrcb.gov.ph/	R
Portugal	https://www.igac.gov.pt/classificacao-etaria/cinema	R
Romania	http://cnc.abt.ro/registru/index.aspx?pageID=2	R
South Africa	http://fpbquery.fpb.org.za/erms/	R
South Korea	http://m.kmr.or.kr/	R
Spain	https://sede.mcu.gob.es/	R
Sweden	https://www.statensmedierad.se/	R
UAE	http://www.timeoutdubai.com/films/archive/	C
United Kingdom	https://bbfc.co.uk/	R
Uruguay	http://www2.cartelera.com.uy/	C
United States	https://www.filmratings.com/	R

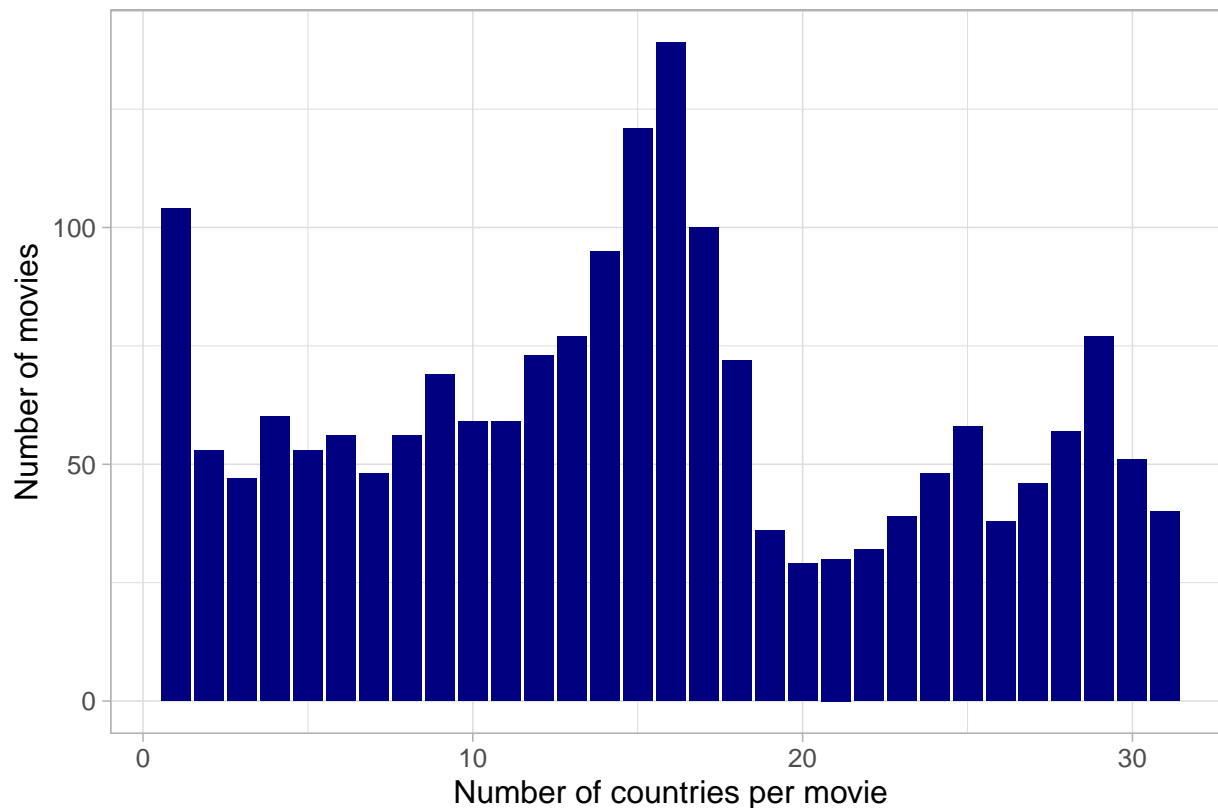
Note: R=Official ratings agency website, C=Cinema website. Additional classifications from IMDb (2017).

Figure B1: Number of countries with complete box office information, by year



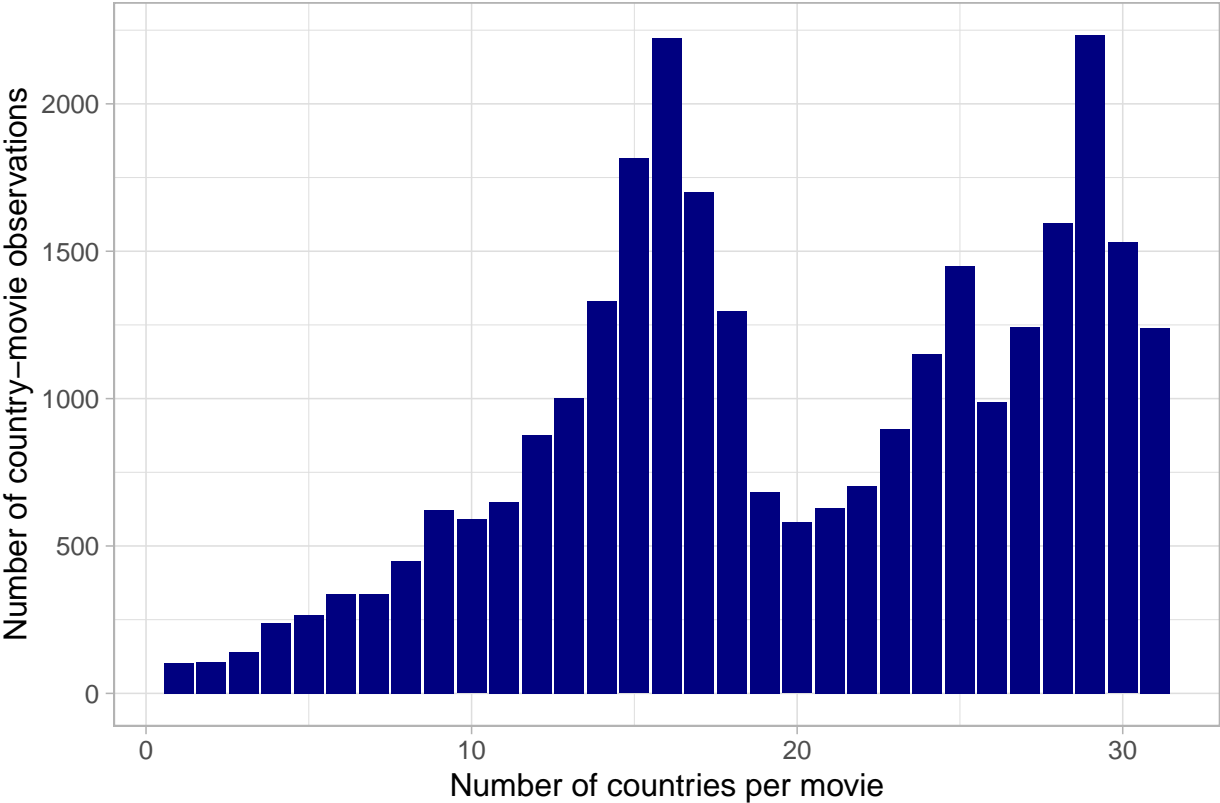
Note: For each year, the graph shows the number of countries in the sample for which we have complete box office information from Box Office Mojo (2019)

Figure B2: Distribution of the number of countries per movie in the estimation sample



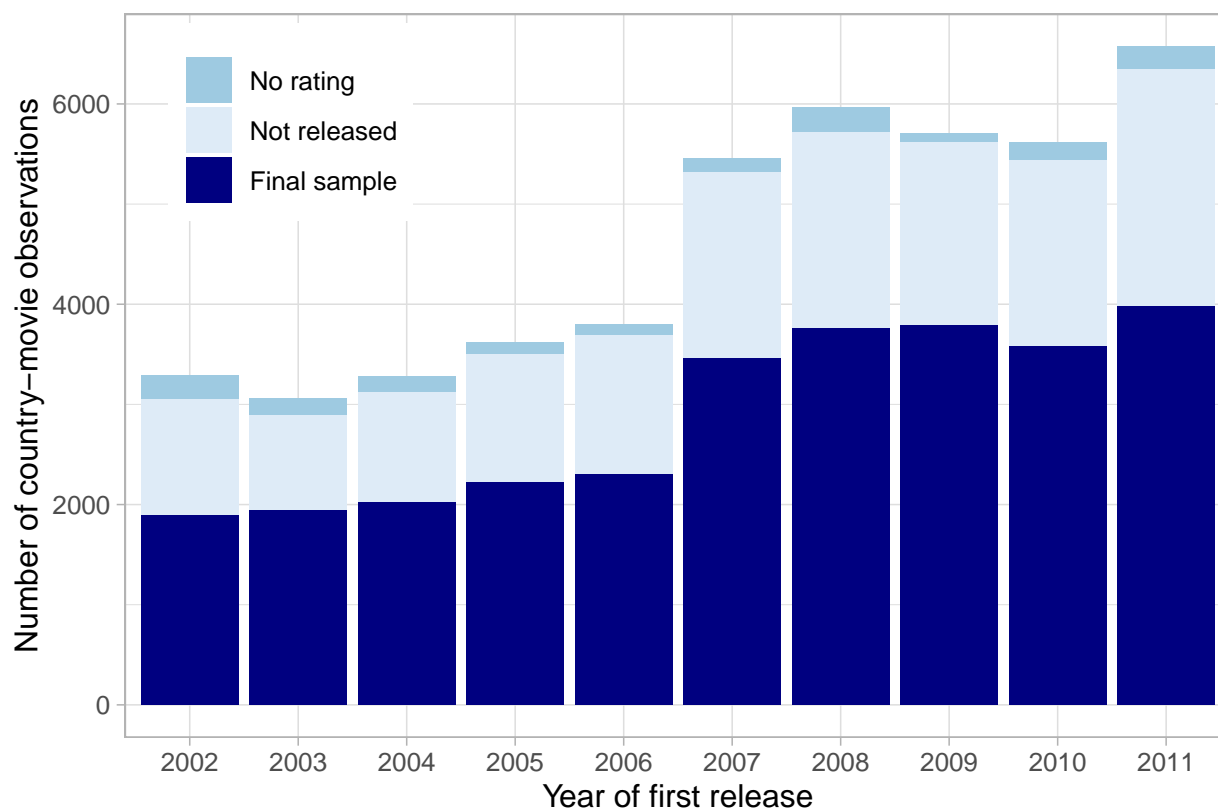
Note: For each of the 1,922 movies, we counted the number of observations for that movie in our sample. The horizontal axis shows the observation count, where the maximum value (31) corresponds to the number of countries in our sample. The vertical bars show the number of movies for each observation count. The total sum of all the bars is equal to the 1,922, the total number of movies.

Figure B3: Total number of country-movie observations, by the number of countries per movie



Note: The graph is constructed in the same way as Figure B2, except now the vertical bars show the number of country-movie observations for each observation count. The total sum of all of the bars is 29,004, the total number of observations in the estimation sample.

Figure B4: Decomposition of country-movie observations per year



Note: For each year, the bottom bar shows the total number of observations in our estimation sample. The top two bars show the reasons for not including observations in our sample: (i) lack of information about the movie rating in a country, and (ii) the movie was not released in a country. The year shown on the horizontal axis is the first year in which the movie was released anywhere.