Does Media Concentration Lead to Biased Coverage? Evidence from Movie Reviews*

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Abstract

Fueled by the need to cut costs in a competitive industry, media companies have become increasingly concentrated. But is this consolidation without costs for the quality of information? Concentrated media companies generate a conflict of interest: a media outlet can bias its coverage to benefit companies in the same group. We test empirically 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 find a statistically significant, if small, bias in the review score for 20th Century Fox movies in the News Corp. outlets. We detect no bias for Warner Bros. movies in the reviews of the Time Warner outlets, but find instead some evidence of bias by omission: the media in this group are more likely to review highly-rated movies by affiliated studios. Using the wealth of detail in the data, we present evidence regarding bias by individual reviewer, and also biases in the editorial assignment of review tasks. We conclude that reputation limits the extent of bias due to conflict of interest, but that nonetheless powerful biasing forces are at work due to consolidation in the media industry.

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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 coverage in the *Wall Street Journal* of businesses in these sectors may be biased to benefit the owner of the Journal, Newscorp.

The *Wall Street Journal* case is hardly isolated. Media outlets are increasingly owned by large corporations, such as General Electric, which owns NBC, the Hearst Corporation, which owns a network of magazines and newspapers as well as ESPN, and Time Warner, which owns AOL, Time, and other newspapers and magazines. 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 in terms of biases in coverage?

Addressing this question is important. The potential biases in coverage can translate into a serious policy concern given the growing evidence of sizeable persuasion effect from the media (DellaVigna and Kaplan, 2007; Gerber, Karlan, and Bergan, 2009; Enikolopov, Petrova, and Zhuravskaya, forthcoming). Based on these and other studies, DellaVigna and Gentzkow (2010) suggest as a benchmark estimate that on average 5 to 10 percent of the audience is persuaded by messages of the media. In the presence of such sizeable persuasion, distortions in media coverage can lead to significant welfare losses.

Yet should we expect coverage to be biased due to consolidation? Economic theory provides no obvious response. If consumers can detect the bias in coverage due to cross-holdings and if media reputation is paramount, no bias should necessarily occur. If, on the other hand, consumers do not easily detect the bias perhaps because of persuasion bias (DeMarzo, Vayanos, and Zwiebel, 2003 and DellaVigna and Kaplan, 2007), and the benefits from distortions to the shareholders are larger than the reputation costs, the bias can be substantial.

Despite the importance of this question, we know of no systematic evidence on distortions in coverage induced by cross-holdings. In this paper, we provide such evidence. We focus on two groups—News Corp. and Time-Warner—and measure how media outlets in these groups review movies distributed by an affiliate in the group—20th Century Fox and Warner Bros. Pictures, respectively. The advantage of focusing on movie reviews is that they are frequent, easily quantifiable, and are believed to influence ticket sales (Reinstein and Snyder, 2005), with clear monetary benefits to the studio distributing the movie. As such, they are a target of potential distortion by the media company.

The identification of bias is transparent. We compare the review of, say, Avatar (distributed by 20th Century Fox) by the *Wall Street Journal* to the reviews by other outlets not owned

by News Corp. Since the *Wall Street Journal* reviewer may have a different evaluation scale from other reviewers, we use as a further control group the reviews of movies distributed by a different studio, such as Paramount. If the *Wall Street Journal* provides systematically more positive reviews for 20th Century Fox movies, but not for Paramount movies, we conclude that conflict of interest induces a bias. In short, the empirical strategy is a difference-in-difference comparison.

To implement the test, we use a data set of over half a million reviews for movies released from 1985 (year in which Newscorp. acquired 20th Century Fox) until 2011. The data sources for the reviews are two online aggregators, Metacritic and RottenTomatoes. We compare the movie reviews by 326 outlets with no conflict of interest (known to us) to the movie reviews issued by ten media outlets with cross-holdings. Seven media outlets are owned by News Corp. during at least part of the sample—the U.S. newspapers *Chicago Sun-Times*, *New York Post*, and *Wall Street Journal* (owned from 2008), the U.K. newspapers *Daily Telegraph, News of the World,* and *Times*, and the weekly *TV Guide* (from 1988 until 1999). Three media outlets are owned by Time-Warner—the weekly magazines *Entertainment Weekly* and *Time* and the website *CNN.com*.

For these media outlets, we estimate whether the conflict of interest induces a bias in the reviews. We find differing results for the two media groups. For the media outlets owned by News Corp., in the more comprehensive empirical specification we find that these media outlets give a more positive review to the 20th Century Fox movies by 2.3 points out of 100. The effect is relatively small, the equivalent of raising the review score by one star (on a zero-to-four scale) for one out of twelve movies. Still, it is a statistically and economically significant difference, and the effect is larger in the specification with controls than in the specification without, suggesting that unobservables may bias the estimates, if anything, downward (Altonji, Elder, Taber, 2006). The effect is statistically significant also for the 'freshness' score employed by Rottentomatoes. When examining the bias media-by-media, the effect is statistically significant only for the *New York Post*, but is similar in size (though less precisely estimated) for *Chicago Sun-Times*, *News of the World*, and *TV Guide*. There is no evidence of bias in the score for the *Wall Street Journal*, but marginally significant evidence of bias using the RottenTomatoes 'freshness' score.

For the media outlets owned by Time Warner, we find no evidence of bias due to cross-holdings. The finding of no bias is not due to lack of power, since we can reject any bias in the reviews larger than 0.7 out of 100 points. In fact, we reject the hypothesis that the bias due to conflict of interest is the same for the two conglomerates.

The unusually detailed information embedded in movie reviews allows us to decompose the possible bias further in three dimensions: (i) by reviewer; (ii) by editorial assignment; (iii) by type of movie, and (iv) by omission of review. These different angles allows us to provide some evidence as to the nature of the observed bias, such as whether it is more likely due to

idiosyncratic reviews by a journalist, or to a (perhaps implicit) editorial policy.

For the media with the most reviews—*New York Post* and *TV Guide* on one side, *Entertainment Weekly* and *Time* on the other—we can test for bias for each of the main movie reviewers. For the *New York Post*, we detect statistical evidence of bias for 3 out of 4 main reviewers, and for 1 of the 2 main *TV Guide* reviewers. For the Time Warner outlets, we instead find no evidence of bias for any of the 4 main reviewers. The commonality of the patterns at the *New York Post* suggests the possibility of a common factor, such as editorial policies.

However, we find no evidence of such policies when we study the assignment of movies to different reviewers. There is no evidence that 20th Century Fox movies are more likely to be assigned to reviewers who are on average less critical, or who display more (estimated) bias. This suggests that the observed bias is unlikely to represent an institutionalized policy – otherwise we would be likely to observe it also in the editorial assignment, and in addition the bias would likely be larger.

Next, we provide evidence on the types of movies for which bias occurs. In the *New York Post*, the bias is concentrated among the movies which reviewers in other media rate positively. An interpretation of this finding is that bias is applied optimally to movies for which the (marginal) return of the bias is likely to be highest, as providing the lone positive review to a movie with uniform negative reviews is unlikely to convince many readers. Still, we have no direct evidence of this channel, and we also do not find this same pattern in the other media outlets, suggesting that this pattern may be incidental.

Finally, we are able to analyze not only the presence of bias, conditional on review occurring, but also *bias by omission*: a media outlet that intends to benefit a studio may decide to selectively review only above-average movies by this studio. Indeed, bias by omission may be key to understanding media markets (Mullainathan, Schwartzstein, and Shleifer, 2008), but the existing evidence is limited since it is generally hard to separate bias by omission from bias by commission. In our setting, however, this analysis is straightforward: we consider the likelihood with which a media outlet reviews movies as a function of the average review by other reviewers. Interestingly, we find no consistent evidence of bias by omission for the News Corp. outlets, but we find evidence for two of the Time Warner outlets: *CNN.com* and *Time magazine*. Both of these media are significantly more likely to review movies which other reviewers rated highly, when the movie is distributed by an affiliated studio. We also examine, using a smaller data set, a related form of omission bias, whether media outlets write longer reviews and less likely to delay a review for high-quality affiliated movies. We find that Time Warner outlets write longer earlier reviews for the Warner Bros. movies; however, this pattern does not depend on the movie quality, unlike for the omission of review.

Altogether, this evidence suggests that bias by omission and bias by commission may be substitutes, rather than complements. Media outlets in the News Corp. group display

moderately-sized evidence of bias in the actual reviews, but no evidence of selective reviewing behavior. Instead, media outlets in the Time Warner group display no evidence of bias in the reviews, but some evidence of selective reviewing behavior.

We conclude the empirical analysis by providing one last piece of evidence on conflict of interest due to cross-holdings. While most of the study focuses on conflict of interest for movie reviewers, the conflict of interest induced by consolidation hardly stops there. Indeed, one of the review aggregators which we use in this study—Rottentomatoes—is itself at risk of conflict of interest: independent when launched in 1998, it was acquired by News Corp. in September 2005 and then divested in January of 2010. This ownership structure generates an incentive for RottenTomatoes to assign more positive reviews (its 'freshness' indicator) of 20th Century Fox movies during the period of Newscorp. ownership. Interestingly, we find no evidence of such distortion. The test of distortion has high power because we can compare the Rottentomatoes rating to the Metacritic score for the *same* movie review. Most telling, we find no bias even when bias would be hardest to detect (and hence presumably most likely), for unscored reviews which are evaluated qualitatively by the Rottentomatoes staff.

Overall, these results have two implications. On the one hand, they imply that reputation-based incentives are quite effective at limiting the occurrence of bias: we find no evidence of explicit editorial bias, such as in the assignment of movies to reviewers, no evidence of bias among the aggregators, and quantitatively small (if statistically significant) evidence of reviewer bias. On the other hand, they also indicate that bias does occur on situation, and that biasing strategies can be sophisticated, such as in the case of seemingly optimal bias for the *New York Post*. This suggests that the potential for bias is always lurking, were reputational concerns not strong enough.

This paper relates to the literature on conflict of interest. A substantial literature on analysts documents significant biases in recommendations for analysts employed by investment banks which recently undertook an IPO or SEO for the company covered (Hong and Kubik, 2003; Richardson et al., 2004; Malmendier and Shanthikumar, 2007) Gilens and Hertzman (2008) provide some evidence that the coverage of the debate on deregulation of TV is biased by conflict of interest. Compared to these papers, we find more nuanced evidence of the impact of conflict of interest. In addition, we are able to disentangle channels and forms of bias which this previous literature could not do.

Perhaps most related is the work by Reuter and Zitzewitz (2006) which provides evidence of the extent to which media outlets bias their coverage to earn more advertising revenue. Focusing on the case of mutual funds, Reuter and Zitzewitz find that biased coverage occurs for some financial magazines, but not for the outlets with the highest reputation, the Wall Street Journal and the New York Times. While this conflict of interest with advertisers is unavoidable for media outlets, we investigate the additional conflict of interest due to cross-holdings which does not arise for media outlets that are independently owned and is due to

the corporatization of the media.

This paper also relates to the literature on the economics of the media (Strömberg 2004; Gentzkow 2006; DellaVigna and Kaplan 2007; Gerber, Karlan, and Bergan 2009; Snyder and Strömberg 2010; Knight and Chiang forthcoming; Enikolopov, Petrova, and Zhuravskaya forthcoming), and in particular papers measuring the extent of bias in media coverage (Groseclose and Milyo, 2005; Gentzkow and Shapiro, 2010; Larcinese, Puglisi and Snyder, 2010; Durante and Knight forthcoming). Within the context of movie reviews we can address questions that have arisen in the economics of the media—such as whether bias occurs by omission or commission and the role of journalists versus the one of editors—about which we had very limited prior evidence.

The remainder of the paper is structured as follows. In Section 2, we introduce the data used in the paper and the institutional context. In Section 3, we present the results of the test of whether media outlets bias movie reviews as a result of a conflict of interest. In Section 4 we conclude.

2 Data

Metacritic and Rottentomatoes. The data used in this paper comes from the publicly-available information collected from two review aggregator websites, *www.metacritic.com* and *www.rottentomatoes.com*. Both websites collect movie reviews from a variety of media and publish snippets of those reviews.

The two websites differ in how they summarize reviews. Metacritic assigns a score for each movie review on a scale from 0 to 100, 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* (out of 4 stars), the score is a straightforward renormalization on a 0-100 scale. For reviews without a numerical score, such as for *Time* magazine, Metacritic staffers read the review, evaluate its general tone and assign a score on the same 0-100 scale (typically in increments of 10).

In contrast, Rottentomatoes does not build a 0-100 score, though it does report the underlying summary assessment for reviews with a quantitative score. For each review, Rottentomatoes instead classifies a movie as 'fresh' or 'rotten' based on the review, and then computes an aggregate score for each movie – the *tomatometer* – as the share of reviews which are 'fresh'. For reviews that are quantitative, the binary indicator for 'freshness' is built relatively straightforwardly as a function of the underlying score: for example, movies with 2 stars or fewer are nearly always classified as 'rotten', while movies with 3 or more stars are classified as 'fresh', with movies with 2.5 stars split based on a subjective judgment. For the reviews with no quantitative score, the movies is rated as 'fresh' or 'rotten' using a subjective evaluation by the staff, similarly to the Metacritic case (though the final evaluation is a 0/1 indicator, not a

0-100 score).

The two data sets have different advantages for our purposes. Metacritic contains more information on each review, since a review is coded on a 0-100 scale, rather than just a binary indicator. Rottentomatoes, however, is a much more comprehensive data set, containing about five times as many reviews as Metacritic, due both to coverage of many more media and to a longer time span. To take advantage of the strength of both data sets, we combine all reviews in the two data sets for movies produced since 1985 and reviewed up until July 2011 in the Metacritic website and until March 2011 on the Rottentomatoes website. We eliminate earlier reviews because the review data for earlier years is quite sparse, and in addition 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 also eliminate a small number of duplicate reviews by the same reviewer in a given media.

We merge the reviews in the two data sets (134,129 reviews in MetaCritic and 583,783 reviews in RottenTomatoes) by title, year of production of the movie (since some movie titles are repeated in the data), and media of review, and name of the reviewer. Out of the resulting sample of 640,042 reviews, we excluded all movies with fewer than 5 reviews, and all media with fewer than 400 reviews, for a final sample of 548,764 movie reviews.[1]

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

Media Sources. Table 1, Panel A reports summary statistics on the combined data set of 548,764 reviews covering a total of 12,999 movies reviewed in 336 different media outlets. The data set includes reviews from seven media with a conflict of interest within the News Corp. group with 20th Century Fox movies: the American newspapers *Chicago Sun-Times* (owned by News Corp. only between 1985 and 1986), *New York Post* (owned by News Corp. from 1993), and *Wall Street Journal* (owned by News Corp. since December 2007), the British newspapers *Daily Telegraph, News of the World,* and *Times* (all owned throughout the period) and the magazine *TV Guide* (owned by News Corp. from 1988 until 1999). The number of reviews, and the data source, differs across these seven media. The British newspapers are represented only in Rottentomatoes and have less than 1,000 reviews each in the data. The *New York*

[1] While we edited to the extent possible the title of movies and the name of the reviewer to match the names in the two data sets, some reviews in the merged data are duplicates because they were not exact matches. To increase the match rate, we allow for the year of the movies in the two data sets to differ by one year.

Post is represented in both data sets and has the most reviews (6,278, all under conflict of interest). *TV Guide* and *Wall Street Journal* have a relatively high number of reviews, but only a minority under conflict of interest. All but one of these seven media (the *Wall Street Journal*) have a quantitative scoring rule for the reviews, with the *Daily Telegraph* combining qualitative and quantitative reviews. Within each of these media, the average quantitative score ranges between 56 and 70 (out of 100). Finally, notice that 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 lower part of Table 1, Panel A reports the information on the three media owned by Time Warner: the website *CNN.com*, and the weekly magazines *Time* and *Entertainment Weekly* (both owned by Time Warner from 1990 on). The reviews in these three publications are at conflict of interest with Warner Bros. movies, since the studio was acquired in 1989 by Time, Inc. Two of the three outlets – *CNN.com* and *Time* – use only qualitative reviews; since the reviews from *CNN.com* are only in the Metacritic data set, there is no 0-100 score for these reviews, but only a freshness rating. Most of the observations are from *Entertainment Weekly*, with nearly 5,000 reviews.

Studios. Table 1, Panel B presents information on the studios distributing the 12,999 movies reviewed in our data set. Among the distributors owned by News Corp., 20th Century Fox movies are the largest group (449 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 ones that are owned by Newscorp., which we call for brevity 20th Century Fox, and ones that are owned by Times Warner, which we call Warner Bros.

3 Bias in Movie Reviews

3.1 Bias in Average Review

Graphical Evidence. As a first step in the analysis, we examine whether the conflict of interest induces a bias on average in the reviews, that is, whether, say, the *Wall Street Journal* provides a more positive review to 20th Century Fox movies when owned by Rupert Murdoch. Appendix Figure 1 provides preliminary evidence in this regard for movies reviewed by the *Wall Street Journal* on a quantitative review score between 0 and 100.

The top panel presents the information for reviews for the period in which Newscorp. owns the Journal (2008 on), while the bottom panel presents the earlier data. The first quadrant focuses on the 20th Century Fox movies produced from 2008 which were reviewed by the *Wall*

Street Journal, and compares the reviews by the Journal to reviews by other media for the same movies.[2] The Journal reviews are more negative than other reviews. The second quadrant does a similar comparison for movies produced by other studios and finds a similar, if somewhat smaller, difference. The bottom panel shows similar statistics for movies produced before News Corp. owned the *Wall Street Journal*, that is, pre-2008. Overall, this comparison produces no obvious evidence of bias due to cross-holdings, or possibly a negative bias.

However, the evidence in Appendix Figure 1 is based on a small number of movies, as the *Wall Street Journal* reviewed only 45 movies produced by 20th Century Fox since 2008. Hence, in Figure 1a we expand the analysis to consider all media owned by Newscorp. The left panel in Figure 1a focuses on the 406 movies produced by 20th Century Fox over the period 1985-2011: the average review score by the News Corp. owned media is just slightly lower than the score attributed for the same movies by other media outlets.

This comparison, however, does not control for possible differences in the average ratings for the media owned by News Corp. versus the other media. Indeed, the second panel of Figure 1a shows that for the 6,976 movies not distributed by 20th Century Fox, the average rating by News Corp. media is about 3 points lower than the average rating by other media outlets. Once one takes into account this baseline difference in a difference-in-difference comparison, News Corp.-owned media give a more positive review to movies distributed by 20th Century Fox. Below, we provide evidence on whether this difference is statistically significant and robust to the addition of control variables.

Figure 1b provides the same evidence for movies distributed by Warner Brothers and their reviews, compared to movies distributed by other companies. The media owned by Time Warner provide on average slightly more positive reviews than other media, and this difference is nearly identical for movies produced by Warner Brothers and for other movies. Hence, unlike for the case of News Corp. we find no *prima facie* evidence of conflict of interest in the movie reviews for media owned by Time Warner.

Average Bias in Review. In the following, we implement a test for the effect of conflict of interest which builds on the graphical evidence above, but allows for the addition of control variables, which is important since movies produced by different studios differ in important ways. We estimate a difference-in-difference OLS regression:

$$\begin{aligned} r_{m,o} &= \alpha + \beta^{FM} d_m^{FoxMovie} + \beta^{FO} d_o^{FoxOutlet} + \gamma^F d_m^{FoxMovie} d_o^{FoxOutlet} \\ &\quad + \beta^{TM} d_m^{TWMovie} + \beta^{TO} d_o^{TWOutlet} + \gamma^T d_m^{TWMovie} d_o^{TWOutlet} + BX_{m,o} + \varepsilon_{m,o} \end{aligned} \tag{1}$$

Each observation in the regression is a review for movie m on media outlet o. The dependent variable $r_{m,o}$ is a summary of the review either on a 0 to 100 scale or as a indicator for 'freshness' in the Rottentomatoes sample. The coefficient β^{FM} captures the average difference in reviews

[2] To compute the average review by other media outlets, we first compute for each movie the average review by all other outlets, and then we average these averages across movies.

for movies that are produced by 20th Century Fox, for which the indicator variable $d_m^{FoxMovie}$ equals 1. The coefficient β^{FO} captures the average difference in reviews for media outlets that are owned by News Corp. at the time of movie release, in which case the indicator variable $d_o^{FoxOutlet}$ equals 1. The key coefficient is γ^F, which indicates the estimated impact of the conflict of interest, that is, the average rating for a movie released by 20th Century Fox when reviewed by a media owned by News Corp., compared to the counterfactual. The coefficients β^{TM}, β^{TO}, and γ^T present the parallel cases for the Time Warner group. The control variables X vary across different specifications. The standard errors are clustered at the movie level to allow for correlation of errors across multiple reviews of a movie.[3]

Table 2 reports the results for the combined sample of 473,727 reviews on the 0-100 review score. (Notice that the sample is smaller than the overall sample of 548,764 reviews because it does not include qualitative reviews in the Rottentomatoes data, which are not scored) In Columns 1 to 4 we present the results after including an increasing number of control variables, to show the effect of controlling for observables. A specification without any controls (Column 1) indicates an insignificant effect of conflict of interest for both the News Corp. outlets (γ^F) and the Time Warner outlets (γ^T), and introducing fixed effects for the year of release of the movie reviewed (Column 2) does not affect the estimates appreciably. These estimates, however, do not control for the fact that the type of movies reviewed by the Newscorp. and Time Warner media may differ from other media in a way that could bias the estimates. It could be, for example, that Time magazine reviews only good movies produced by smaller studios, but reviews both good and bad movies produced by large studios such as Warner Bros. In this case, the coefficient γ^T on the conflict of interest interaction could be downward biased because we are not controlling for movie quality. The estimated null effect could thus be due to a biasing factor such as this counter-acting a positive bias.

In Column 3 we control for movie quality by introducing fixed effects for each movie. Not surprisingly, these controls raise the R^2 significantly from 0.01 to 0.41. Once we control for movie quality, we now detect a statistically significant, if moderate sized, effect of conflict of interest for the News Corp. outlets: $\hat{\gamma}^F = 1.7088$: movies at risk of conflict of interest receive a more positive review by 1.7 points out of 100. There is instead no significant estimated impact of conflict of interest for the Time Warner outlets: in fact, the estimated effect of conflict of interest is to lower the score by 1 point out of 100, if insignificantly so. Given the opposite sides of the coefficients, an F-test rejects the equality of the conflict of interest coefficients for the two media groups with a p-value of 0.0089 (bottom row in Table 2).

To further control for the selection of movies reviewed into different media, in Column 4 we introduce fixed effects for each of the 336 media in the sample. The introduction of these fixed effects, which raises the R^2 further to 0.46, increases the estimated effect of the bias due

[3] In Appendix Table 1 we consider alternative forms of clustering and show that clustering by movie is the most aggressive one.

to conflict of interest for the News Corp. media to $\hat{\gamma}^F = 2.2755$, significantly different from 0 at the 1 percent level. The estimated effect of conflict of interest for the Time Warner group, instead, remains negative, small, and not significantly different from zero.

Finally, in Columns (5) and (6) we estimate separately the effect for movie reviews in, respectively, the Metacritic data base and in the Rottentomatoes data base. (Movie reviews which are in both data sets are present in both samples) The results are similar in the two samples, with larger estimates of conflict of interest for News Corp. in the MetaCritic data.

The results using the 0-100 score hence provide evidence of a statistically significant bias for the News Corp. outlet of 2.3 points out of 100 in the most controlled specification, corresponding to a 3 percent increase relative to the average score of 61.5 points. The effect is relatively small, the equivalent of raising the review by one star (on a zero-to-four scale) for one out of 11 movies reviewed. The fact that the addition of a rich set of control variables increases the estimated effect suggests that the estimate may be if anything biased downward, to the extent that the unobservables resemble the observables (Altonji, Elder, and Taber, 2006) The conclusions of the Altonji, Elder, and Taber test are strengthened by the fact that the covariates control a significant share of the residual variance, with an R^2 of 0.46 in Column 4.

For the Time Warner outlets, given the precision of the estimates, in the benchmark specification we can reject a positive bias larger than 0.9 points out of 100, corresponding to 1.5 percent of the mean score. Hence, the finding of no bias for Time Warner is not due to lack of power.

In Table 3 we estimate the OLS regression (1) with the 'freshness' indicator as dependent variable. While the 0-100 score used in Table 2 conveys more information than a 0-1 variable, the freshness indicator is defined for the qualitative reviews in the Rottentomatoes data, which the 0-100 score is not. The results in Table 3 are remarkably parallel to the results in Table 2. There is no significant evidence of conflict of interest in the specification with no controls (Column 1). However, once the controls for movie fixed effect (Column 3) and media fixed effect (Column 4) are added, the results indicate a statistically significant positive bias for the News Corp. outlets. In the most controlled specification, the bias amounts to a 5.74 percentage point higher probability of a 'fresh' review for movies with conflict of interest, a 10 percent increase relative to an average freshness score of 59 percentage points. The estimate is even larger in the sub-sample of RottenTomatoes data which is also part of the Metacritic data (Column 5). We return below to a comparison of the magnitude of bias in Table 3 versus in Table 2. In contrast, we find no evidence of positive bias and some evidence of a (statistically insignificant) negative bias for the Time Warner outlets.

In Appendix Table 1 we present the result of a series of robustness checks for the benchmark specification with full controls (Column 4 in Tables 2 and 3); we report only the relevant conflict-of-interest coefficients. Alternative ways to cluster standard errors by studio and by

media leads to higher standard errors than in the benchmark specification (Columns 2 and 3, compared to the benchmark clustering reproduced in Column 1). We then explore the impact of restricting the sample of studios considered to ones that are arguably more similar to the ones at conflict of interest: the Big-6 major studios— Columbia Pictures, Paramount Pictures, Universal Pictures, Walt Disney/Touchstone Pictures, in addition to 20th Century Fox and Warner Bros.— and the major indie studios. This includes all the movies at potential conflict of interest, but restricts the sample of comparison movies so the sample is 303,632 movies rather than 473,664 as in the main estimates. The results are very similar (Column 4). Finally, we analyze separately the quantitative reviews (Column 5) and the qualitative reviews (Column 6). The evidence of bias for Newscorp. is for the quantitative reviews, which are the large majority; the sample of purely qualitative reviews is much smaller, and hence the estimates quite noisy.

Bias By Media. One advantage of this test of conflict of interest is that we can perform the test separately for each media in the two conglomerates. To the extent that there is a common (implicit or explicit) policy within a media company, we expect to find similar results across the different media. The decision could, however, also vary by outlet as a function of the reputation and influence.

For each media j, we estimate the specification

$$r_{m,o} = \alpha^j + \beta^{jM} d_m^{G(j)Movie} + \beta^{jO} d_o^{G(j)outlet} + \gamma^j d_m^{G(j)Movie} d_o^{G(j)Outlet} + B^j X_{m,o} + \varepsilon_{m,o}, \quad (2)$$

where $G(j)$ is the relevant industrial group (e.g., FOX if the media considered is TV Guide). We include in the sample for media j all reviews for movies that are reviewed by media j, and include only years in which media j is owned by the industrial group $G(j)$ (e.g., for the TV Guide regressions, we only include the years 1988-99). The controls X are the full set of movie and reviewer fixed effects. We present the estimates for the 0-100 score in Panel A of Table 4 and for the freshness score in Panel B of Table 4.

For 6 out of 7 media owned by News Corp., the coefficient for bias is positive, whether one considers the score results or the freshness results. Given the larger standard errors involved in a media-by-media analysis, the bias is however significant for only one media, the daily *New York Post,* for which the bias is significant both in terms of 0-100 score (3.13 points) and 'freshness' (7.18 percentage points). There is also marginally significant evidence of a bias in the 'freshness' variable, though not in the 0-100 score, for the *Wall Street Journal.* For this latter media, however, the estimate is quite imprecise as the period of conflict of interest starts only from the year 2008. Interestingly, the largest point estimate of bias in the 0-100 score is for *News of the World*, the UK daily which recently closed down because of the scandal regarding journalistic behavior in hacking. Still, the point estimate is noisy given the small sample of reviews for this media outlet.

For the three media owned by Time Warner, instead, the estimated coefficients of bias are

all negative, although insignificant. For both *Entertainment Weekly* and *Time* magazine, the estimates are quite precise and given the confidence intervals we are able to reject any sizeable bias, such as bias larger than 1.2 points (out of 100) for *Entertainment Weekly* and larger than 1.8 points (out of 100) for *Time* magazine.

3.2 Decomposing Editorial Bias

So far, we discussed the extent of possible bias in review for the two media conglomerates, including examining the extent of bias media-by-media. We documented significant and precisely estimated bias in one newspaper (New York Post) and possible evidence of bias in other media in the Newscorp. group, though not statistically significant. We found no evidence of bias among the Time Warner media.

The above evidence, however, does not speak to the possible channels through which bias may occur: (i) an intentional, but unsolicited, decision by a reviewer, presumably to please an editor; (ii) an unintentional reviewer bias; (iii) an explicit editorial policy conveyed to the journalists. While we cannot ultimately settle for one of these, and potentially other, channels, we provide evidence which opens up the black-box of journalistic decisions, and helps asses the different possibilities.

We take advantage of the fact that most media have only a small number of movie reviewers, and these reviewers 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 unique feature within the literature. Table 5 lists all the significant reviewers for the media in the two conglomerates. Some media outlets, such as *Chicago Sun-Times, News of the World,* and *Wall Street Journal*, have only one reviewer, respectively Roger Ebert, Robbie Collin, and Joe Morgenstern. Most other media outlets have two main reviewers, including the *Daily Telegraph*, *TV Guide*, *The Times, Entertainment Weekly,* and *Time Magazine.* Finally, the *New York Post* has five main reviewer, three of which are more frequent than the others.

We take advantage of the relatively high number of reviews per reviewer to estimate the extent of bias due to conflict of interest for each reviewer in Table 6. We estimate, reviewer-by-reviewer, the equivalent of specification (2), except that we include in the sample only reviews done by a particular reviewer, and all other reviews by other media of those same movies. The first four columns of Table 5 present the analysis separately for four of the main reviewers of the *New York Post.* (We do not include V.A. Musetto because, as discussed below, he reviewed only four 20th Century Fox movies, and hence we cannot estimate whether he is biased). Interestingly, the estimates indicate statistically significant evidence of bias (at least at 10% level) for three out of four of the *New York Post* reviewers. The conclusion holds whether we use the 0-100 score measure or the 'freshness' indicator. The estimated bias for the *New York Post,* hence, is not due to an outlying individual. We also estimate significant

bias for the main reviewer of the *TV Guide* (Maitland McDonagh), but not for the second *TV Guide* reviewer. For the two other Newscorp. outlets with multiple reviewers—*Daily Telegraph* and *Times*—the point estimates do not indicate bias, but the sample is small enough that the estimates are quite imprecise (results not reported).

Turning to the Time Warner outlets, we detect no evidence of bias for any of the two reviewers of *Entertainment Weekly* and *Time*. (In fact, there statistically significant evidence of negative bias for one Time reviewer, but the result does not hold with the 'freshness' score.) Hence, the null finding of bias in the Time Warner outlets does not appear to be due to multiple reviewers having opposite biases, but rather a uniform finding.

The evidence for the *New York Post* suggests a quite systematic pattern – but how likely is it that the pattern is due to editorial policy or pressure? While it is impossible to tell for sure, we exploit the presence of multiple reviewers to test for explicit editorial assignment of movies to reviewers meant to deliver higher scores for the affiliated movies. More precisely, we test if affiliated movies are more likely to be assigned to reviewers who on average assign higher scores. To estimate whether there indeed are significant differences in average reviewer score, we estimate the OLS regression

$$r_{m,o} = \alpha + \lambda_j + \eta_m + \varepsilon_{m,o},$$

where $r_{m,o}$ is the 0-100 score for movie m on media outlet o, η_m is a movie fixed effect, and λ_j is a reviewer fixed effect (with A.O. Scott of the *New York Times* as omitted category). We exclude movies distributed by studios owned by Newscorp. or Time Warner. Table 5 reports the estimated reviewer fixed effects $\hat{\lambda}_j$, together with the standard errors. Movie reviewers indeed differ quite sizably, even within the same outlet. At the *Daily Telegraph*, the two main reviewers differ by over 10 points (the difference is clearly statistically significant). Within the *New York Post*, reviewers differ by up to 7 points, by 5 points in *TV Guide,* and 3 points in the *Times*. The differences are instead smaller in the Time Warner outlets, with a 2-point difference in *Entertainment Weekly*, and a 1-point difference in *Time Magazine*.

Given that journalists, at least in the News Corp. media, differ in terms of the average generosity of their reviews, we can estimate whether movies at conflict of interest are more likely to be assigned to reviewers who are on average more generous. This kind of assignment would be more likely to indicate an explicit editorial bias, as opposed to idiosyncratic journalistic decisions. The last column of Table 5 provides evidence on the share of each journalist's reviews which are about movies from affiliated studios. There is no detectable pattern in the data: for example, in the Daily Telegraph, the share of 20th Century Fox movies reviewed is about 8% for each reviewer, despite the large difference in average score generosity. The one exception is that a reviewer at the New York Post, V.A. Musetto, reviewed nearly none of the 20th Century Fox movies, differently from the other 4 reviewers. The pattern is, however, explained by the fact that this reviewer covers nearly exclusively indie movies; and in any case

this reviewer has a high fixed effect, and hence would have been expected, in case of intention editorial assignment, to handle *more* 20th Century Fox movies.

To formalize the test, we run for each media with a regressions like (2), except that the dependent variable is the estimated reviewer fixed effect $\hat{\lambda}_j$. The evidence, in Appendix Table 2, provides no indication of editorial bias. In fact, for the *New York Post* we obtain evidence of negative selection which is due, as discussed before, to one specialized indie movie reviewer who happens to be relatively generous. We can therefore reject any systematic pattern of assignment of movies to reviewers in order to benefit the affiliated studio. In fact, the approximately random assignment of movies documented in Table 5 implies that we can reject alternative assignment processes, such as assigning movies from affiliated studios to reviewers which are more likely to display bias in the case of conflict of interest.

3.3 Selective Bias

The findings so far focused on the extent of bias on average. Bias may, however, take a more subtle form. It is quite possible that the media owners, while intending to benefit the sales of movies, want to do so while appearing unbiased. In such case, a possible strategy is to ensure no bias on average, but to instead bias significantly the reviews of select movies where the returns for bias is likely higher, and compensate with other movies. The data set permits a preliminary analysis of these patterns of selective bias using proxies of the extent to which a movie review is likely to have higher returns.

As a proxy of the returns to bias we use the rating of a movie by other media outlets. We assume that movies with negative reviews by other outlets would yield the least impact from a biased review, since it is harder to move priors of the public for a movie with uniform negative reception. Hence, we expect that the media outlets with incentive conflicts would refrain from bias, possibly even biasing negatively to compensate. The potential return to bias is likely to be higher instead for movies with more positive reception. Admittedly, not having an estimate of the returns of a positive review, this test relies on an untested assumption.

We present graphical evidence in Figures 2a-2f. Figure 2a plots the average movie review score for 20th Century Fox movies (the continuous lines) and for other movies (the dotted lines). We further split the data into movie reviews by Newscorp. media (the dark blue line) and reviews by other media (the light blue line). Each of the four lines is plotted as a function of the average 0-100 score review by all media reviewing a movie, in 5-score bins. (We truncate movies with average reviews below 20 points and above 85 points, since such movies are rare.) The graph allows to compare the review by the affiliated media to the review for the other media (light blue lines) which, by definition, are on the 45-degree line. Figure 2a shows that the average review by Newscorp. media for 20th Century Fox movies follows quite closely the line for reviews by Newscorp. media of other movies, except for movies with score higher than

60, where it lies above. Hence, it is for movies that other reviewers generally like that the bias due to conflict of interest appears.

Figures 2b and 2c display similar evidence for the two main media in the Newscorp. group, the *New York Post* and the *Wall Street Journal.* The pattern for the *New York Post* indicates a similar pattern to the one in Figure 2a, except even more accentuated. The pattern is qualitatively present, but noisier, for the *Wall Street Journal.*

Figures 2d-2f present parallel figures on aggregate for the Time Warner media, and then separately for the two main outlets, *Entertainment Weekly* and *Time.* For neither of the media we detect any systematic pattern of deviation for affiliated movies from the pattern for non-affiliated movies.

We provide a regression based test in the next OLS specification in Table 7, which we illustrate here for the Newscorp. case:

$$\begin{aligned} r_{m,o} &= \alpha + \gamma^F d_m^{FoxMovie} d_o^{FoxOutlet} + \delta^F_{55-70} d_m^{FoxMovie} d_o^{FoxOutlet} * d_{55<\bar{r}_m\leq 70} \\ &\quad + \delta^F_{70+} d_m^{FoxMovie} d_o^{FoxOutlet} * d_{\bar{r}_m>70} + BX_{m,o} + \varepsilon_{m,o}. \end{aligned} \tag{3}$$

The dependent variable $r_{m,o}$ is the review 0-100 score by a particular media, $\bar{r}_m$ is the average review for movie m, and $d_{55<\bar{r}_m\leq 70}$ and $d_{\bar{r}_m>70}$ are indicators for, respectively, whether the average review falls in the range $55 < \bar{r}_m \leq 70$ or in the range $\bar{r}_m > 70$. As such, the coefficients δ^F_{55-70} and δ^F_{70+} are the key coefficients which indicate how the effect of conflict of interest changes for different types of movies. The regressions include not only movie fixed effects and media outlet fixed effects, but also interactions between the media outlet fixed effect and the indicators $d_{55<\bar{r}_m\leq 70}$ and $d_{\bar{r}_m>70}$.

The evidence in Table 7 provides statistically significant evidence for the *New York Post* of a larger bias for movies with more positive reviews, as in Figure 2b. However, we find no similar evidence for the other media, suggesting that the case of *New York Post* may be the exception rather than the rule.

3.4 Bias by Omission

So far, we have focused on testing whether on average media outlets bias the reviews of movies for films where the parent company would benefit from extra attendances. However, bias can occur by omission, rather than by commission. A movie outlet may decide not to review a below-average movie by an affiliated studio, and make sure to review an above-average movie by the same studio. In this case, the movie may not display any bias conditional on review, but the bias is in the review decision itself. We hence analyze the extent to which the News Corp. outlets fail to review 20th Century Fox movies that other reviewers rate negatively, while reviewing the movies with positive reviews, and similarly for Time Warner outlets.

Investigating this channel is particularly important because bias by omission in the me-

dia may well be more important than bias by commission (Mullainathan, Schwartzstein, and Shleifer, 2008), and such bias is generally difficult to detect. The study of movie reviews offers an opportunity to do such a study because we know the universe of movies which receive at least some review in the media, and hence can measure the absence of coverage, which is instead hard to do for most other studies of media coverage.

Full Omission. We estimate the extent to which different outlets do, or do not, review movies, as a function of the average review that *other* reviewers assign. The average review by other media for the same movie is a reasonable predictor of the likely review that a media would issue, and so allows us to test whether, in case of conflict of interest, a media outlet is more likely to review movies with high predicted review, compared to its usual pattern. The not-obvious part of this comparison is that media outlets differ widely in their average probability to review a movie: the *New York Post*, *TV Guide* and *Entertainment Weekly* review a good share of movies, while *Time* Magazine reviews only a fraction.

To address this problem, we match each media in the News Corp. or Time Warner Group with the ten other media in the sample with the most similar probability of reviewing movies. We then compare the probability of publishing a review in the media at hand and in the average of the matched media, as a function of whether the movie is produced by a studio with conflict of interest or not.

Figures 3a-3d present the graphical evidence for the four main media in the sample, the *New York Post* and *Wall Street Journal* under Newscorp. ownership, and *Time magazine and Entertainment Weekly* under Time Warner ownership. We plot the average probability of review after grouping movies in bins of 5-point intervals (review 15-19, 20-25, etc.) by the average review over all media in the sample, excluding the 11 media considered in the Figure; we truncate movies with average reviews below 20 points and above 85 points, since such movies are rare.

Figure 3a presents the evidence for the *New York Post* and the average of ten matched media. The dotted lines plot how the probability of review varies for movies not produced by 20th Century Fox respectively in the *New York Post* (darker blue line) and on average in the matched media (lighter blue line). The probability of review varies between 40% and 65% and is generally increasing in the average review score; importantly, the pattern is quite similar for the two types of media outlets, suggesting a successful match. The question then is whether this pattern differs for movies distributed by 20th Century Fox, plotted with a continuous line. Even in the matched media (represented by the continuous light blue line) the probability of review is higher for 20th Century Fox movies compared to other movies, likely because 20th Century Fox produces movies with a higher budget and hence on average higher audiences relative to some smaller studios. Compared to this line, the probability of review by the *New York Post* for 20th Century Fox movies is essentially identical. Hence, there is no evidence of bias by omission for this paper.

Figure 3b presents parallel evidence for the *Wall Street Journal*. The evidence is significantly noisier because it only includes the years in which the Journal was under Newscorp., that is, from 2008 on. The comparison suggests little systematic pattern in the probability of review.

Turning to the media owned by Time Warner, Figure 3c presents the corresponding evidence for *Time* magazine. The figure provides quite striking evidence of omission bias. The probability of review of Warner Bros. movies is strongly increasing in the measured quality of the movie, and this relationship is significantly more accentuated than in the matched media. Still, a cautionary note is that the match is imperfect in that even for non-Warner Bros. movies the probability of review by *Time* magazine is more responsive to the score than it is in the sample of matching media.

Figure 3d presents the evidence for *Entertainment Weekly*. The average probability of review of Warner Bros. movies in this weekly as a function of movie quality closely parallels the corresponding average probability of review in the ten matched media (with a higher level). As such, there is no evidence of omission bias.

To complement the graphical evidence, we estimate the following linear probability model in Table 8, which we illustrate for the case of media owned by News Corp.:

$$d_{m,o} = \alpha + \gamma^F d_m^{FoxMovie} d_o^{FoxOutlet} + \delta^F d_m^{FoxMovie} d_o^{FoxOutlet} * \bar{r}_m + BX_{m,o} + \varepsilon_{m,o}. \qquad (4)$$

An observation is a possible review for a movie by one of eleven media: the media outlet featured in the respective column and the ten media outlets in the sample with the closest matching probability of review to the featured media. In each specification, the time period spans the period in which the featured media exists and is owned by the conflicted conglomerate. The dependent variable is the indicator $d_{m,o}$ which equals 1 if media outlet o reviews movie m. The key coefficient is δ^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 a rich set of fixed effect, movie fixed effects, media outlet fixed effects, and media outlet fixed effects interacted with the mean rating $\bar{r}_m$. The inclusion of these fixed effects implies that we are controlling for other double interaction terms such as $d_m^{FoxMovie} * \bar{r}_m$ (absorbed by the movie fixed effects) and $d_o^{FoxOutlet} * \bar{r}_m$ (absorbed by the media outlet fixed effects interacted with the mean rating). A key assumption made in equation (4) 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 3a-3d.

The evidence in Table 8 provides no consistent evidence of selective review consistent with omission bias for the Newscorp. media. Indeed, the relevant coefficient δ^{FF} on the interaction between conflict of interest and average review score is significantly negative for two media (*Daily Telegraph* and *The Times*) and marginally significantly positive for two other media

(*TV Guide* and *Wall Street Journal*). For the Time Warner outlets, instead, we find evidence consistent with strategic omission bias for two outlets – *CNN.com* and *Time Magazine*. This evidence, consistent with the graphical evidence, therefore suggests that bias by omission is a substitute, not a complement, of bias by commission, as we find evidence of it in the media group – Time Warner – for which we found no evidence of bias condition on a review.

Partial Omission. To provide further evidence on the possibility of bias by omission, we consider a more subtle biasing strategies of partial omission of information: delivering a review later, once readers are likely to have received the information to other media and hence a review is likely less influential, and providing shorter reviews, which likely convey less information.

Since the information on both date of review and on the content of the review are not available on either the Metacritic or Rottentomatoes site, we scraped the content of all the reviews available on the websites of the three media with the most reviews in our data: *Entertainment Weekly* (3,372 reviews starting from 1990), *New York Post* (1,252 reviews starting from 2006), and *Time* magazine (638 reviews starting from 1985), and in addition from two control media which were relatively easy to scrape, the *Boston Globe* (870 reviews starting from 2002), and the *Village Voice* (3,934 reviews starting from 1998). For the subset of reviews in these media with information on date of review, we create an indicator variable for movies reviewed 5 or more days after the release date, as well as a continuous variable for the difference between the date of review and the date of movie release[4]. We also use as an indicator of length the log of number of words in a review (we set to missing reviews shorter than 100 words).

In Table 9, for each of the three outcome variables, we estimate specification (1) to test whether there is an impact of conflict of interest, independent of the quality of movie. We include both media and movie fixed effects. We find evidence of biased coverage in the Time Warner outlets: the reviews for movies produced by Warner Bros. are less likely to be delayed by about 10 percentage points (Column 1), are released on average one day early (Column 3), and are one average 16 percent longer (Column 5). There is no consistent evidence instead for the Newscorp. outlets, with if anything evidence of more delay for the 20th Century Fox movies.

We then consider how these patterns vary by the average review score of the movie (computed excluding the five media), as in specification (4). We include fixed effects for movie, media, and media interacted with the average review score. In this specification, we find no evidence that the intensity of coverage differs as a function of the quality of the movie, either in the Time Warner outlets or in the Newscorp. outlets.

Altogether, there is evidence of more intensive coverage for movies at conflict of interest in the Time Warner outlets; however, unlike for the evidence on omission of reviews, this pattern is not responsive to the movie quality.

[4]For both variables, we exclude reviews published either more than 10 days before the release date, or more than 20 days after the release date, since for these observations the date is likely to be miscoded.

3.5 Bias in Movie Aggregator

So far we have focused on the most obvious conflict of interest in the movie industry induced by the consolidation of studios like 20th Century Fox and Warner Bros. into media conglomerates which employ movie reviewers. But the conflict of interest induced by consolidation hardly stops there.

Both of the review aggregators which we use in this study—Metacritic and Rottentomatoes—are themselves at risk of conflict of interest. Metacritic.com, an independent entity when launched in 2001, was acquired by CNET in August 2005, and CNET itself was acquired in 2008 by CBS. Rottentomatoes.com, also 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 RottenTomatoes, was then sold in January of 2010 by Newscorp. Interestingly, in April 2011 IGN was then acquired by Time Warner, the other conglomerate in our study.

The ownership structure of RottenTomatoes generates an obvious conflict of interest to post more positive reviews of the 20th Century Fox movies during the period of Newscorp. ownership (2006-2009). Since the movie reviews are posted quickly on the Rottentomatoes site and then rarely updated[5], we use the year of release of the movie to test the hypothesis of conflict of interest.

More specifically, we estimate

$$r_{m,o} = \alpha + \gamma^{CI} d_m^{FoxMovie} d_t^{2006-09} + \beta^F d_m^{FoxMovie} + BX_{m,o} + \varepsilon_{m,o}, \tag{5}$$

where $r_{m,o}$ is a measure of a movie review for movie m on media outlet o, and the coefficient of interest if γ^{CI} which captures how movies distributed by the 20th Century Fox studio (indicated with $d_m^{FoxMovie} = 1$) are characterized in reviews in the years 2006-2009, compared with the years before and after. Since 20th Century Fox movies may have a different average quality than movies produced by other studios, we control for the time-invariant quality with coefficient δ^F. Also, in most specifications we include in the control variables X year fixed effects (to control for differences in movie quality or review generosity by year) and media fixed effects (to control for time-varying media over time). Most importantly, since we match the Rottentomatoes sample of movie reviews with the corresponding sample of movie reviews in Metacritic, we can include among the controls the MetaCritic score for a given movie review.

In Table 10 we report the estimate of (5) where in Columns 1 to 7 we use as measure of the coding of a movie review the 0-1 freshness indicator which is the hallmark score for a review of the Rottentomatoes site. Using the sample of all reviews in the Rottentomatoes sample and with no controls (Column 1), the estimates suggest that over the period of Newscorp.

[5]Consistent with this, two separate scrapes of the site at 3 month distance yielded no change in the reviews for older movies.

ownership, Rottentomatoes provides more *negative* reviews of 20th Century Fox movies ($\hat{\gamma}^{CI} = -0.0684$), a conclusion which does not change after inclusion of year and media fixed effects (Column 2).

It is however quite likely that this finding may be spurious and due to objectively lower quality movies produced by the Fox studio in those four years. To control for this fact, we add as control the underlying quantitative score of the review, as reported by Rottentomatoes, and translated into a 0-100 scale as described in Section 2. Hence, in this specification we examine whether Rottentomatoes is more generous in attributing 'fresh' reviews to Fox movies, given the underlying coded score (say, 3 out of 5 stars). Once we control for the score variable (Column 3), the effect of conflict of interest is precisely estimated to be close to zero ($\hat{\gamma}^{CI} = -0.0073$). The standard errors in this specifications are tight, allowing us to reject as an upper bound that conflict of interest increases the probability of a fresh score by 0.7 percentage points, a small effect.

To examine more in detail where bias could occur, we analyze separately reviews which have a quantitative score (such as number of stars) versus qualitative reviews for which the freshness score is attributed by a staff reading. Since scored reviews are likely to receive a freshness score which is automatically attributed as a function of the score, bias is less likely, and indeed in this sample there is no bias (Column 4). However, even in this sample the freshness score is hardly automatic. While nearly all movie reviews scored below 50 receive a 'rotten' rating and nearly all movie reviews scored above 70 receive a 'fresh' rating, for reviews with scores between 50 and 70, Rottentomatoes does not apply a strict cut-off rule and seems to use qualitative information such as a detailed reading of the review. Even in the sample of reviews with score in this intermediate range, we detect no bias (Column 5).

Arguably, however, the bias is likely to be highest for movie reviews in which the review does not have a quantitative score. Indeed, this is the case in which the reputation costs of a bias are likely to be lowest because the probability of detection is particularly low given the absence of a quantitative benchmark. Yet, even in this subsample of reviews (Column 6), we find no evidence of a positive bias. To tighten the power of the test in this sample, in Column 7 we consider qualitative reviews which are however scored by the staff of Metacritic. Since Metacritic does not suffer from the same conflict of interest, its score should be unbiased in this respect. When we include the Metacritic 0-100 score as control (and hence reducing the sample to qualitative reviews which are stored in both aggregators), we obtain a more precise null effect of the conflict of interest on bias (Column 7).

Finally, we consider the possibility that the Rottentomatoes bias may not be directly in the freshness indicator, but in the quantitative score which is stored in the data. While this is less likely, it is important to check for the presence of bias, since we used the review score as an objective control in Columns 3-5. Hence, in Column 8 we regress the RottenTomatoes quantitative score (hence excluding unscored reviews) on the corresponding score for the same

review in MetaCritic. The regression estimates indicate a very high fit, and allow us to reject even a very small bias due to conflict of interest of 0.15 points out of 100.

Hence, the results from this part of the analysis indicate that, despite the presence of a substantial conflict of interest, there is no semblance of bias in Rottentomatoes, even for the types of reviews for which detection of bias would be hard.

4 Conclusion

Consolidation in the media industry is considered by many as a condition for survival for an industry which has been hard hit by the loss of advertising. Yet, consolidation does not come without costs. In addition to the usual concern about the potential loss of diversity, we consider the increased incidence of conflict of interest, and possible ensuing bias. In particular, we focus on conflict of interest for movie reviews, such as when the Wall Street Journal reviews a movie by 20th Century Fox. The holding company, Newscorp., would 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 2011, we have shown that while media bias due to conflict of interest in conglomerates occurs, its extent is limited, presumably by the value of the reputation of the media outlets and the reviewers themselves. We find that Newscorp. media outlets provide a more positive review to 20th Century Fox movies by 2.3 points out of 100, the equivalent of one extra star every 11 reviews. We find no evidence of such bias among the Time Warner outlets, although among these outlets we find evidence of bias by omission—weaker Warner Bros. movies are less likely to be reviewed. We examined the incidence of bias by type of movie, by individual reviewer, and considered the editorial choices. Although we can point to some reviewers with higher bias than other reviewers, we find no evidence that affiliated movies are more likely to be assigned to more generous reviewers, an editorial choice which would have indicated more conscious bias. We also find no evidence of bias in the Rotten Tomatoes aggregator, which was owned by Newscorp. between 2006 and 2009.

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 previously had very limited empirical knowledge. 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.

The findings in this paper relate to the general debate about the impact of conflicts of interest. Conflicts of interest are believed to have played a major role in the recent economic crisis, as in the case of rating agencies that had incentives to provide AAA ratings even when the underlying security was hard to price. This particular project focuses on one form of conflict of interest in the context of the media, the one induced by cross-holdings, which has

not previously been investigated. We believe that it is important to better understand how media outlets navigate the trade-off between professional journalism and revenue maximization for the owners. Certainly, the availability of trustworthy news sources is key for a well-informed society.

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Figure 1a. Average bias in movie ratings: News Corp.-affiliated outlets

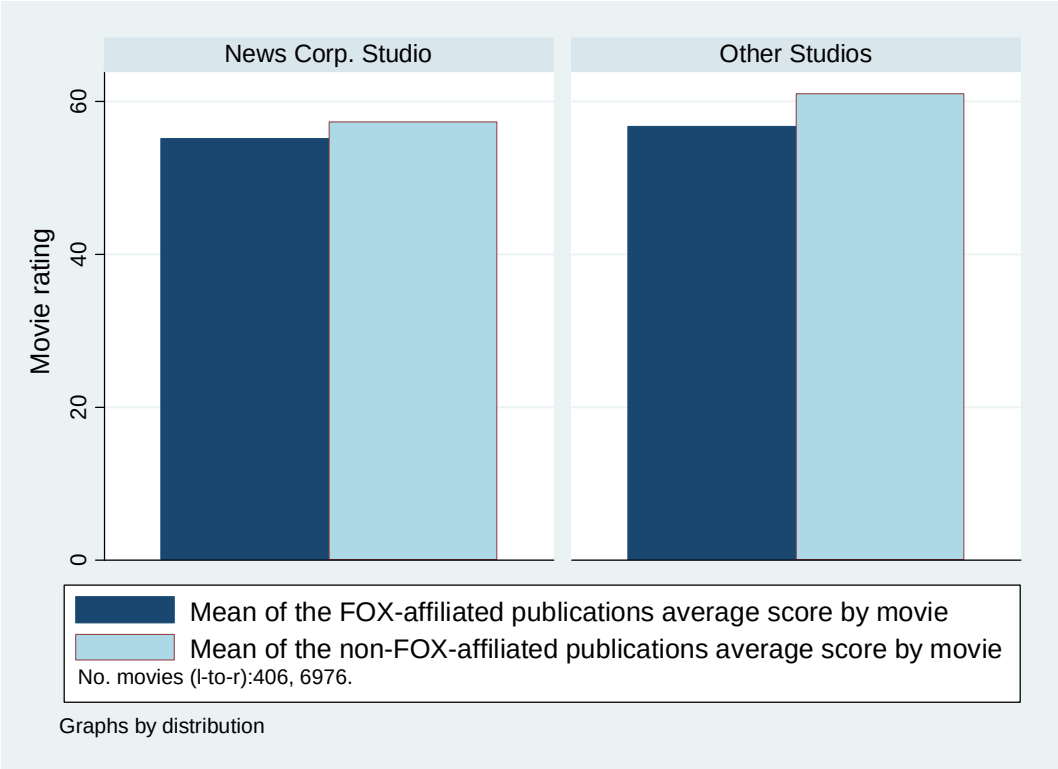
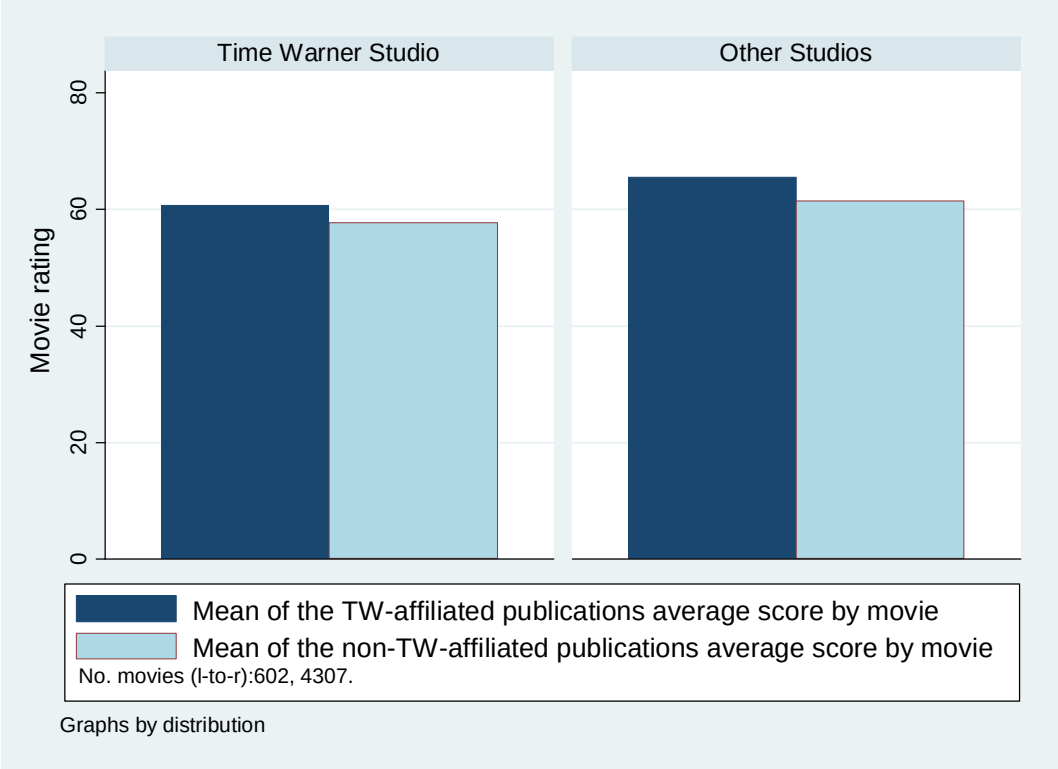


Figure 1b. Average bias in movie ratings: Time Warner-affiliated outlets



Figures 2a-2f. Selective bias in different outlets

Figure 2a. Selective bias: News Corp.-owned outlets

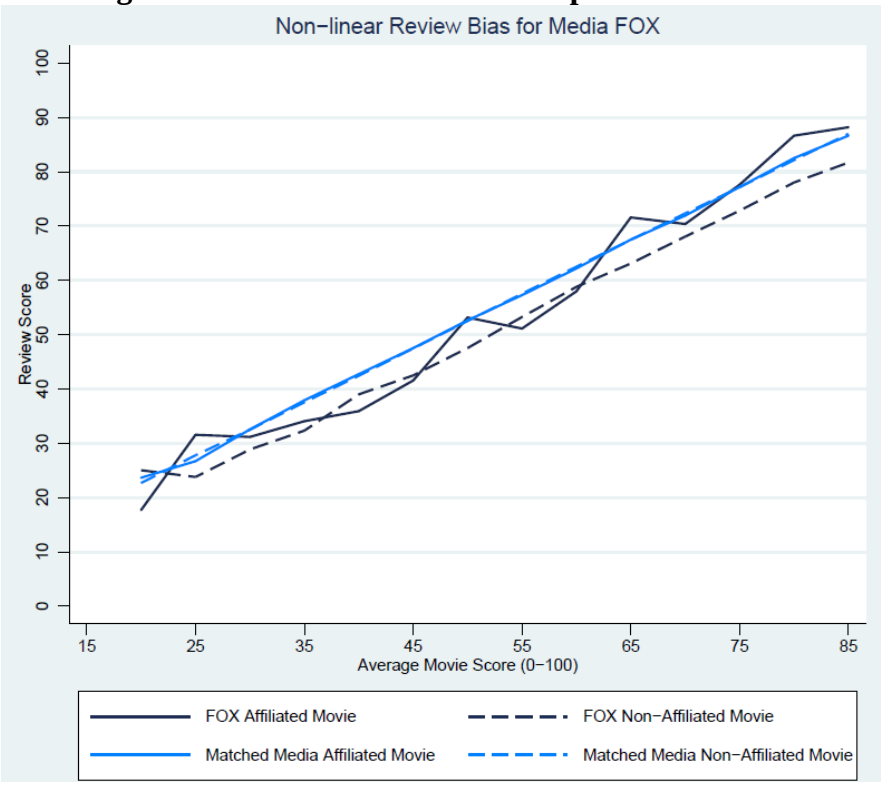


Figure 2b. Selective bias: New York Post

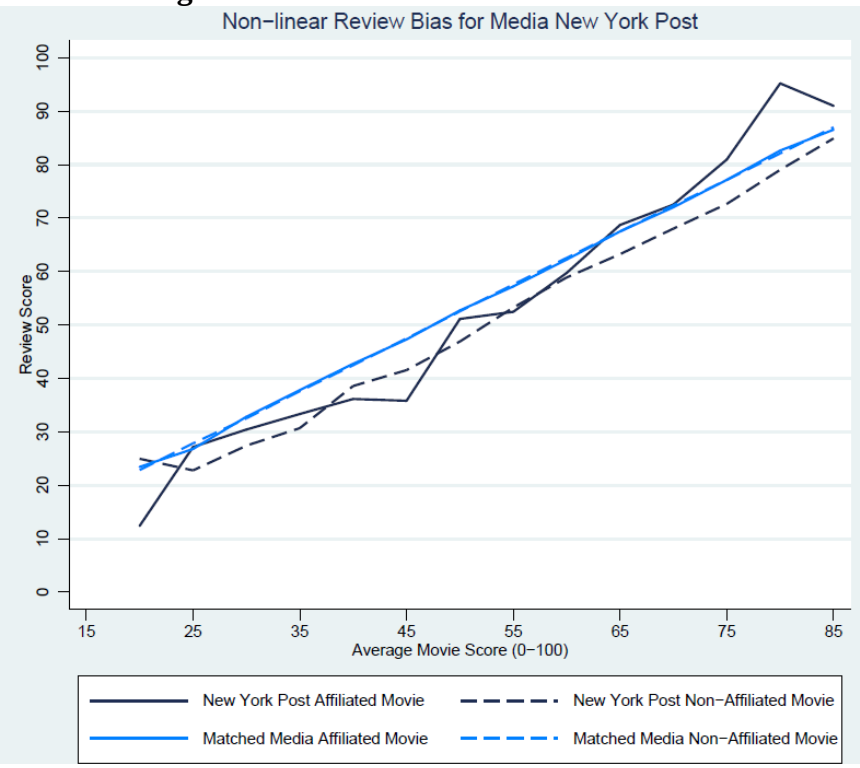


Figure 2c. Selective bias: Wall Street Journal

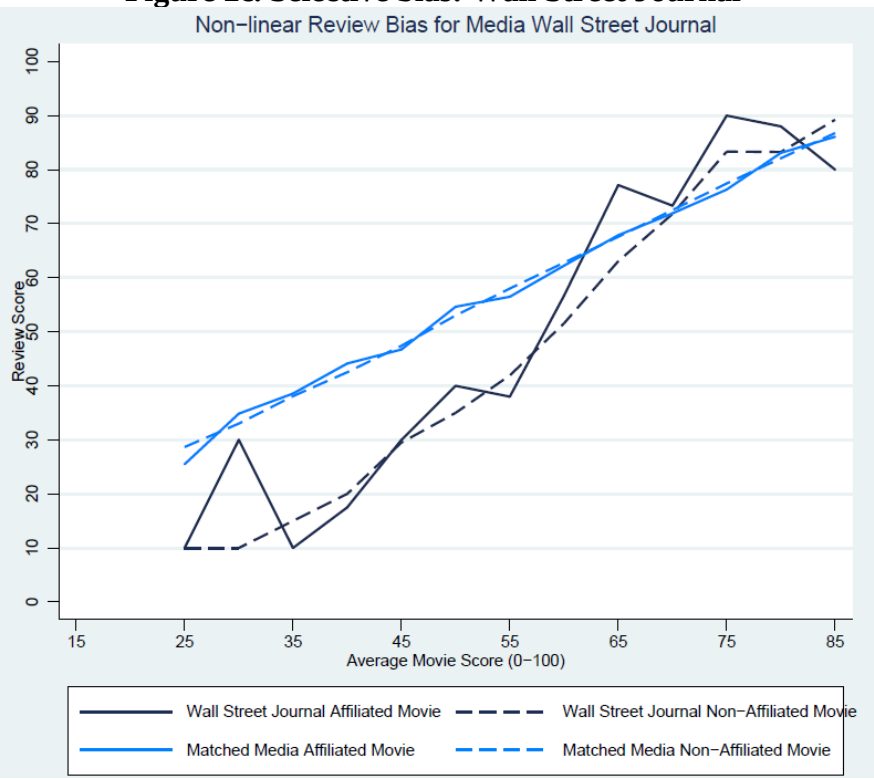


Figure 2d. Selective bias: Time Warner-owned outlets

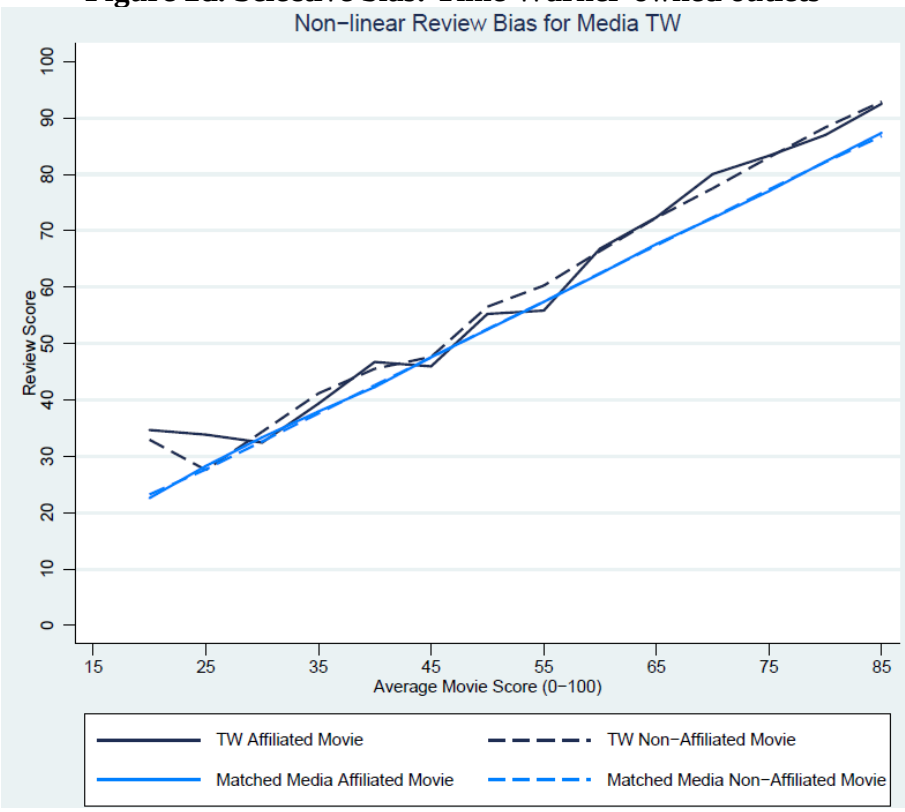


Figure 2e. Selective bias: Time Magazine

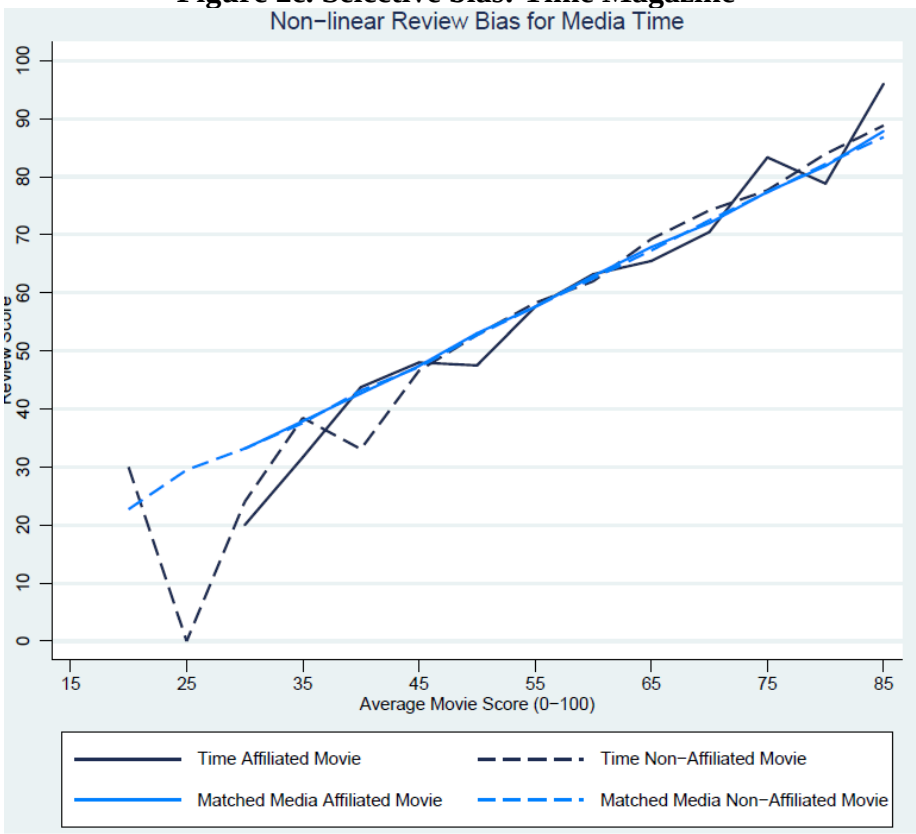


Figure 2f. Selective bias: Entertainment Weekly

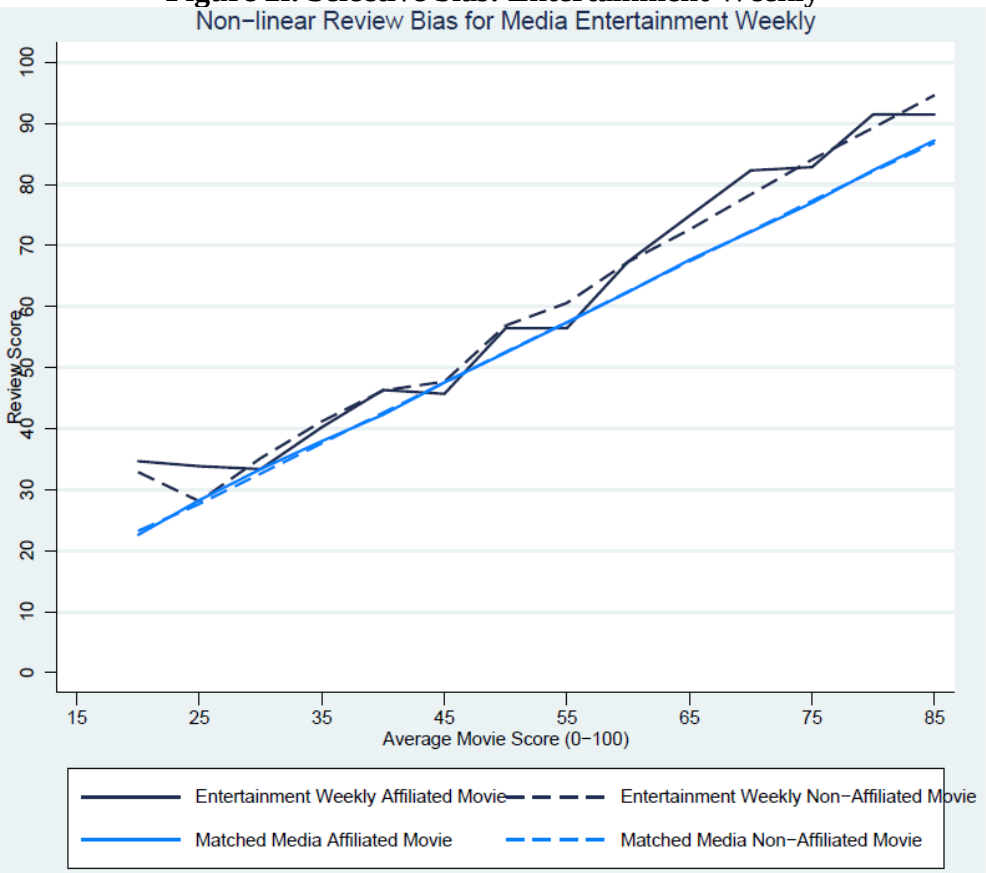
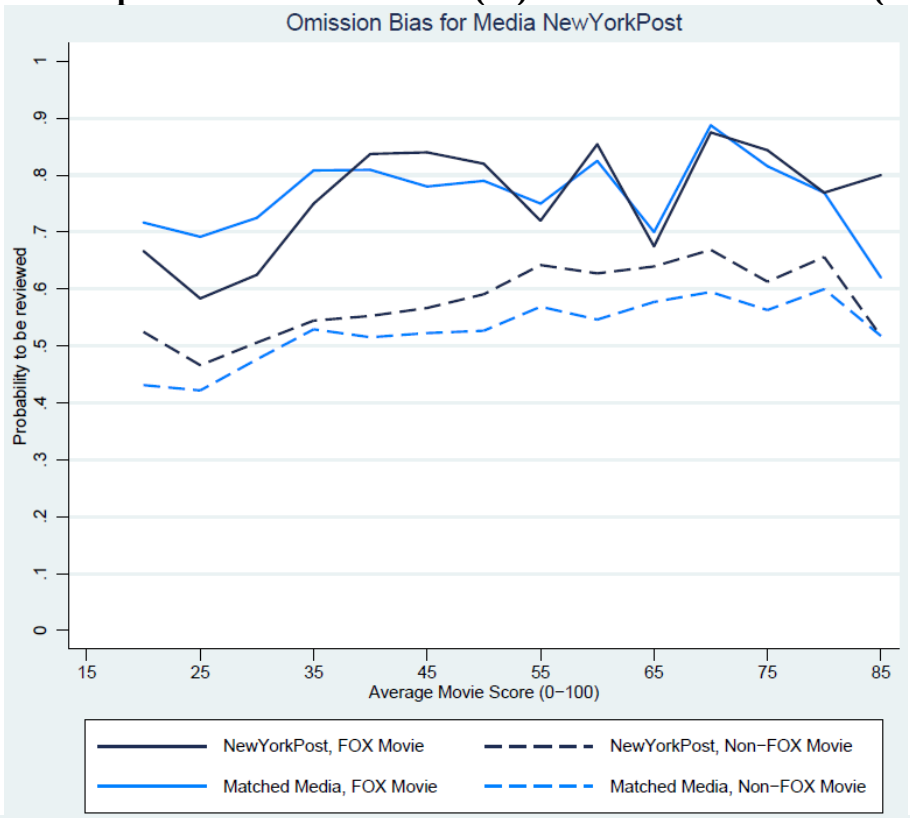


Figure 3a-b. Selective coverage -- Probability of review by movie quality (rating): News Corp. outlets: New York Post (3a) and Wall Street Journal (3b)



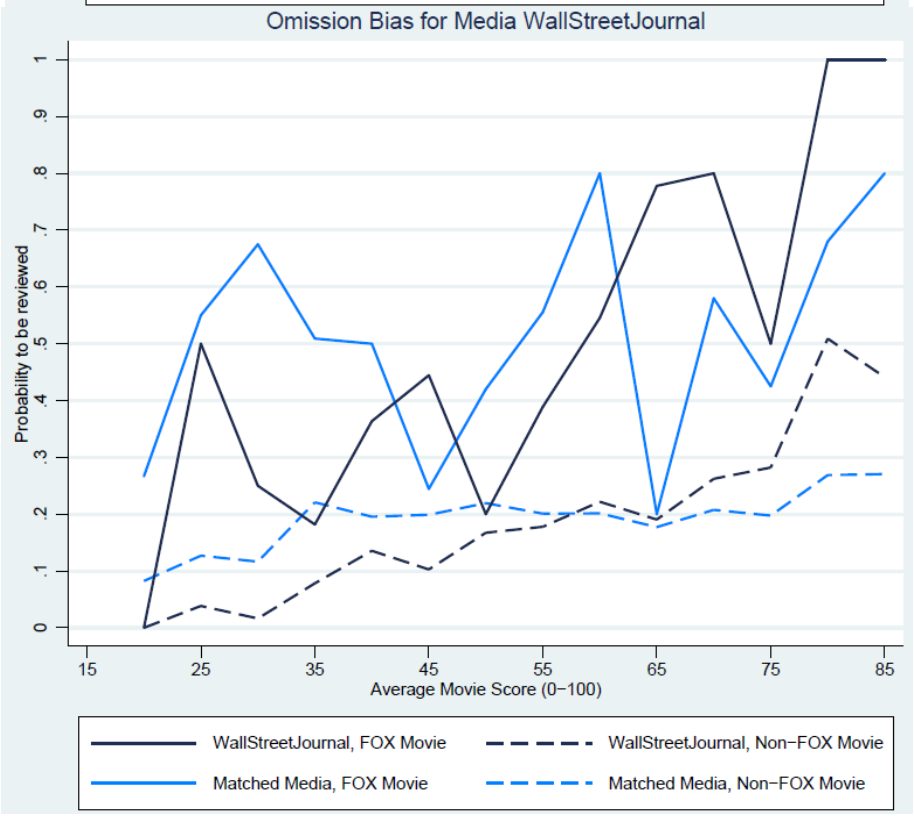
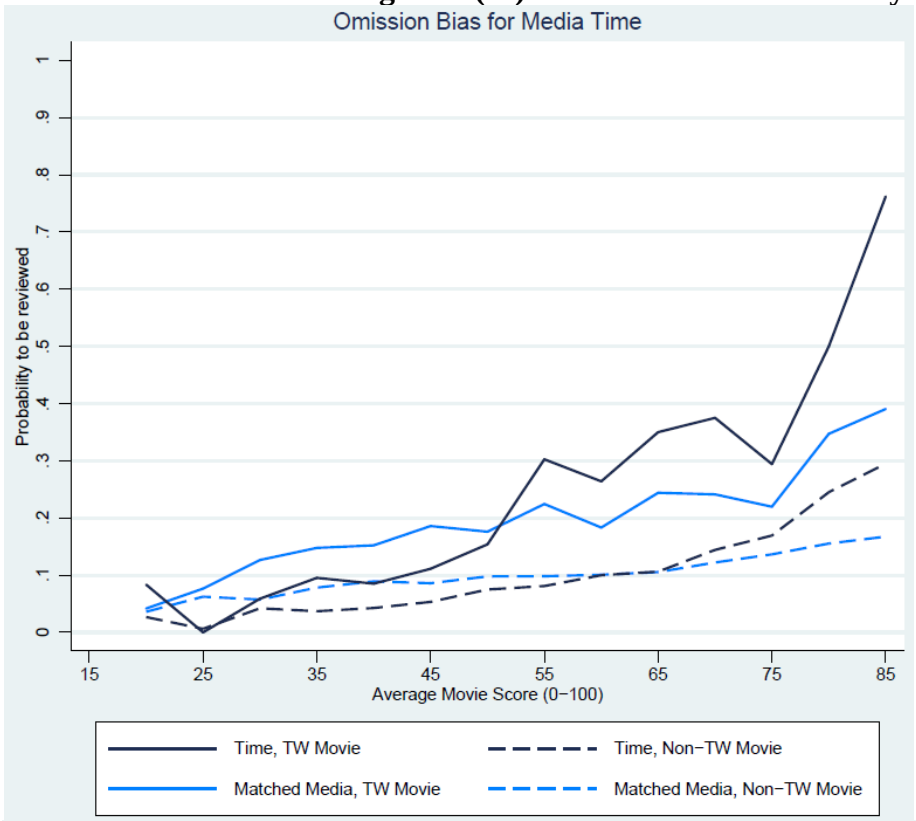


Figure 3c-d. Selective coverage -- Probability of review by movie quality (rating): Time Warner outlets: Time Magazine (3c) and Entertainment Weekly (3d)



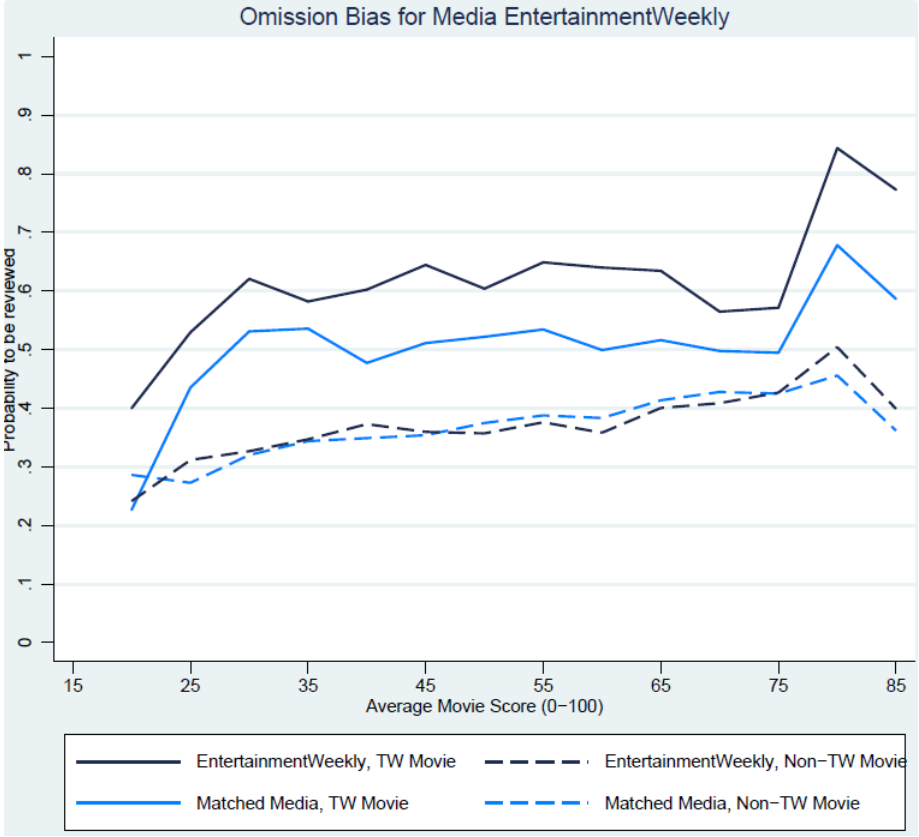


TABLE 1, PANEL A
SUMMARY STATISTICS: MEDIA SOURCES OF MOVIE REVIEWS

Media Outlet	Media Type	Years	Owner	No. of Reviews While Owned	No. of Reviews While Not Owned	Usual Rating System	Data Source (Rotten Tomato - RT, MetaCritic - MC, or Both)	Score in MC - Mean (s.d.)	Score in RT - Mean (s.d.)	Share 'fresh' in RT	Most common reviewers
All Reviews	336 media	1985-2011		17039	531725	Varies	MC (54354), RT (416862), Both	61.13 (21.52)	61.65 (21.57)	0.59	
Chicago Sun-Times	Newsp.	1985-2011	News Corp. until 1986	186	5833	0 to 4 stars (1/2 allowed)	MC (653), RT (2531), Both (2835)	71.20 (20.41)	68.75 (21.14)	0.62	Roger Ebert (5638)
Daily Telegraph	Newsp. (UK)	2005-2011	News Corp.	881	-	0 to 5 stars or qualitative	RT	-	55.01 (21.61)	0.55	Tim Robey (474), Sukhdev Sandhu (255)
New York Post	Newsp.	1998-2011	News Corp. from 1993	6278	-	0 to 4 stars (1/2 allowed)	MC (1472), RT (1200), Both (3606)	56.35 (22.48)	56.09 (22.74)	0.48	Lou Lumenick (2236), V.A. Musetto (1618), Kyle Smith (1154)
News Of The World	Newsp. (UK)	2008-2011	News Corp.	407	-	0 to 5 stars	RT		58.08 (24.41)	0.57	Robbie Collin (407)
TV Guide	Weekly	1985-2009	New Corp. 1988-99	980	4876	0 to 4 stars (1/2 allowed)	MC (1928), RT (900), Both (3028)	59.48 (17.20)	60.24 (17.18)	0.59	Maitland McDonagh (2588), Ken Fox (2072)
Times	Newsp. (UK)	2003-2011	News Corp.	960	-	0 to 5 stars	RT	-	53.60 (20.64)	0.55	Wendy Ide (377), James Christopher (286)
Wall Street Journal	Newsp.	1985-2011	News Corp. from 2008	555	1218	Qualitative	MC (1124), RT (81), Both (568)	58.56 (26.28)	-	0.56	Joe Morgenstern (1510)
CNN.com	Website	1997-2007	Time Warner	528	-	Qualitative	RT	-	-	0.55	Paul Clinton (325)
Entertainment Weekly	Weekly	1990-2011	Time Warner from 1990	4889	-	A to F (+/- allowed)	MC (1340), RT (615), Both (2934)	65.15 (23.04)	65.16 (22.99)	0.59	Owen Gleiberman (2307), Lisa Schwarzbaum (1946)
Time	Weekly	1985-2010	Time Warner from 1990	1375	97	Qualitative	MC (773), RT (240), Both (459)	66.57 (22.83)	-	0.71	Richard Corliss (775), Richard Schickel (542)
Other Reviews	326 media	1985-2011		-	519701	Varies	MC (47064), RT (408519), Both	60.93 (21.40)	61.63 (21.55)	0.59	

Notes: The sources of the movie review data are *www.metacritic.com* (abbreviated MC) and *www.rottentomatoes.com* (abbreviated RT). The data covers all reviews available from 1985 until July 2011. See text for additional information.

TABLE 1, PANEL B
SUMMARY STATISTICS: STUDIOS

Distributor of Movie (Studio)	Studio Type	Years	Owner	No. of Reviews	No. of Movies	Data Source (Rotten Tomato - RT, MetaCritic - MC, or Both)	Score in MC - Mean (s.d.)	Score in RT - Mean (s.d.)	Share 'fresh' in RT
All Studios		1985-2011		548764	12999	MC (54354), RT (416862), Both (77548)	61.13 (21.52)	61.65 (21.57)	0.59
20th Century Fox	Major	1985-2011	News Corp.	32159	449	MC (2580), RT (25455, Both (4124)	54.40 (21.57)	56.33 (21.79)	0.48
Fox Searchlight	Independent	1995-2011	News Corp.	12547	126	MC (990), RT (9433), Both (2124)	66.91 (19.41)	67.40 (20.07)	0.68
Fox (Other)	Other	1987-2010	News Corp.	390	13	MC (70), RT (307), Both (13)	54.55 (28.55)	66.40 (20.18)	0.71
Warner Bros.	Major	1989-2011	Time Warner from 1989	44162	575	MC (3428), RT (34511), Both (6223)	55.84 (22.27)	58.04 (22.05)	0.50
Fine Line	Independent	1990-2005	Time Warner from 1989	3764	80	MC (526), RT (2751), Both (487)	68.96 (21.37)	68.80 (22.00)	0.71
HBO	Independent	1989-2010	Time Warner from 1989	605	64	MC (23), RT (532), Both (50)	74.60 (18.29)	66.65 (20.83)	0.78
New Line	Independent	1989-2008	Time Warner from 1989	16667	233	MC (1310), RT (2014), Both (2198)	55.49 (23.12)	57.94 (22.55)	0.50
Picturehouse	Independent	2005-2009	Time Warner from 1989	2590	34	MC (195), RT (2014), Both (381)	65.10 (19.02)	66.54 (20.14)	0.66
Warner Independent	Independent	2004-2008	Time Warner from 1989	2733	26	MC (177), RT (2105), Both (451)	65.95 (18.90)	66.53 (19.21)	0.63
Warner Home Video	Other	1989-2009	Time Warner from 1989	783	59	MC (30), RT (739), Both (14)	52.61 (22.60)	58.93 (24.02)	0.57
Other Studios		1985-2011		432364	11423	MC (45025), RT (325856), Both (61483)	61.92 (21.27)	62.29 (21.38)	0.60

Notes: The sources of the movie review data are *www.metacritic.com* (abbreviated MC) and *www.rottentomatoes.com* (abbreviated RT). The data covers all reviews available from 1985 until July 2011. See text for additional information.

TABLE 2

THE EFFECT OF CONFLICT OF INTEREST ON MOVIE REVIEWS: AVERAGE BIAS (0-100 SCORE)

Specification:	OLS Regressions					
Dep. Var.:	Movie Review on a 0-100 Scale for Movie *m* in Media Outlet *o*					
	(1)	(2)	(3)	(4)	(5)	(6)
Indicator for Fox Movie on News Corp.-Owned Outlet	0.5437	0.5943	1.7088**	2.2755***	2.7005***	1.9872**
(Measure of Conflict of Interest for News Corp.)	[0.9637]	[0.9617]	[0.7839]	[0.7688]	[0.9087]	[0.8835]
Indicator for Warner Bros. Movie on TW-Owned Outlet	-1.1649	-1.1502	-1.0114	-0.4737	-0.0263	-0.0930
(Measure of Conflict of Interest Time Warner)	[0.7904]	[0.7890]	[0.6770]	[0.6769]	[0.7158]	[0.8081]
Indicator for 20th Century Fox Movie	-3.0050***	-3.0580***	.	.		
	[0.7428]	[0.7403]				
Indicator for Warner Brothers Movie	-3.3179***	-3.3010***	.	.		
	[0.6284]	[0.6300]				
Indicator for Media Outlet Owned by News Corp.	-4.9831***	-4.8790***	-4.5219***	-1.6833***	-2.1709***	-1.7745**
	[0.2317]	[0.2154]	[0.1896]	[0.4621]	[0.5122]	[0.7135]
Indicator for Media Outlet Owned by Time Warner	4.2594***	4.3980***	3.7410***	4.4804*	3.7703	3.5569
	[0.2770]	[0.2730]	[0.2432]	[2.6392]	[2.5258]	[4.6751]
Control Variables:						
Year Fixed Effects		X	X	X	X	X
Movie Fixed Effects			X	X	X	X
Media Outlet Fixed Effects				X	X	X
Sample:	Metacritic Sample + RottenTomatoes Sample				MetaCritic Only	RottenTomatoes Only
Mean of Dependent Variable	61.52	61.52	61.52	61.52	61.13	61.52
p-value of test of equality of effect of conflict of interest for News Corp. and for Time Warner:	p = 0.1733	p = 0.1636	p = 0.0089***	p = 0.0076***	p = 0.0195**	p = 0.0838*
R^2	0.01	0.01	0.41	0.46	0.52	0.45
N	N=473,727	N=473,727	N=473,727	N=473,727	N=131,902	N=419,373

Notes: An observation is a movie review by a media outlet from 1985 to July 2011. The dependent variable is a movie review converted on the 0-100 scale devised by *metacritic.com*. The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 3

THE EFFECT OF CONFLICT OF INTEREST ON MOVIE REVIEWS: AVERAGE BIAS (0-1 FRESH INDICATOR)

Specification:	OLS Regressions				
Dep. Var.:	Indicator for "Fresh" movie for Movie *m* in Media Outlet *o*				
	(1)	(2)	(3)	(4)	(5)
Indicator for Fox Movie on News Corp.-Owned Outlet	0.0157	0.0143	0.0546***	0.0574***	0.0835***
(Measure of Conflict of Interest for News Corp.)	[0.0228]	[0.0227]	[0.0191]	[0.0190]	[0.0261]
Indicator for Warner Bros. Movie on TW-Owned Outlet	-0.0003	-0.0024	-0.0193	-0.0123	0.0033
(Measure of Conflict of Interest Time Warner)	[0.0184]	[0.0183]	[0.0176]	[0.0176]	[0.0223]
Indicator for 20th Century Fox Movie	-0.0676***	-0.0683***	.	.	.
	[0.0148]	[0.0147]			
Indicator for Warner Brothers Movie	-0.0818***	-0.0805***	.	.	.
	[0.0120]	[0.0121]			
Indicator for Media Outlet Owned by News Corp.	-0.0885***	-0.0860***	-0.0886***	-0.0362**	-0.0056
	[0.0059]	[0.0057]	[0.0052]	[0.0175]	[0.0232]
Indicator for Media Outlet Owned by Time Warner	0.0109	0.0152**	0.0115*	0.1233*	0.0549
	[0.0069]	[0.0069]	[0.0065]	[0.0676]	[0.1034]
Control Variables:					
Year Fixed Effects		X	X	X	X
Movie Fixed Effects			X	X	X
Media Outlet Fixed Effects				X	X
Sample:	RottenTomatoes Sample				Subsample of RT also in MC
Mean of Dependent Variable	0.590	0.590	0.590	0.590	0.555
p-value of test of equality of effect of conflict of interest for News Corp. and for Time Warner:	p = 0.5853	p = 0.5684	p = 0.0044***	p = 0.0072***	p = 0.0198**
R^2	0.01	0.01	0.28	0.32	0.36
N	N=494,410	N=494,410	N=494,410	N=494,410	N=77,548

Notes: An observation is a movie review by a media outlet from 1985 to July 2011 in the *rottentomatoes.com* aggregator. The dependent variable is an indicator for movie "freshness" devised by *rottentomatoes.com* . The standard errors in parentheses are clustered by movie.
* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 4

THE EFFECT OF CONFLICT OF INTEREST ON MOVIE REVIEWS: BY MEDIA

Specification:	OLS Regressions									
	News Corp. Conflict of Interest							*Time Warner* Conflict of Interest		
	Chicago SunTimes	*Daily Telegraph*	*New York Post*	*News of the World*	*TV Guide*	*Times (UK)*	*Wall Street Journal*	*CNN.com*	*Entertainment Weekly*	*Time*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A.										
Dep Var.: Score (0-100)										
Indicator for Conflict of Interest	2.3530	-1.3933	3.1382***	3.8096	2.4169	0.0286	0.5175	.	-0.3039	-0.9717
	[4.8051]	[2.7693]	[0.9877]	[3.2221]	[1.6519]	[2.2918]	[3.1342]	.	[0.7363]	[1.3957]
R^2	0.49	0.47	0.45	0.48	0.43	0.46	0.46	.	0.46	0.41
N	N=3,314	N=68,735	N=362,309	N=36,787	N=46,740	N=73,318	N=47,888	.	N=362,266	N=127,688
Panel B.										
Dep Var.: Indicator for Fresh in Rottentomatoes										
Indicator for Conflict of Interest	-0.0166	0.0017	0.0718***	0.0130	0.0672	0.0598	0.1120*	-0.0541	-0.0027	-0.0079
	[0.1261]	[0.0516]	[0.0258]	[0.0769]	[0.0913]	[0.0593]	[0.0615]	[0.0436]	[0.0208]	[0.0457]
R^2	0.38	0.31	0.30	0.31	0.32	0.30	0.29	0.29	0.31	0.27
N	N=3,435	N=76,967	N=381,533	N=40,551	N=42,286	N=82,516	N=50,265	N=73,883	N=379,758	N=133,835
Control Variables:										
Movie Fixed Effects	X	X	X	X	X	X	X	X	X	X
Media Outlet Fixed Effects	X	X	X	X	X	X	X	X	X	X

Notes: An observation is a movie review by a media outlet from 1985 to July 2011. Each column is a separate regression including as observations only movies with at least one review by the featured outlet, and as independent variables indicator variables for the outlet and for production by the conflicted distributing company (20th Century Fox and Warner Bros.). The dependent variable in Panel A is a 0-100 score for the review, whille the dependent variable in Panel B is an indicator variable for "freshness" from the rottentomatoes data. All specifications include fixed effects for the movie and for the media reviewing.The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 5
REVIEWERS FOR MEDIA AT RISK OF CONFLICT OF INTEREST

Media Outlet	Media Type	Years While Owned	Reviewer Name	No. of Reviews	Fixed Effect for Average Score (s.e.)	Share reviews of affiliated studio
Panel A. News Corp. Outlets						
Chicago Sun-Times	Newsp.	1985-1986	Roger Ebert	184	10.23 (.46)	8.70%
Daily Telegraph	Newsp. (UK)	2005-2011	Tim Robey	474	6.68 (1.07)	8.02%
Daily Telegraph	Newsp. (UK)	2005-2011	Sukhdev Sandhu	254	-3.89 (1.75)	7.48%
New York Post	Newsp.	1998-2011	Lou Lumenick	2236	-2.19 (.56)	6.98%
New York Post	Newsp.	1998-2011	V.A. Musetto	1618	-1.34 (.57)	0.25%
New York Post	Newsp.	1998-2011	Kyle Smith	1154	-7.38 (.78)	6.67%
New York Post	Newsp.	1998-2011	Jonathan Foreman	622	-0.74(.80)	6.91%
New York Post	Newsp.	1998-2011	Megan Lehmann	366	-3.81 (.98)	7.10%
News of the World	Newsp. (UK)	2008-2011	Robbie Collin	407	-0.62 (1.17)	9.09%
TV Guide	Weekly	1988-1999	Maitland McDonagh	370	-0.60 (.48)	9.19%
TV Guide	Weekly	1988-1999	Ken Fox	134	4.29 (.50)	9.70%
Times	Newsp. (UK)	2003-2011	Wendy Ide	377	-7.82 (.96)	5.31%
Times	Newsp. (UK)	2003-2011	James Christopher	377	-4.59 (1.28)	9.09%
Wall Street Journal	Newsp.	2008-2011	Joe Morgenstern	286	-3.64 (.66)	1218
Panel B. Time Warner Outlets						
CNN.com	Website	1997-2007	Paul Clinton	252	.	22.46%
Entertainment Weekly	Weekly	1990-2011	Owen Gleiberman	2307	6.49 (.58)	12.83%
Entertainment Weekly	Weekly	1990-2011	Lisa Schwarzbaum	1946	8.41 (.53)	11.97%
Time	Weekly	1990-2010	Richard Corliss	724	3.53 (.88)	16.71%
Time	Weekly	1990-2010	Richard Schickel	502	2.50 (1.11)	16.73%

Notes: The sources of the movie review data are *www.metacritic.com* (abbreviated MC) and *www.rottentomatoes.com* (abbreviated RT). The data covers all reviews available from 1985 until July 2011. See text for additional information.

TABLE 6

THE EFFECT OF CONFLICT OF INTEREST ON MOVIE REVIEWS: BY REVIEWER

Specification:	OLS Regressions									
	News Corp. Conflict of Interest						*Time Warner* Conflict of Interest			
	New York Post				*TV Guide*		*Entertainment Weekly*		*Time*	
	Lou Loumenick	Kyle Smith	Jonathan Foreman	Megan Lehmann	Maitland McDonagh	Ken Fox	Owen Gleiberman	Lisa Schwarzbau	Richard Corliss	Richard Schickel
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A.										
Dep Var.: Score (0-100)										
Indicator for Conflict of Interest	3.0068**	6.0914***	-0.2606	5.4902*	6.0412***	-4.2065	-0.3830	-0.4791	0.9784	-4.6170**
	[1.3149]	[2.3501]	[2.8959]	[3.1414]	[2.1031]	[5.0740]	[1.1448]	[1.0141]	[1.8489]	[2.3329]
R^2	0.46	0.45	0.46	0.44	0.43	0.47	0.44	0.45	0.42	0.38
N	N=165,133	N=82,384	N=42,165	N=25,553	N=20,826	N=5,708	N=172,627	N=152,808	N=71,569	N=43,975
Panel B.										
Dep Var.: Indicator for Fresh in Rottentomatoes										
Indicator for Conflict of Interest	0.0614*	0.1537***	0.0368	0.1479*	0.2377**	0.0105	-0.0097	0.0059	0.0511	-0.0182
	[0.0348]	[0.0558]	[0.0769]	[0.0837]	[0.0918]	[0.1812]	[0.0309]	[0.0298]	[0.0639]	[0.0719]
R^2	0.30	0.31	0.31	0.31	0.32	0.35	0.30	0.30	0.28	0.26
N	N=175,793	N=87,197	N=45,559	N=25,634	N=20,214	N=5,326	N=180,977	N=162,379	N=75,084	N=46,505
Control Variables:										
Movie Fixed Effects	X	X	X	X	X	X	X	X	X	X
Media Outlet Fixed Effects	X	X	X	X	X	X	X	X	X	X

Notes: An observation is a movie review by a media outlet from 1985 to July 2011. Each column is a separate regression including as observations only movies with at least one review by the featured reviewer, and as independent variables indicator variables for the outlet and for production by the conflicted distributing company (20th Century Fox and Warner Bros.). The dependent variable in Panel A is a 0-100 score for the review, whille the dependent variable in Panel B is an indicator variable for "freshness" from the rottentomatoes data. All specifications include fixed effects for the movie and for the media reviewing.The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 7

THE EFFECT OF CONFLICT OF INTEREST ON MOVIE REVIEWS: SELECTIVE BIAS

Specification:	OLS Regressions									
Dependent Variable:	Movie review score (0-100)									
	News Corp. Conflict of Interest							*Time Warner* Conflict of Interest		
	Chicago SunTimes	*Daily Telegraph*	*New York Post*	*News of the World*	*TV Guide*	*Times (UK)*	*Wall Street Journal*	*CNN.com*	*Entertainment Weekly*	*Time*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Indicator for Conflict of Interest	-1.8511	3.3631	1.6053	9.3846**	2.7745	3.0971	-0.4418	.	0.0172	-1.3100
	[8.1669]	[4.7872]	[1.5719]	[4.5067]	[3.1145]	[3.1936]	[4.6435]		[1.2686]	[3.4622]
Indicator for Conflict of Interest *	6.6737	-7.3874	1.2414	-15.0553**	-3.4936	-5.8530	6.0759	.	-0.1049	0.9607
(55<Average Movie Rating<=70)	[8.9600]	[6.2831]	[2.2644]	[6.9450]	[3.9723]	[5.8224]	[6.6080]		[1.7136]	[4.0386]
Indicator for Conflict of Interest *	-5.5183	-7.8287	5.6198***	5.5208	-0.1861	-6.4469	2.1793	.	1.2430	1.6107
(Average Movie Rating>70)	[8.7293]	[6.1358]	[2.1265]	[6.1254]	[3.9991]	[5.0638]	[6.2369]		[1.7644]	[3.9919]
R^2	0.58	0.50	0.48	0.51	0.47	0.49	0.48	.	0.48	0.43
N	N=3,314	N=68,719	N=362,272	N=36,772	N=46,740	N=73,308	N=47,880	.	N=362,230	N=127,682
Control Variables:										
Movie Fixed Effects	X	X	X	X	X	X	X	X	X	X
Media Outlet Fixed Effects	X	X	X	X	X	X	X	X	X	X
Media Outlet f.e. *(55<Average Movie Rating<=70)	X	X	X	X	X	X	X	X	X	X
Media Outlet f.e. *(Average Movie Rating>70)	X	X	X	X	X	X	X	X	X	X

Notes: An observation is a movie review by a media outlet from 1985 to July 2011. Each column is a separate regression including as observations only movies with at least one review by the featured outlet during the period in which the outlet is owned by Newscorp. or Time Warner. The average score is computed as the average 0-100 score for a movie from all media outlets. The dependent variable is a 0-100 score for the review. The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 8
CONFLICT OF INTEREST AND OMISSION BIAS: MISSING REVIEWS

Specification:	OLS Regressions									
Dependent Variable:	Indicator variable for review of a movie by media m									
	News Corp. Conflict of Interest							*Time Warner* Conflict of Interest		
	Chicago SunTimes	*Daily Telegraph*	*New York Post*	*News of the World*	*TV Guide*	*Times (UK)*	*Wall Street Journal*	*CNN.com*	*Entertainment Weekly*	*Time*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Indicator for Conflict of Interest * Average Movie Rating	-0.0189*	-0.0053**	0.0011	-0.0008	0.0039*	-0.0035**	0.0051*	0.0024**	0.0004	0.0034***
	[0.0103]	[0.0022]	[0.0012]	[0.0027]	[0.0022]	[0.0016]	[0.0027]	[0.0010]	[0.0007]	[0.0009]
Indicator for Conflict of Interest	1.0969*	0.1981	-0.1214	-0.0142	-0.1896	0.1329	-0.3019**	-0.0903	0.0939**	-0.1493***
	[0.5838]	[0.1268]	[0.0750]	[0.1546]	[0.1212]	[0.0936]	[0.1439]	[0.0605]	[0.0388]	[0.0483]
R^2	0.31	0.40	0.52	0.44	0.44	0.32	0.48	0.23	0.48	0.34
N	N=3,278	N=59,180	N=109,747	N=28,974	N=37,048	N=76,978	N=28,974	N=85,316	N=133,331	N=133,342
Control Variables:										
Movie Fixed Effects	X	X	X	X	X	X	X	X	X	X
Media Outlet Fixed Effects	X	X	X	X	X	X	X	X	X	X
Media Outlet Fixed Effects*Average Movie Rating	X	X	X	X	X	X	X	X	X	X
Sample:	Potential review in featured media and in each of 10 matched media, with match based on similar average probability of review									

Notes: Each column is a separate regression including as observations potential movie reviews by the featured media outlet, or by any of 10 matched media, with match based on similar average probability of review. The sample only includes years in which the media featured in the relevant column is owned by Newscorp. or Time Warner. The average score is computed as the average 0-100 score for a movie from all media outlets excluding the featured media and the 10 matched media. All specifications include fixed effects for the movie, for the media reviewing, and an interaction of the average score and the reviewer fixed effect .The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%

TABLE 9
PARTIAL OMISSION BIAS: DELAYED REVIEWS AND REVIEW LENGTH

Specification:	OLS Regressions					
Dep. Var.:	Indicator for delayed review		Difference between date of review and of release		Log (Word length in review)	
	(1)	(2)	(3)	(4)	(5)	(6)
Conflict of Interest for News Corp.	0.1204***	0.0961	1.1295**	-0.5775	0.0589	0.5377
	[0.0287]	[0.1340]	[0.4425]	[2.6158]	[0.0700]	[0.4022]
Conflict of Interest for News Corp. * Average Movie Rating		0.0003		0.0249		-0.0073
		[0.0020]		[0.0391]		[0.0057]
Conflict of Interest for Time Warner	-0.1055***	-0.1036	-0.9739**	-1.1497	0.1605***	-0.0155
	[0.0271]	[0.1621]	[0.4676]	[3.1212]	[0.0610]	[0.3243]
Conflict of Interest for Time Warner * Average Movie Rating		0.0000		0.0039		0.0025
		[0.0026]		[0.0522]		[0.0049]
Control Variables:						
Movie Fixed Effects	X	X	X	X	X	X
Media Outlet Fixed Effects	X	X	X	X	X	X
Media Outlet Fixed Effects * Average Movie Rating		X		X		X
Sample:	*Boston Globe, Entertainment Weekly, New York Post, Time,* and *Village Voice* reviews					
Mean of Dependent Variable	0.185	0.185	0.185	0.185	5.976	5.976
R^2	0.68	0.71	0.76	0.77	0.75	0.75
N	N=9,556	N=9,556	N=9,556	N=9,556	N=9,827	N=9,827

Notes: An observation is a movie review by the *Boston Globe, Entertainment Weekly, New York Post, Time magazine,* or *Village Voice.* The dependent variable in Columns 1 and 2 is an indicator variable for a review taking place at least 5 days after the movie release date. The dependent variable in Columns 3 and 4 is the difference between the date of the review and the date of the release of a movie. The dependent variable in Columns 5 and 6 is the log of the word count. The average review score for a movie is computed excluding the media in the sample. The standard errors in parentheses are clustered by movie.
* significant at 10%; ** significant at 5%; *** significant at 1%

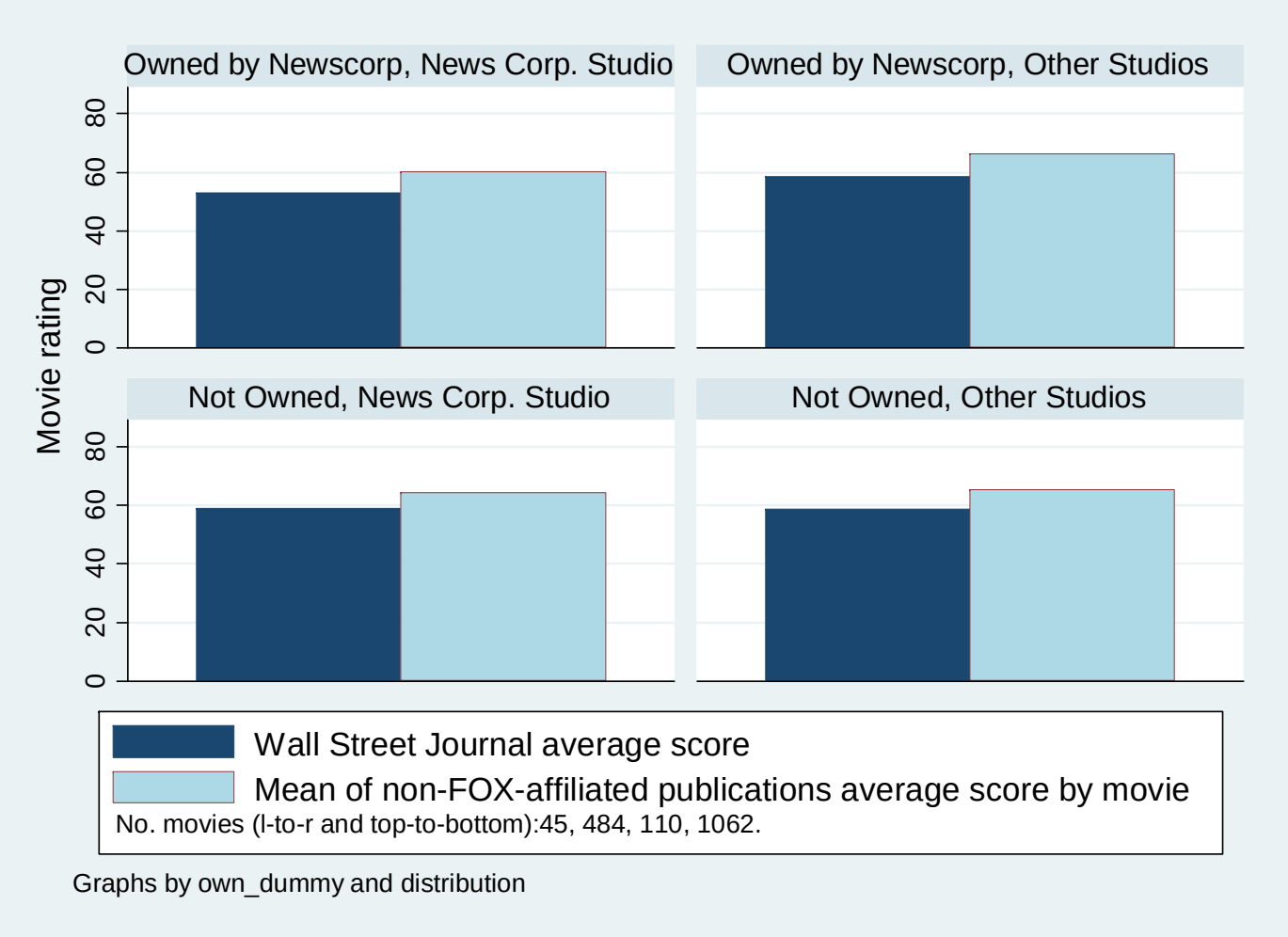
TABLE 10
BIAS IN ROTTEN TOMATO: EFFECT OF NEWSCORP. OWNERSHIP

Specification:	OLS Regressions							
Dep. Var.:	RottenTomatoes 0-1 "Freshness" indicator							RottenTomatoes 0-100 Score
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Indicator for 20th Century Fox Movie *	-0.0684**	-0.0637*	-0.0073	-0.0075	0.0002	-0.0557	-0.0049	-0.1609
(RottenTomatoes owned by Newscorp.: 2006-09)	[0.0328]	[0.0330]	[0.0069]	[0.0069]	[0.0084]	[0.0349]	[0.0188]	[0.1471]
Indicator for 20th Century Fox Movie	-0.0329**	-0.0366**	-0.0082**	-0.0070*	-0.0060	-0.0470**	-0.0255**	-0.1698*
	[0.0164]	[0.0161]	[0.0037]	[0.0038]	[0.0049]	[0.0185]	[0.0111]	[0.0948]
0-100 Review Score			0.0182***	0.0183***	0.0394***			
			[0.0001]	[0.0001]	[0.0002]			
0-100 MetaCritic Review Score							0.0174***	0.9597***
							[0.0001]	[0.0012]
Control Variables:								
Year Fixed Effects		X	X	X	X	X	X	X
Media Outlet Fixed Effects		X	X	X	X	X	X	X
Sample:		All Reviews		Only Reviews Scored in RT	Only Reviews with 50<=Score<=70	Only Reviews Unscored in RT		Reviews Scored in RT and MC
R^2	0	0.04	0.64	0.65	0.57	0.05	0.56	0.94
N	N=494,410	N=419,375	N=419,375	N=394,908	N=152,343	N=97,375	N=24,467	N=53,108

Notes: An observation is a movie review. The dependent variable in Columns 1 to 7 is an indicator variable for 'freshness' of a movie according to review in RottenTomatoes, while the dependent variable in Column 8 is the underlying quantitative rating of a review in RottenTomatoes converted into a 0-100 score according to the MetaCritic procedure. The key indepedendent variables are indicators for movies distributed by 20th Century Fox and an interaction of this indicator with the years in which Rottentomatoes is owned by Newscorp. (2006-09). The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%

Appendix Figure 1. Average bias in movie ratings: Wall Street Journal pre- and post-2008 (year of acquisition by News Corp.)



APPENDIX TABLE 1

THE EFFECT OF CONFLICT OF INTEREST ON MOVIE REVIEWS: ROBUSTNESS

Specification:	OLS Regressions					
Dep. Var.:	Movie Review on a 0-100 Scale for Movie *m* in Media Outlet *o*					
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A. Dep Var.: Score (0-100)						
Indicator for Fox Movie on News Corp.-Owned Outlet	2.2759***	2.2759***	2.2759***	1.8132**	2.4086***	-1.2320
(Measure of Conflict of Interest for News Corp.)	[0.7688]	[0.2437]	[0.5988]	[0.7918]	[0.9162]	[3.1864]
Indicator for Warner Bros. Movie on TW-Owned Outlet	-0.4733	-0.4733	-0.4733**	-0.4279	-0.5175	4.6602*
(Measure of Conflict of Interest Time Warner)	[0.6769]	[0.3544]	[0.2170]	[0.7052]	[0.8815]	[2.7003]
R^2	0.46	0.46	0.46	0.46	0.45	0.6
N	N=473,664	N=473,664	N=473,664	N=303,632	N=394,908	N=24,467
Panel B. Dep Var.: Freshness Indicator (0-1)						
Indicator for Fox Movie on News Corp.-Owned Outlet	0.0572***	0.0572***	0.0572***	0.0473**	0.0557***	0.0466
(Measure of Conflict of Interest for News Corp.)	[0.0190]	[0.0076]	[0.0122]	[0.0197]	[0.0213]	[0.0458]
Indicator for Warner Bros. Movie on TW-Owned Outlet	-0.0123	-0.0123	-0.0123	-0.0209	-0.0066	-0.0288
(Measure of Conflict of Interest Time Warner)	[0.0176]	[0.0126]	[0.0095]	[0.0183]	[0.0206]	[0.0337]
R^2	0.32	0.32	0.32	0.31	0.33	0.35
N	N=494410	N=494410	N=494410	N=320,497	N=397,035	N=97,375
Control Variables:						
Indicators for ownership of media by FOX and TW	X	X	X	X	X	X
Movie Fixed Effects	X	X	X	X	X	X
Media Outlet Fixed Effects	X	X	X	X	X	X
Robustness Check:	Benchmark	Cluster by Studio	Cluster by Media	Only major-6 studios and major indie studios	Numeric reviews only	Qualitative reviews only

Notes: An observation is a movie review by a media outlet from 1985 to July 2011. The dependent variable is a movie review converted on the 0-100 scale devised by *metacritic.com*. The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%

APPENDIX TABLE 2

TEST OF EDITORIAL ASSIGNMENT TO REVIEWER WITH HIGHEST SCORE

Specification:	OLS Regression					
Dependent Variable:	Estimated Fixed Effect per Reviewer of 0-100 Score					
	News Corp. Conflict of Interest				*Time Warner* Conflict	
	Daily Telegraph	*New York Post*	*TV Guide*	*Times (UK)*	*Entertainment Weekly*	*Time*
	(2)	(3)	(5)	(6)	(9)	(10)
Indicator for Conflict of Interest	-0.1615	-0.5914***	0.3535	0.4271	-0.3039	-0.9717
	[0.1734]	[0.1381]	[0.3915]	[0.3288]	[0.7363]	[1.3957]
R^2	0.84	0.75	0.69	0.82	0.46	0.41
N	N=72,091	N=388,382	N=47,593	N=77,481	N=386,348	N=136,823
Control Variables:						
Movie Fixed Effects	X	X	X	X	X	X
Media Outlet Fixed Effects	X	X	X	X	X	X

Notes: An observation is a movie review by a media outlet from 1985 to July 2011. Each column is a separate regression including as observations only movies with at least one review by the featured outlet, and as independent variables indicator variables for the outlet and for production by the conflicted distributing company (20th Century Fox and Warner Bros.). The dependent variable is the estimated fixed effect for the chosen reviewer. As such, the specification tests whether for movies with conflict of interest, reviewers who tend to give on average more positive socres are more likely to be chosen. All specifications include fixed effects for the movie and for the media reviewing.The standard errors in parentheses are clustered by movie.

* significant at 10%; ** significant at 5%; *** significant at 1%