

# Does Conflict of Interest Lead to Biased Coverage? Evidence from Movie Reviews\*

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## Abstract

Media outlets are increasingly owned by conglomerates, inducing a conflict of interest: a media outlet can bias its coverage to benefit companies in the same group. We test for bias by examining movie reviews by media outlets owned by News Corp.—such as the *Wall Street Journal*—and by Time Warner—such as *Time*. We use a matching procedure based on reported preferences to disentangle bias due to conflict of interest from correlated tastes. We find no evidence of bias in the reviews for 20th Century Fox movies in the News Corp. outlets, nor for the reviews of Warner Bros. movies in the Time Warner outlets. We can reject even small effects, such as biasing the review by one extra star (out of four) every 13 movies. We test for differential bias when the return to bias is plausibly higher, examine bias by media outlet and by journalist, as well as editorial bias. We also consider bias by omission: whether the media at conflict of interest are more likely to review highly-rated movies by affiliated studios. In none of these dimensions do we find systematic evidence of bias. Lastly, we document that conflict of interest within a movie aggregator does not lead to bias either. We conclude that media reputation in this competitive industry acts as a powerful disciplining force.

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# 1 Introduction

On Dec. 13, 2007, News Corp. officially acquired Dow Jones & Company, and hence the *Wall Street Journal*, from the Bancroft family. The acquisition was controversial in part because of concerns about a conflict of interest. Unlike the Bancroft family whose holdings were limited to Dow Jones & Company, Murdoch's business holdings through News Corp. include a movie production studio (20th Century Fox), cable channels such as Fox Sports and Fox News, and satellite televisions in the Sky group, among others. The *Wall Street Journal* coverage of businesses in these sectors may be biased to benefit the parent company, News Corp.

The *Wall Street Journal* case is hardly unique. Media outlets are increasingly controlled by large corporations, such as Comcast, which owns NBC and Telemundo, the Hearst Corporation, which owns a network of newspapers and ESPN, and Time Warner, which owns HBO, CNN, and other media holdings. Indeed, in the highly competitive media industry, consolidation with the ensuing economies of scale is widely seen as a necessary condition for survival.

But is this consolidation without cost for the quality of coverage given the induced conflict of interest? Addressing this question is important, since potential biases in coverage can translate into a policy concern in the presence of sizeable persuasion effects from the media (e.g., DellaVigna and Kaplan, 2007; Enikolopov, Petrova, and Zhuravskaya, 2011).

Yet should we expect coverage to be biased due to consolidation? If consumers can detect the bias in coverage due to cross-holdings and if media reputation is paramount, no bias should occur. If consumers, instead, do not detect the bias perhaps because they are unaware of the cross-holding, coverage in the conglomerate is likely to be biased.

Despite the importance of this question, there is little systematic evidence on distortions in coverage induced by cross-holdings. In this paper, we study two conglomerates—News Corp. and Time-Warner—and measure how media outlets in these groups review movies distributed by an affiliate in the group—such as 20th Century Fox and Warner Bros. Pictures, respectively. The advantage of focusing on movie reviews is that they are frequent, quantifiable, and are believed to influence ticket sales (Reinstein and Snyder, 2005), with monetary benefits to the studio distributing the movie. As such, they are a potential target of distortion.

To identify the bias, we adopt a difference-in-difference strategy. We compare the review of movies distributed by 20th Century Fox by, say, the *Wall Street Journal* to the reviews by outlets not owned by News Corp. Since the *Wall Street Journal* may have a different rating scale, we use as a further control group the reviews of movies distributed by different studios, such as Paramount. If the *Wall Street Journal* provides systematically more positive reviews for 20th Century Fox movies, but not for Paramount movies, we infer that conflict of interest induces bias.

Still, a legitimate worry is that this comparison may capture correlation in taste, rather than bias. The *Wall Street Journal* may provide more positive reviews to, say, action movies of the type distributed by 20th Century Fox because this reflects the tastes of its audience (or

of its journalists), not because of conflict of interest. When estimating the impact of conflict of interest, one would like to compare the reviews of a given 20th Century Fox movie only to reviews of movies by other studios which share the same style. In principle, one could attempt to find movies with similar features such as genre. This approach however is infeasible because users may like (or dislike) movies based on fine features or details which are not observable.

Instead, we propose a reported preference approach. We say that movies A and B are comparable if viewers that like movie A also like movie B, and vice versa users who dislike movie A also dislike movie B. This approach does not require any information on movie characteristics, since preferences already distill the relevant features. It does however require a rich individual-level data set of movie ratings by potential audience members.

We take advantage of three rich such data sets by *Netflix*, *Flixster*, and *MovieLens*. Using the individual user ratings, we find, for each 20th Century Fox and Warner Bros. movie, the ten movies distributed by other studios which are most comparable by the above reported preference criterion. In a validation test, we show that matching movies are likely to share the genre, the MPAA rating, and the average rating by movie reviewers, among other characteristics. We thus use these matching movies as comparison group.

We start from a data set of half a million professional reviews of movies released from 1985 (the year in which News Corp. acquired 20th Century Fox) until 2010 (the year in which the user ratings data ends). The data sources are the online aggregators Metacritic and Rotten Tomatoes. We compare the reviews by 324 outlets with no conflict of interest (known to us) to the reviews issued by 12 media outlets with cross-holdings. Eight media outlets are owned by News Corp. during at least part of the sample—the U.S. newspapers *Chicago Sun-Times* (owned until 1986), *New York Post* (owned until 1988 and after 1993), and *Wall Street Journal* (owned from 2008), the U.K. newspapers *News of the World*, *Times* and *Sunday Times*, the weekly *TV Guide* (owned from 1988 until 1999) and the website *Beliefnet* (owned from 2007 to 2010). Four media outlets are owned by Time Warner—the weeklies *Entertainment Weekly* and *Time* as well as *CNN* and the online service *Cinematical* (owned from 2004 until 2009).

We provide six pieces of evidence on the extent, type, and channel of bias. In the first test, we compare the reviews of movies distributed by the studios at conflict of interest to the reviews of the ten matching movies. We test for average bias in outlets at conflict of interest, such as the *Wall Street Journal* and *Time* magazine.

We find no evidence of bias for either the News Corp. or Time Warner outlets. In the benchmark specification we estimate an average bias of -0.2 points out of 100 for News Corp. and of 0 points for Time Warner. The richness of the data ensures tight confidence intervals for the finding of no bias. We can reject at the 95% level a bias of 1.9 points for News Corp. and of 1.7 points for Time Warner, corresponding to a one-star higher review score (on a zero-to-four scale) for one out of 13 movies at conflict of interest. We find similar results on the binary ‘freshness’ indicator employed by Rotten Tomatoes.

We underscore the importance of the matching procedure for the estimates of bias: cross-

sectional regressions on the whole sample of movies yield statistical evidence of bias for News Corp. This seeming bias depends on the inclusion in the control group of movies that are not comparable to the movies at conflict of interest, thus biasing the estimates. Further, we provide direct evidence on correlated tastes: News Corp. outlets provide more positive reviews to movies distributed by other studios when they are similar to the 20th Century Fox movies.

Second, while there appears to be no bias overall, a bias may be detectable for movies where the return to bias is plausibly larger, holding constant the reputational cost of bias to the media outlets. While we do not have measures of the return to bias, we consider dimensions which are likely to correlate with it. We expect that movies with generally higher review scores are likely to have higher return to bias, as an extra star is likely to matter more if it is the 4th star out of 4, as compared to the second star. Also, movies distributed by the mainstream studios, movies with larger budgets or larger box office sales are likely to have higher returns to bias. We find no systematic pattern of differential bias in this respect.

Third, the overall result of no bias may mask heterogeneity in bias by the individual outlets. We find no overall statistical evidence in the twelve outlets, with more precise null effects for the *New York Post* and *TV Guide* (News Corp.) as well as for *Entertainment Weekly* and *Time* (Time Warner). Given that each outlet employs a small number of reviewers, we go further and test for bias by journalist, and again do not find any systematic evidence of bias.

Fourth, we test for bias at the editorial level by examining the assignment of movies to reviewers. Since reviewers differ in the average generosity of their reviews, even in the absence of bias at the journalist level, assignment of movies to more generous reviewers would generate some bias. We find no evidence that affiliated movies are more likely to be assigned to reviewers who are on average more positive, confirming the previous results.

So far we tested for bias by commission: writing more positive reviews for movies at conflict of interest. In our fifth piece of evidence, we examine *bias by omission*. A reviewer that intends to benefit an affiliated studio may selectively review only above-average movies by this studio, while not granting the same benefit to movies by other studios. This type of bias would not appear in the previous analysis, which examines bias *conditional* on review. Bias by omission is generally hard to test for, since one needs to know the universe of potential news items. Movie reviews is a rare setting where this is the case, and thus allows us to test for this form of bias which plays a role in models of media bias (e.g., Anderson and McLaren, 2012).

We thus examine the probability of reviewing a movie as a function of the average review the movie obtained in control outlets. The reviewing patterns do not differ for movies at conflict of interest versus the matching movies of other studios, thus providing no evidence of omission bias. We show how apparent evidence of omission bias for *Time* magazine reflects a spurious pattern, since it appears also before *Time* became part of the Time Warner conglomerate.

The sixth and final piece of evidence on bias examines conflict of interest for the movie aggregator itself. Rotten Tomatoes was independent when launched in 1998, was then acquired by News Corp. in September 2005, only to be divested in January of 2010. This ownership

structure generates an incentive for Rotten Tomatoes to assign more positive reviews (its ‘freshness’ indicator) to 20th Century Fox movies during the period of News Corp. ownership. This test of bias is particularly powerful: bias is identified *within* a media outlet and by comparison of the Rotten Tomatoes review versus the Metacritic score for the *same* movie review. Further, the public is likely to be largely unaware of the cross-ownership, making bias harder to detect by the audience. Once again, we find no evidence of bias, even where bias would be hardest to detect (and hence presumably most likely), for unscored reviews which are evaluated qualitatively by the Rotten Tomatoes staff.

Overall, reputation-based incentives appear to be effective at limiting the occurrence of bias: we find no evidence of bias by commission, no evidence of editorial bias, no systematic evidence of bias by omission, and no evidence of bias among the aggregators.

Using these results, we compute a back-of-the-envelope bound for the value of reputation. Assume that an extra star (out of 4) persuades 1 percent of readers to watch a movie, an effect in the lower range of estimates of persuasion rates (DellaVigna and Gentzkow, 2010) and smaller than the estimated impact of media reviews of Reinstein and Snyder (2005), though admittedly we have no direct evidence.<sup>1</sup> Under this assumption, an extra star in a single movie review for a 20th Century Fox movie in a newspaper like the *New York Post* with a circulation of about 500,000 readers would add approximately \$40,000 in profits for News Corp.<sup>2</sup> If the *New York Post* had biased by one star all reviews for the 448 20th Century Fox movies released since 1993, the profit could have been nearly \$20m. The fact that such systematic bias did not take place indicates a higher value of reputation. The potential returns are about an order of magnitude larger for a periodical like *Time* magazine, with an average of 4 million readers, and so is the value of the reputation.

This paper relates to a vast literature on conflict of interest and most specifically in the media (e.g., Hamilton, 2003; Ellman and Germano, 2009). Reuter and Zitzewitz (2006) and Di Tella and Franceschelli (2011) find that media outlets bias their coverage to earn advertising revenue. We conjecture that the difference from our result of no bias is likely due to two factors. First, the revenue from the ads directly benefits the media outlet, while the revenue from increased movie attendance would accrue to the shareholders of the conglomerate, a more indirect link. Second, movie reviews are easy to compare across a number of outlets while coverage of mutual fund performance and of scandals are less so.

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<sup>1</sup>The average 20th Century Fox and Warner Bros. movie has a total domestic box office audience of around 7 million viewers, that is, about 3 percent of the relevant US population. Newspapers and magazine readers are likely to have higher rates of movie attendance, which could be 5 percent. The 1 percent persuasion rate thus implies that, say, a very positive review (4 stars out of 4) compared to a positive review (3 stars) increases the share of readers who decide to watch the movie from, say, 5 to 6 percent, a magnitude we find plausible. Of course, the potential effect of reviews on attendance is larger for high-profile movies, and smaller for more indie-type movies, a difference that we consider in the paper.

<sup>2</sup>The studios receive about half of the box office sales (at an average price of \$8 per ticket), and about another half from higher DVD and TV royalties. Personal communication with Bruce Nash, founder of *the-numbers.com*.

A small number of papers considers media bias due to consolidation, as we do. Gilens and Hertzman (2000) provide some evidence that the coverage of the debate on TV deregulation is biased by conflict of interest. Goolsbee (2007) and Chipty (2001) examine the extent to which vertical integration in the entertainment industry affect network programming and cable offering. Dobrescu, Luca, and Motta (2013) estimate the bias in 1,400 book reviews due to affiliation with the outlet reviewing the book; consistent with our findings, their evidence of apparent bias is most consistent with correlated tastes, not conflict of interest. Rossman (2011) and Ravid, Wald, and Basuroy (2006) examine the extent of bias in movie reviews, including due to conflict of interest. Both papers use a small sample of reviews—about 1,000 reviews for Rossman (2011) and about 5,000 reviews for Ravid et al. (2006). Relative to these papers, the granularity of information embedded in half a million reviews and the matching procedure allow us to obtain more precise measures and study the bias in a number of novel directions, such as editorial bias and bias by omission. Camara and Dupuis (2014) estimate a cheap talk game using movie reviews, including in the estimates a parameter for conflict of interest.

This paper also relates to the economics of the media (Strömberg 2004; George and Wald-fogel, 2006; DellaVigna and Kaplan, 2007; Mullainathan, Schwartzstein, and Shleifer, 2008; Knight and Chiang 2011; Enikolopov, Petrova, and Zhuravskaya 2011; Dougal et al., 2012), and in particular to papers on media bias (Groseclose and Milyo, 2005; Gentzkow and Shapiro, 2010; Larcinese, Puglisi and Snyder, 2011; Durante and Knight 2012). Within the context of movie reviews we address questions that have arisen in this literature—such as whether bias occurs by omission or commission and the role of journalists versus that of editors—about which there is little evidence.

Finally, the paper relates to the literature on disclosure, such as reviewed in Dranove and Jin (2010). In our settings, media outlets do not withhold reviews for low-quality affiliated movies, consistent with the Milgrom and Roberts (1986) unraveling result. Brown, Camerer, and Lovallo (2012) instead provide evidence of strategic movie releases by studios with cold openings for low-quality movies.

The remainder of the paper is as follows. In Section 2 we introduce the data and explain the movie matching procedure, in Section 3 we present the results of the tests of bias due to conflict of interest, and in Section 4 we conclude.

## 2 Data

### 2.1 Movie Reviews

**Media Review Aggregators.** The data used in this paper comes from two aggregators, *metacritic.com* and *rottentomatoes.com*. Both sites collect reviews from a variety of media and publish snippets of those reviews, but they differ in their scoring rules. Metacritic assigns a score from 0 to 100 for each review, and then averages such scores across all reviews of a movie

to generate an overall score. For reviews with a numeric evaluation, such as for the *New York Post* (0-4 stars), the score is a straightforward normalization on a 0-100 scale. For reviews without a numerical score, such as primarily for *Time* magazine, Metacritic staffers evaluate the review and assign a score on the same 0-100 scale (typically in increments of 10).

Rotten Tomatoes does not use a 0-100 score, though it reports the underlying rating for reviews with a score. It instead classifies each movie as ‘fresh’ or ‘rotten’, and then computes a score for each movie – the *tomatometer* – as the percent of reviews which are ‘fresh’. For quantitative reviews, the ‘freshness’ indicator is a straightforward function of the rating: for example, movies with 2 stars or fewer (out of 4) are ‘rotten’, movies with 3 or more stars are ‘fresh’, and movies with 2.5 stars are split based on a subjective judgment. For reviews with no quantitative score, the movie is rated as ‘fresh’ or ‘rotten’ by the staff.

The two data sets have different advantages for our purposes. Metacritic contains more information per review, since a review is coded on a 0-100 scale, rather than with a 0 or 1 score. Rotten Tomatoes, however, contains about five times as many reviews as Metacritic, due to coverage of more media (over 500 compared to less than 100) and a longer time span. We take advantage of both data sets and combine all reviews in the two data sets for movies released since 1985 and reviewed up until July 2011 in the Metacritic website and until March 2011 on the Rotten Tomatoes website. We eliminate earlier reviews because the review data for earlier years is sparse, and before 1985 there is no conflict of interest: Newscorp. acquired 20th Century Fox in 1985 and the conglomerate Time Warner was created in 1989.

We merge the reviews in the two data sets in two steps. First, we match the movies by title, year and studio with an approximate string matching procedure, checking manually the imperfect matches. Then, we match reviews of a given movie by media and name of the reviewer.<sup>3</sup> We then exclude movies with fewer than 5 reviews and media with fewer than 400 reviews, for a final sample of 540,799 movie reviews.

To make the two data sets compatible, we then apply the Metacritic conversion into a 0-100 scale to the Rotten Tomatoes reviews which report an underlying quantitative score. To do so, we use the reviews present in both data sets and assign to each Rotten Tomatoes score the corresponding median 0-100 score in the Metacritic data, provided that there are at least 10 reviews present in both samples with that score. For a small number of other scores which are common in Rotten Tomatoes but not in Metacritic, we assign the score ourselves following the procedure of the Metacritic scoring rules (e.g., a score of 25 to a movie rated ‘2/8’).

**Media Outlets.** The data set includes eight media outlets within the News Corp. conglomerate: the American newspapers *Chicago Sun-Times* (owned by News Corp. only up until 1986), *New York Post* (owned until 1988 and after 1992), and *Wall Street Journal* (owned from 2008), the British newspapers *News of the World*, *Times* and *Sunday Times* (all owned throughout the period), the magazine *TV Guide* (owned from 1988 until 1999) and the website

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<sup>3</sup>We allow for the year of the movies in the two data sets to differ by one year.

*Beliefnet* (owned from 2007 to 2010). The number of reviews and the data source differ across these outlets. The British newspapers are represented only in Rotten Tomatoes and have less than 1,000 reviews each. The *New York Post* is represented in both data sets and has the most reviews (5,657). *TV Guide* and *Wall Street Journal* have a relatively high number of reviews, but only a minority while owned by News Corp. All but one of these eight media (the *Wall Street Journal*) have quantitative scores in the reviews. These media employ as reviewers a small number of journalists who stay on for several years, and often for the whole time period. Therefore, within each media the two most common reviewers (three for the *New York Post*) cover the large majority of the reviews, with two media using essentially only one reviewer: *Chicago Sun-Times* (Roger Ebert) and the *Wall Street Journal* (Joe Morgenstern).

The second media conglomerate, Time Warner, includes four media: the weekly magazines *Time* and *Entertainment Weekly* (both owned by Time Warner from 1990 on), *CNN* (owned from 1996) and the web service *Cinematical* (owned between 2007 and 2010). The reviews in these media are at conflict of interest with Warner Bros. movies, since the studio was acquired in 1989 by Time, Inc. Two of the four outlets – *CNN* and *Time* – use only qualitative reviews; since the reviews from *CNN* are only in the Rotten Tomatoes data set, there is almost no 0-100 score for these reviews, but only a freshness rating. Most of the observations are from *Entertainment Weekly*, with more than 4,000 reviews. These outlets, like the News Corp. outlets, employ only one or two major reviewers.

**Studios.** Dozens of different studios distribute the 11,832 movies reviewed in our data set, including the 6 majors *20th Century Fox*, *Columbia*, *Disney*, *Paramount*, *Universal*, and *Warner Bros*. Among the distributors owned by News Corp., 20th Century Fox movies are the largest group (426 movies), followed by Fox Searchlight which distributes movies in the ‘indie’ category. Among the studios owned by Time Warner, the largest distributor is Warner Bros., followed by a number of distributors of ‘indie’ movies: Fine Line, New Line, Picturehouse, and Warner Independent. In most of the following analysis, we group all the studios into those owned by News Corp., which we call for brevity 20th Century Fox, and those owned by Time Warner, which we call Warner Bros.

**Additional Movie Information.** We also merge this data set to additional information on movies from *the-numbers.com*, including the genre and the MPAA rating.

## 2.2 Matching Procedure

**User Ratings.** We employ user-generated movie ratings from *Netflix*, *Flixster*, and *MovieLens* to find the movies most similar to a 20th Century Fox or Warner Bros. movie.

*Netflix* is an online movie streaming service. Users rate movies on a scale from 1 to 5 with 1-point increments, typically right after watching a movie. *Netflix* made public a large data set of (anonymized) reviews as part of its Netflix prize competition. This dataset contains roughly 100 million ratings by 480,000 users of 17,700 movies released up to 2005.



*Flixster* is a social network for users interested in the film industry. Besides other services, *Flixster* offers movie recommendations based on user ratings. We use a subset of this data which is available at <http://www.cs.ubc.ca/~jamalim/datasets/>. The rating scale ranges from .5 to 5 in .5 steps. The dataset contains about 8 million ratings by 150,000 users on 48,000 movies released up to 2010.

*MovieLens* is an online movie recommendation service launched by GroupLens Research at the University of Minnesota. The service provides users with recommendations once a sufficient number of ratings has been entered (using the same .5 to 5 scale as in *Flixster*). The dataset, which can be downloaded at <http://www.grouplens.org/datasets/movielens/>, was designed for research purposes. It provides 7 million ratings by roughly 70,000 users on more than 5,000 movies released up to 2004.

Online Appendix Table 1 summarizes the key features of the three samples. *Netflix* has the most comprehensive data set of reviews but, like *MovieLens*, it does not cover more recent movies. *Flixster* covers the most recent years but it is a smaller data set and has a small number of ratings per user. We use all three data sets, and perform the matches separately before aggregating the results.<sup>4</sup>

To determine the movie matches for a particular 20th Century Fox or Time Warner movie based on the user-generated reviews, we use the following procedure. Given movie  $i$  by 20th Century Fox, we narrow down the set of potential matching movies  $J_i$  according to four criteria: (i) the distributing studio of a movie  $j \in J_i$  is not part of the same conglomerate as  $i$  in order to provide a conflict-of-interest-free comparison; (ii) at least 40 users reviewed both movie  $i$  and movie  $j$  so as to guarantee enough precision in the similarity measure; (iii) movie  $j$  is represented in either the Metacritic or Rotten Tomatoes data set; (iv) movies  $i$  and  $j$  are close on two variables: the difference in release years does not exceed 3 years, and the absolute log-difference of the number of individual user ratings is not larger than .5.

Among the remaining potential matches  $j \in J_i$  for movie  $i$ , we compute the mean absolute difference in individual ratings between movie  $i$  and a movie  $j$  as  $D_{ij} = \frac{1}{k} \sum_k |r_{ik} - r_{jk}|$ , where we aggregate over all users  $k$  who reviewed both movies (hence the requirement  $k \geq 40$ ). We then keep the 10 movies with the lowest distance measure  $D_{ij}$ .

To determine the overall best ten matches for movie  $i$ , we pool the matching movies across the three data sets. If movie  $i$  is present in only one data set, say because it was released after 2006 and thus is only in *Flixster*, we take the ten matches from that data set. If movie  $i$  is present in multiple data sets, we take the top match in each data set, then move to the second best match in each data set, and so on until reaching ten unique matches.<sup>5</sup> We denote as a

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<sup>4</sup>Within each of the three data sets, we match the movies to the movies in the Metacritic/Rotten Tomatoes data set using a parallel procedure to the one used when merging the Metacritic and Rotten Tomatoes data. This allows us also to import the information on the year of release of the movie, used below.

<sup>5</sup>We take matches from *Netflix* first, then *MovieLens*, then *Flixster*. Notice that to identify the top 10 matches overall, one may need to go down to, say, the top 5 matches or lower even with three data sets, given that the different data sets may yield the same matching movie  $j$ .

*movie group* the set of 11 movies consisting of movie  $i$  and its ten closest matches. Later, we examine the robustness of the results to alternative matching procedures.

**Main Sample.** We illustrate the sample construction with an example in Table 1. For the 20th Century Fox movie *Black Knight*, the movie group includes movies of similar genre like *Down To Earth* and *Snow Dogs*. We combine the movie-group information with the review information from MetaCritic and Rotten Tomatoes. We thus form *movie-media groups* consisting of reviews in a given media outlet of any of the 11 movies in the movie group. The first movie-media group in Table 1 consists of reviews by the *New York Post* of *Black Knight* and its 10 matches. The difference within this group between the review of *Black Knight* and the review of the matching movies contributes to identify the effect of conflict of interest. The next movie-media group consists of reviews by *Entertainment Weekly* magazine of the same 11 movies. These reviews by a ‘control’ media outlet contribute to identify the average differential quality of a 20th Century Fox movie. In the specifications we include movie-media group fixed effects, thus making comparisons within a movie group for a particular media outlet.

Note two features of the procedure. First, each media typically reviews only a subsample of the 11 movies and thus a movie-media group can consist of fewer than 11 observations. Second, a movie can be a match to multiple 20th Century Fox or Warner Bros. movies and as such will appear in the data set multiple times. In Table 1, this is the case for *102 Dalmatians* which is a match for both *Black Knight* and *Scooby-Doo*. In the empirical specifications, we address this repetition by clustering the standard errors at the movie level.

The initial sample for the test of conflict of interest in the News Corp. conglomerate includes all movie-media groups covering movies distributed by 20th Century Fox and all media outlets in the sample. We then drop matching movies which were not reviewed by at least one News Corp. media outlet. A movie group has to fulfill two conditions to remain in the final sample: (i) there has to be at least one review with conflict of interest (e.g., one review of the 20th Century Fox movie by an outlet owned by News Corp.) and (ii) the movie group has to contain at least one movie match (which was reviewed by a News Corp. outlet).

Appendix Table 1, Panel A reports summary statistics on the sample for the News Corp. conglomerate (top panel) and for the Time Warner conglomerate (bottom panel). The data set covers reviews from 335 different media outlets. Appendix Table 1, Panel B presents information on the studios belonging to News Corp. and to Time Warner.

## 3 Bias in Movie Reviews

### 3.1 Validation of Matching Procedure

In the analysis of potential bias due to conflict of interest, we compare the reviews of movies by 20th Century Fox (and by Warner Bros.) to the reviews of the ten most comparable movies distributed by other studios, according to the matching procedure discussed above. This

procedure is designed to address the concern that movies distributed by, say, 20th Century Fox may have special features that not all movies have.

Does the matching procedure work? Figures 1a-f document the similarities between the movies distributed by 20th Century Fox and Warner Bros. and the ten matching movies by other studios with respect to three characteristics: movie genre, MPAA rating, and number of theaters at opening. Since the match procedure did not use any of these features, we can interpret the similarity, or lack thereof, as a validation of the approach. Furthermore, we choose features that are pre-assigned and thus cannot be affected by the reviews themselves.

Figure 1a shows that 20th Century Fox movies are most likely to be action, comedy, and drama, and unlikely to be documentaries. The matching movies display a similar pattern, while the movies that are never a match to a 20th Century Fox movie are more likely to be documentaries. Figure 1b displays parallel findings for the Warner Bros. movies. Turning to the MPAA rating (Figures 1c-d), the 20th Century Fox and Warner Bros. movies and their respective matches are very similar, while the non-matching movies are more likely to be rated R and less likely to be rated PG-13. Figures 1e-f display a third feature, the number of theaters on the opening weekend, sorted in quintiles in 5-year bins. The 20th Century Fox and Warner Bros. movies are close to their matches, while the non-matching movies follow an opposite pattern.

In the online appendix we provide further evidence on the quality of the match. We document that the same match pattern holds for a micro level comparison, namely matching movies are disproportionately likely to share the genre, rating, and theaters at opening of the movie they are matched to, compared to the general population of movies (Online Appendix Figure 1a-f). We also document that matching movies resemble the movies at conflict of interest with respect to two key outcomes of interest, the average 0-100 review score (Online Appendix Figure 2a-d) and the probability of review (Online Appendix Figures 3a-d). Hence, the matching procedure appears to be successful in identifying broadly comparable movies. Building on this evidence, we now turn to the comparison outlined above.

## 3.2 Overall Bias

**Graphical Evidence.** We examine whether conflict of interest induces a bias on average, starting with the 20th Century Fox movies. The bars on the right of Figure 2a indicate the average review score for media *not* owned by News Corp. (the ‘placebo’ group). In this group, the average review score for the 20th Century Fox movies (dark blue bar) and for the matching movies distributed by other studios (light blue bar) is indistinguishable. The matching movies appear to provide a good counterfactual: in the absence of conflict of interest, their average score is essentially identical to the one of the 20th Century Fox movies.

The left bars in Figure 2a present the average score for reviews in News Corp. media outlets, like the *Wall Street Journal*. The score for the matching movies (light blue bar) is somewhat

lower than in the non-News Corp. media, indicating that the News Corp. media outlets are on average somewhat harsher in their reviews. The key question is whether this pattern is the same for the movies distributed by 20th Century Fox, or whether those movies receive a more generous treatment. The leftmost bar provides no evidence of bias: the average score for the 20th Century Fox movies is essentially identical to the one for the matching movies by other studios, with tight confidence intervals. A difference-in-difference estimator indicates a difference of -0.12 points (out of 100, with p-value of .908 of the test of equality to zero).

Figure 2b presents the evidence for Time Warner. Once again, the reviews in non-Time Warner media outlets are scored in about the same way for Warner Bros. movies and for matching movies (right panel). Turning to the reviews in the Time Warner outlets (left panel), the score is also essentially the same for the Warner Bros. movies and for the matching movies. In this second conglomerate we also find no evidence of bias due to conflict of interest.

**Regressions.** To present a formal test and to examine the impact of control variables, we estimate a regression-based specification. For the 20th Century Fox movies we estimate the difference-in-difference OLS regression:

$$r_{m,o} = \alpha + \beta^{FM} d_m^{FoxMovie} + \beta^{FO} d_o^{FoxOutlet} + \gamma^F d_m^{FoxMovie} d_o^{FoxOutlet} + \zeta_{M(m),o} + \varepsilon_{m,o} \quad (1)$$

Each observation is a review for movie  $m$  by outlet  $o$ . The dependent variable  $r_{m,o}$  is a 0 to 100 score, or an indicator for ‘freshness’. The coefficient  $\beta^{FM}$  captures the average difference in reviews for movies distributed by 20th Century Fox, compared to the matching movies distributed by other studios. The coefficient  $\beta^{FO}$  captures the average difference in reviews for outlets owned by News Corp. at the time of the movie release, compared to the other outlets. The key coefficient,  $\gamma^F$ , indicates the estimated impact of the conflict of interest, that is, the average rating difference for a 20th Century Fox movie when reviewed by a media owned by a News Corp. outlet, compared to the counterfactual. We include a fixed effect  $\zeta$  for each movie-media group, where we denote with  $M(m)$  the 11 movies in the group for movie  $m$ . The standard errors are clustered at the movie level to allow for correlation of errors across multiple reviews of a movie.<sup>6</sup> We run a parallel specification for the Time Warner group.

Panel A of Table 2 reports the results for the score variable. Considering first the 20th Century Fox movies (Columns 1-2), we present the results first with no controls and then with fixed effects for each movie-media group (see Table 1). In this second specification, regression (1) is a matching estimator, comparing reviews for a 20th Century Fox movie to reviews for the 10 matched movies. The result is similar in the two specifications, so we mostly discuss the estimates with fixed effects (Column 2). The estimated coefficient on 20th Century Fox movies in Column 2,  $\hat{\beta}^{FM} = -0.75$ , is close to zero indicating, consistent with Figure 2a, that the 20th Century Fox movies and the matched movies are comparable in quality. The estimated coefficient on the News Corp. outlets in Column 1,  $\hat{\beta}^{FO} = -4.34$ , is negative, again consistent

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<sup>6</sup>In Table 3 we show that alternative forms of clustering lead to comparable or lower standard errors.

with Figure 2a.<sup>7</sup> The key coefficient,  $\hat{\gamma}^F = -0.19$ , indicates a null effect of the conflict of interest for News Corp. outlets: 20th Century Fox movies receive slightly *less* positive reviews by News Corp. outlets by 0.2 points out of 100. The small standard errors imply that we can reject at the 95% confidence level an effect of bias of 1.92 points out of 100, equivalent to an increase of one star (on a zero-to-four scale) for one out of 13 movies reviewed.

In Columns 3 and 4 we estimate the impact of conflict of interest on the Warner Bros. movies. The results are parallel to the ones for the News Corp. conglomerate: we find no evidence of an impact of conflict of interest:  $\hat{\gamma}^T = -0.02$ . Given the larger sample of Warner Bros. movies, we can reject even smaller effects, corresponding to 1.72 points out of 100, equivalent to an increase of one star (out of 4) for one out of 14.5 reviews.

In Panel B of Table 2 we present parallel specifications with the ‘freshness’ indicator as dependent variable. The results for the ‘freshness’ variable are parallel to the results for the score variable: we find no evidence of bias for either of the two conglomerates. For the rest of the paper we focus on the 0-100 score variable given the higher statistical power given by a continuous variable, the results are parallel with the freshness indicator.

**Robustness.** In Table 3 we present alternative specifications of the benchmark results (Columns 2 and 4 of Table 2), reporting only the conflict-of-interest coefficient. We examine alternatives for: (i) standard errors, (ii) additional controls, (iii) the underlying data source, (iv) the matching procedure. Clustering the standard errors by studio and by media outlet lead to lower standard errors (Columns 2 and 3, compared to the benchmark clustering reproduced in Column 1). Adding movie fixed effects has a small impact on the estimates (Column 4). Estimating the effect separately for the Metacritic database (Column 5) and in the Rotten Tomatoes database (Column 6) yields similar results. (Movie reviews which are in both data sets are present in both samples).

We also investigate the robustness of the matching procedure. Restricting the match to only the best 3 movie matches (rather than 10) does not change the estimate appreciably but, predictably, lowers the precision somewhat (Column 7). Changing the closeness measure to maximizing the correlation in reviews yields similar results (Column 8). Not using any observable variable (year of release and number of reviews) in the match procedure also has little impact (Column 9). In Online Appendix Table 2 we show that the results are robust to computing matches using only one of the user reviews data sets, and using as a criterion for closeness a likelihood ratio measure of the probability of rating a movie.

**Cross-Sectional Estimates.** In Table 4 we compare the matching estimates to cross-sectional estimates for specification (1) using all reviews in the MetaCritic and Rotten Tomatoes data, making no use of the matching procedure. The estimates of the effect of conflict of interest for Time Warner are negative but close to zero, similar to the main specification (Table 2). Instead, the estimate of the conflict of interest effect for the News Corp. outlets

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<sup>7</sup>In Column 2 this coefficient is identified off of media outlets that change ownership within our sample.

indicate a statistically significant, if quite small, 2.04 points of bias in the specification with movie and media fixed effects (Column 2).<sup>8</sup> The next columns reconcile this estimate with the matching estimate. The difference is not due to excluding movies that are not reviewed by outlets at conflict of interest (Column 3) or to the fact that some of the 20th Century Fox and Warner Bros. movies are not present in the *Flixster/Netflix/MovieLens* data set (Column 4), and thus dropped from our matching analysis. Instead, the main difference is the inclusion of control movies that are not matches to a 20th Century Fox or Warner Bros. movie. When we drop these movies (Column 5), the estimate is very similar to the benchmark estimate.<sup>9</sup>

Given the evidence that non-matching movies differ from matching movies in several dimensions like genre, rating, and opening weekend (Figures 1a-f), this suggests that reviewers in the News Corp. outlets have specific tastes that it is important to control for in the analysis. To more directly document this, we show that movies that are distributed by other studios but are matches to 20th Century Fox movies are indeed reviewed more positively by the News Corp. outlets (Online Appendix Table 3). We find similar evidence for correlated tastes when considering movies similar in genre to the Fox movies, though not for similarity of MPAA rating and budget. Given the evidence of the confound due to correlated tastes, we use the matching estimator in the rest of the paper.

### 3.3 Bias by Movie Quality and Type

So far, we presented evidence on bias for the average movie. Yet, bias should be larger for movies with a higher return to bias, holding constant the reputational cost. While we do not have direct measures of return to bias, we consider two dimensions which are likely to correlate with it. We expect that movies with generally higher review scores are likely to have higher return to bias, as an extra star is likely to matter more if it is the 4th star out of 4, as compared to the first star. We also assume that high-profile movies are likely to have higher returns given the larger potential audience (holding constant the persuasive impact of a review).

**Bias by Movie Quality.** In Figure 3a we present evidence on potential bias as function of movie quality for the 20th Century Fox movies. We assign to each movie the average review score computed excluding the reviews in media at potential conflict of interest. We then display a polynomial plot of the review score in the News Corp.-owned media outlets for the movies distributed by 20th Century Fox (dark blue line) and for the matching movies distributed by

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<sup>8</sup>A previous working paper version of this paper estimated a bias of similar magnitudes using this specification.

<sup>9</sup>Notice that this last specification still differs from the matching one because (i) the set of fixed effect differs and (ii) in the benchmark specification reviews for a matching movie appear multiple times if the movie is a match to multiple, say, 20th Century Fox movies; instead, in the cross-sectional specification each movie review appears only once. Column (5) shows that this difference is immaterial to the results. Furthermore, the estimate in Column (5) is similar to the estimate in Column (4) in Table 3 where movie fixed effects are included as additional controls.

other studios (light blue line).<sup>10</sup> The plot for the matching movies indicates that the News Corp. outlets largely follow the other outlets in their review. The plot for the movies at conflict of interest hovers around the one for the matching movies, with no evidence of deviation for movies of higher, or lower, quality. For Time Warner as well (Figure 3b), the average score for affiliated movies tracks very closely the score for the non-affiliated movies, with no systematic deviation for higher-quality movies. Thus we do not find evidence of differential bias.

**Bias by Movie Profile.** In addition to the mainstream studios 20th Century Fox and Warner Bros., the News Corp. and Time Warner conglomerates include indie studios like Fox Searchlight, Fine Line, and New Line (see Appendix Table 1B). Figures 4a and 4b plot, for each studio, the average review score in media outlets at conflict of interest (y axis) and in other outlets (x axis). To make the comparison clear, we plot the same measure for the other 9 major studios.<sup>11</sup> There is no evidence of differential bias, which consists of points lying above the 45 degree line, for the mainstream studio compared to the indie studios.

In Online Appendix Table 4, we present additional evidence. We re-estimate specification (1) allowing for a differential effect of conflict of interest for four proxies of return to bias: (i) distribution by a mainstream studio, (ii) production budget, (iii) number of theaters at opening and (iv) domestic box office.<sup>12</sup> We find no statistically significant evidence of differential bias by the four proxies, even though directionally the sign of the effects is as expected for the 20th Century Fox movies. Overall, there is no clear evidence of differential bias for movies with plausibly higher return to bias.

### 3.4 Bias by Media and Journalist

The previous evidence indicates the apparent lack of bias due to conflict of interest, even when considering separately movies with plausibly higher incentives for bias. These results reject the scenario of widespread bias across all outlets within a conglomerate. Still, it is possible that some media outlets, or some journalists, bias their reviews, but this is balanced by the lack of bias in other outlets in the same conglomerate, or perhaps even by negative bias (to avoid criticism). We thus examine the occurrence of bias by media and by journalist.

**Bias By Media.** The scatter plot in Figure 5a reports for each media outlet the average review for the 20th Century Fox movies and the average review for the matching movies by other studios. To provide a counterfactual, we also plot these measures for the 200 largest media outlets not owned by News Corp.<sup>13</sup> No News Corp. media outlet deviates substantially

<sup>10</sup>We use an Epanechnikov kernel and a 1st degree polynomial, with a kernel of 5 rating points. We truncate movies with average movie score below 30 or above 80, since such movies are rare.

<sup>11</sup>Dot Sizes are proportional to the square root of the number of reviews by News Corp. or Time Warner outlets. We do not use the matching procedure in order to ensure a larger sample of movies by other studios.

<sup>12</sup>For the last three proxies, we use deciles, formed within 5-year periods, of the variable to adjust for changes over time and skewness.

<sup>13</sup>We only include outlets with at least 15 reviews of 20th Century Fox movies while owned by News Corp.

on the positive side of the trend line, the indication for bias.<sup>14</sup> We estimate a specification like (1) for each outlet at conflict of interest separately, and find no significant evidence of bias for any of the outlets (Online Appendix Table 5).

Figure 5b provides parallel evidence for the Time Warner conglomerate, with *Entertainment Weekly*, *Time magazine* and *Cinematical* right on the regression line indicating no bias, a finding that is replicated in regression format (Online Appendix Table 5). Thus, the pattern for the individual outlets is similar to the overall pattern of no bias.

**Bias By Journalist.** We further take advantage of the fact that most media have only a small number of movie reviewers, and these journalists typically stay on for years, if not decades. This long tenure allows us to estimate journalist-specific patterns which, as far as we know, is a rare feature within the media economics literature (Dougal et al., 2012). In Appendix Figures 1a-b we provide parallel plots to Figures 5a-b, but by journalist. In addition to the journalists working in the two conglomerates, we include the 500 other journalists with the most reviews. Only one journalist stands out, Maitland McDonagh (at *TV Guide*), with a statistically significant estimate of bias (Online Appendix Table 6). Yet, given that the pattern appears for only one out of 12 journalists, it is plausible that this pattern is due to chance.

### 3.5 Editorial Bias

In the previous section we tested for bias in the presence of conflict of interest, focusing on the role of journalists. Conversely, we now examine the role of editors. An editor who intends to bias the review process can do so in at least two ways: by putting pressure on the journalists, or by assigning the affiliated movies to journalists who on average assign higher review scores.<sup>15</sup> We examine the latter mechanism, which is well-suited to test for biased coverage as a managerial policy of the conglomerate. While journalists could resist managerial pressure to bias the content of their reviews, this form of bias only requires the assignment of movies to different reviewers.

We provide graphical evidence on this test for the reviewers in News Corp. media outlets in Figure 6a. We plot for each reviewer the average generosity in review score (relative to the media outlet average) (x axis) and the share of their reviews of 20th Century Fox movies (y axis).<sup>16</sup> As the scatter shows, movie reviewers differ sizably in generosity within a given outlet. Yet, there is no evidence that the more generous reviewers are more likely to review

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<sup>14</sup>The *Sunday Times* and *Wall Street Journal* are outliers below the line, but the estimate of bias is imprecise for these outlets given the small number of reviews at conflict of interest.

<sup>15</sup>A third form of editorial influence is the hiring of more favorable journalists and firing of less favorable ones. We observe no evidence of elevated turn-over for the outlets after a change in ownership.

<sup>16</sup>To compute the average generosity, we only take into account score reviews (on a 0-100 scale) and generate for each review an idiosyncratic review score defined as the score minus the average review score of the corresponding movie. We then compute the average of this variable for all journalists and their affiliated outlets. The measure of the average generosity of a journalist (relative to the affiliated outlet) is calculated as the difference between the two means. Here, we do not use the matching procedure in order to preserve a larger sample of movies.



20th Century Fox movies. Indeed, the regression line points to a slight negative relationship between generosity and review probability.

In Figure 6b we report the parallel evidence for the Time Warner outlets. As for the News Corp. outlets, we find no evidence of a systematic pattern of assignment of movies to reviewers in order to benefit the affiliated studio.

### 3.6 Bias by Omission

The previous evidence rules out sizable bias in the movie quality assessed in reviews, whether due to editorial or journalistic decisions. But this evidence does not cast light on a potentially more insidious form of bias: bias by *omission*. The media can selectively display items of information, as in Anderson and McLaren (2012). In our setting, an outlet may decide to not review a below-average movie by an affiliated studio, but make sure to review an above-average movie by the same studio. A media outlet following this strategy would not display any bias *conditional* on review; hence, bias by omission would not be detected by the previous analysis.

In Figure 7a we present evidence on omission bias for the News Corp. media. We test whether News Corp. outlets are more likely to review 20th Century Fox movies with high predicted review (as proxied by high average rating by other reviewers), compared to their reviewing patterns for non-20th Century Fox movies. We display a polynomial smoother of the review probability as a function of the average review score of a movie (in the range between 30 and 80).<sup>17</sup> The average probability of review by News Corp. media outlets of 20th Century Fox movies is barely increasing in the review score (darker continuous line). By comparison, the probability of review of the matching movies by other studios (lighter continuous line) is more clearly increasing in the movie review, suggesting if anything a negative bias by omission.

To strengthen the inference, we also compare these patterns to the probability of review by *other* media outlets not owned by News Corp. In doing so, we need to take into account that media outlets differ in their reviewing propensity. Thus, for each media outlet owned by News Corp. we choose the *ten* media outlets which display the closest pattern in the review probability of non-20th Century Fox movies.<sup>18</sup> The dotted lines in Figure 7a display the

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<sup>17</sup>The sample for the omission bias test in this section is determined as follows. For each of the 8 News Corp. outlets, like the *New York Post*, we determine all 20th Century Fox movies and their movie matches which were released during News Corp. ownership of the respective outlet. For each movie in this subsample and outlet-either the News Corp. or one of the control outlets (see below)-we generate a dummy of whether it was reviewed (0-100 score or ‘freshness’ indicator). Thus, there is only one observation per movie and media outlet. We use this data set when testing for omission bias for that particular outlet. To obtain the sample for the overall test pooling across all 8 outlets, we repeat this procedure for all 8 News Corp. outlets and append the data sets. We follow a parallel procedure for the Time Warner test.

<sup>18</sup>The matching outlets are the ten outlets with the smallest distance in the probability of review for the matching movies. We form bins with a width of 5 points of the average review score and determine the average distance between two media outlets in the review probabilities within each bin. The overall distance is computed averaging the distance across the bins, weighting by the number of movies in a bin.

probability of review by these matched media of 20th Century Fox movies (dotted darker line) and of the matching movies (dotted lighter line). The dotted lines track remarkably well the continuous lines for the matching movies, suggesting that the matching media provide a good counterfactual to the News Corp. media. Overall, Figure 7a suggests no evidence of omission bias. Online Appendix Figures 4a-d show that the same pattern holds when considering the News Corp. media outlets individually.

The corresponding figure for the Time Warner outlets (Figure 7b) instead provides some evidence consistent with omission bias. The probability of review of Warner Bros. movies in Time Warner outlets is increasing in the measured quality of the movie, more so than in the matched media. Yet, this increasing pattern is similar for matching movies in the Time Warner media (lighter continuous line), suggesting that the pattern may be due to a reviewing strategy in the Time Warner media outlets, rather than to bias.

To provide more evidence, in Online Appendix Figures 5a-d we disaggregate the effect by the four Time Warner media outlets. The evidence suggestive of omission bias is almost entirely due to *Time* magazine. To ascertain whether the pattern in the data is due to intended omission bias or an idiosyncratic reviewing strategy by *Time*, we exploit two placebos. First, we take advantage of the fact that in years 1985-89 *Time* magazine was not yet part of the Time Warner conglomerate. Second, we exploit the fact that 20th Century Fox movies share some characteristics with Warner Bros. movies (see Figures 1a-f), but there is no conflict of interest in place with those movies at *Time* magazine. As Online Appendix Figures 6b and 6c show, these two placebos show a similar reviewing pattern to the one in the main sample. This suggests that the pattern at *Time* magazine should not be interpreted as bias by omission.

To further put these findings in context, we compare the extent of selective reviewing in the media at conflict of interest with the same phenomena for the largest 200 other outlets. Figures 8a-b display for each media outlet the estimated sensitivity of the review probability to the average score for the movies at conflict of interest (y axis) versus the same movies in the matching outlet (x axis). The two sensitivity coefficients are just the slope coefficient of separate linear regressions of the review probability on the average review score. Bias by omission would manifest itself as an outlier above the regression line: an outlet is more sensitive to quality when reviewing a movie at conflict of interest. The patterns confirm the findings above. None of the News Corp. outlets stand out for omission bias, while among the Time Warner outlets, only *Time* magazine stands out, a case we discussed above.

To provide a statistical test of omission bias, we estimate a linear probability model in Table 5, which we illustrate for the case of media owned by News Corp.:

$$d_{m,o} = \alpha + \gamma^F d_m^{FoxMovie} d_o^{FoxOutlet} + \Gamma^F d_m^{FoxMovie} d_o^{FoxOutlet} \bar{r}_m + \beta^{FM} d_m^{FoxMovie} + B^{FM} d_m^{FoxMovie} \bar{r}_m + \beta^{FO} d_o^{FoxOutlet} + B^{FO} d_o^{FoxOutlet} \bar{r}_m + \phi \bar{r}_m + \zeta_{M(m),o} + \varepsilon_{m,o}. \quad (2)$$

An observation is a possible review of a 20th Century Fox movie or of a matching movie by one of the News Corp. or matching outlets with similar probability of review. The dependent

variable is the indicator  $d_{m,o}$  which equals 1 if media outlet  $o$  reviews movie  $m$ . The key coefficient is  $\Gamma^F$  on the interaction of the conflict of interest variable with the mean rating score  $\bar{r}_m$ . This coefficient indicates how the probability of a review varies with the average review score, in the presence versus absence of a conflict of interest. The regression includes movie-media group fixed effects. A key assumption made in equation (2) is that the probability of movie review is linearly increasing in the average movie score; we adopt this assumption given the evidence of approximate linearity in Figures 7a-b.

Table 5 provides no evidence of selective review consistent with omission bias for the News Corp. or for the Warner Bros. media. For News Corp. outlets, we can reject that a one-standard deviation increase in movie quality (14 points in overall score) for a 20th Century Fox movie increases the probability of review (differentially) by more than 1.7 percentage points. Similarly, for Time Warner we can reject for a similar increase in movie quality an increase in review probability of more than 2.2 percentage points. In Online Appendix Table 7 we present the results separately for each media outlet. The relevant coefficient  $\delta^F$  on the interaction between conflict of interest and average review score is significantly positive only for *Time Magazine*, a special case we discussed above. Overall, we conclude that it is unlikely that any of the outlets is explicitly adopting a strategy of bias by omission.<sup>19</sup>

### 3.7 Bias in Movie Aggregator

So far we have focused on the conflict of interest induced by the consolidation of studios like 20th Century Fox and Warner Bros. into media conglomerates which employ movie reviewers. But consolidation affects the review aggregators themselves. Rotten Tomatoes, independent when launched in 1998, was acquired by IGN Entertainment in June 2004, and IGN itself was purchased by News Corp. in September 2005. IGN, and hence Rotten Tomatoes, was then sold in January of 2010 by News Corp. and acquired in April 2011 by Time Warner.

This ownership structure generates an incentive for Rotten Tomatoes to post more positive reviews of 20th Century Fox movies during the period of News Corp. ownership (2006-2009). Since the reviews are posted quickly on the Rotten Tomatoes site and then rarely updated<sup>20</sup>, we use the year of release of the movie to test the hypothesis of conflict of interest. We estimate

$$f_{m,o} = \alpha + \gamma^{CI} d_m^{FoxMovie} d_t^{2006-09} + \beta^F d_m^{FoxMovie} + \eta_t + \beta r_{m,o} + \varepsilon_{m,o}, \quad (3)$$

where  $f_{m,o}$  is the ‘freshness’ indicator on Rotten Tomatoes for movie  $m$  in media outlet  $o$ . The coefficient of interest,  $\gamma^{CI}$ , captures how movies distributed by the 20th Century Fox studio

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<sup>19</sup>We also examined a form of partial omission: whether media at conflict of interest are more likely to display delayed reviews and shorter reviews for low-quality affiliated movies. Using a smaller data set (since the information on date of review and length of review is not in Metacritic or Rotten Tomatoes) we do not find evidence of such bias.

<sup>20</sup>Consistent with this, two separate scrapes of the site at 3 month distance yielded no change in the reviews for older movies.

( $d_m^{FoxMovie} = 1$ ) are characterized in years 2006-2009, compared with the years before and after. We allow for a baseline difference in reviews for 20th Century Fox movies (captured by  $\beta_F$ ) and fixed effects for year  $t$  and for the movie-media group. Most importantly, we control for the MetaCritic scoring  $r_{m,o}$  for the *same* movie review<sup>21</sup>.

Column 1 in Table 6 shows that the effect of conflict of interest is a precisely estimated zero ( $\hat{\gamma}^{CI} = 0.0031$ ), a result that replicates when using all reviews, rather than just the matched sample (Column 2). We can reject as an upper bound that conflict of interest increases the probability of a fresh score by 0.6 percentage points (Column 2), a small effect. In Figure 9a, using the matched sample, we present graphical evidence using a local polynomial estimator of the Rotten Tomatoes ‘freshness’ indicator on the 0-100 quantitative score. We run the non-parametric regressions separately for the 20th Century Fox movies (the continuous lines) and the matching movies by other studios (dotted lines), split by the period of News Corp. ownership (dark blue line) and the remaining time period (light blue line). The two continuous as well as the two dotted lines are very close on the graph, again indicating no bias.

While we detect no bias on average, bias may have been present in some years, for example when News Corp. just acquired Rotten Tomatoes and awareness of the conflict of interest was presumably lower. We estimate an event study specification:

$$f_{m,o} = \alpha + \gamma_t^F d_m^{FoxMovie} \eta_t + \gamma_t^{NF} (1 - d_m^{FoxMovie}) \eta_t + \beta r_{m,o} + \varepsilon_{m,o}.$$

The specification is parallel to (3) except that, instead of separating the years into a period of ownership (2006-09) and all else, we interact the year fixed effects  $\eta_t$  with an indicator for 20th Century Fox movie and an indicator for the complement. Figure 9b shows that the residual freshness score for the 20th Century Fox movies ( $\gamma_t^F$ ) tracks the series for other movies ( $\gamma_t^{NF}$ ) also during the years of ownership, providing no evidence of bias. Since bias may still be present in a subset of the data, we analyze separately reviews with a quantitative score (i.e. stars) and qualitative reviews for which the freshness score is determined by a staff reading. For the quantitative reviews, we focus on reviews with scores between 50 and 70, for which Rotten Tomatoes appears to use qualitative information to assign the ‘freshness’ rating. Even in this sample (Column 3), we detect no bias.

However, bias should be most likely for reviews *without* a quantitative score since the probability of detection is particularly low. Yet, we find no evidence of bias in this sample either (Column 4). We replicate this result on the smaller sample of qualitative reviews stored in both aggregators, so as to include as a control the score attributed by the Metacritic staff (Column 5), again finding no effect of the conflict of interest on bias, with more precise estimates.

Despite the conflict of interest, there is no semblance of bias in the movie aggregator Rotten Tomatoes, even for the types of reviews for which detection of bias would be hardest.

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<sup>21</sup>The quantitative scoring is as reported by Rotten Tomatoes, translated into the 0-100 score. If the Rotten Tomatoes score is missing, for example for qualitative reviews, we use the score in MetaCritic if available. We confirm that Rotten Tomatoes does not bias this quantitative score by regressing it on the corresponding score for the same review in MetaCritic, when both are available.

## 4 Conclusion

Consolidation in the media industry is considered by many a condition for survival in an industry hit hard by the loss of advertising. Yet, consolidation does not come without potential costs. In addition to the potential loss of diversity (George and Waldfogel, 2003), consolidation increases the incidence of conflict of interest due to cross-holdings, and possible ensuing bias. We focus on conflict of interest for movie reviews, such as when the *Wall Street Journal* reviews a 20th Century Fox movie. The holding company, News Corp., can potentially benefit financially from a more positive review, and hence higher movie attendance, creating a conflict of interest.

Using a data set of over half a million movie reviews from 1985 to 2010, we find no statistical evidence of media bias due to conflict of interest in either the News Corp. conglomerate or the Time Warner conglomerate. The null finding is not due to imprecision. We can reject small estimates of bias, such as one extra star (out of 4) in one out of every 13 movies at conflict of interest. Moreover, we are able to examine bias at a high level of detail, including bias by media outlet and journalist, comparative statics in the return to bias, bias in editorial assignment, bias by omission as opposed to commission, and bias by the aggregator. In the end, we feel confident of the overall estimate.

As we discussed in the introduction, these estimates imply a back-of-the-envelope bound for the value of a reputation for the media outlets. Under the assumption that an extra star (our of 4) convinces 1 percent of readers to watch a movie, an extra star in a single movie review for a 20th Century Fox in the *New York Post* would add approximately \$40,000 in profits for News Corp. The correspondent figure for an extra star in a review of a Warner Bros. movie in *Time* magazine is approximately \$300,000. The fact that such systematic bias did not take place in either outlet indicates that the value of their respective reputations is larger.

Within the context of movie reviews, we addressed questions that have arisen in the economics of the media, such as whether bias occurs by omission or commission, about which we have limited information. We view this contribution as a step forward in better understanding the functioning of media outlets, which play a key role in the formation of public opinion. In particular, this paper provides some evidence on how media outlets navigate the trade-off between professional journalism and revenue maximization for the owners. In this case, professionalism and reputation concerns appear to trump possible short-term revenue gains.

As we discussed above, our results differ from the impact of conflict of interests for advertising. In the latter case, both Reuter and Zitzewitz (2006) and Di Tella and Franceschelli (2011) document sizable distortions. We conjecture that two differences likely play a role. First, the benefits from the ads directly benefit the media outlet, while in the case at hand the benefits accrue to the shareholders of the conglomerate, a more indirect link. Second, movie reviews are easy to compare across a number of outlets while coverage of scandals and of mutual fund performance are less so. More research will hopefully clarify these differences.

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