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DETERMINANTS OF UK BOX OFFICE SUCCESS: THE IMPACT OF QUALITY SIGNALS

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ABSTRACT

This paper analyses the roles of various potential quality signals in the demand for cinema in the United Kingdom using a breakdown of advertising totals by media category. Estimation of a two stage least squares model with data for 546 films released in the United Kingdom shows that the impacts of types of advertising on box office revenues vary both in channels and magnitudes of impact. We also offer a more sophisticated treatment of critical reviews than hitherto by examining the spread (entropy) rather than just the mean rating.

KEYWORDS

Advertising

Critical Reviews

Films

1. Introduction

Despite the availability of new media for home viewing, cinema admissions have remained buoyant in both the US and UK. The experience of watching a film in a *collective* environment in front of a large screen, via paid admission, is still attractive to many as is watching a film recently released that is discussed by the public and the media. There has been a rising trend in UK cinema admissions over the period 1995-2004 with 170 million visits recorded for 2004 (UK Film Council Statistical Yearbook 2004/5). Hence, despite the growth of potentially substitute products, cinema-going remains a very popular activity, especially for people aged between 15 and 29.

Films can be considered as experience goods in which the quality, as perceived by the consumer, is only fully revealed after the good is consumed (Nelson, 1970; Shapiro and Varian, 1999). Filmgoers may well have an expectation of the film's likely quality but this expectation can be either exceeded or unfulfilled. In choosing whether to go to a cinema to watch a film, an individual has available the title, genre, rating certificate, cast and director of the production. Sometimes the film will be a sequel, in which case the experience and record of the previous offering are factors that will determine willingness to view the follow-up product. Another attribute of a film is the size of budget. A large production budget could be taken as a signal of higher quality. These indicators may be supplemented by a number of other potential quality signals. The goal of this paper is to assess the relative importance of different quality signals for success of films released in the United Kingdom. These include the nomination and winning of awards, of which the most famous are the US Academy Awards or 'Oscars' (Nelson *et al.* 2001). We also consider critical reviews. As with many other

entertainment products, such as books, music CDs and theatre productions, films are typically reviewed by critics in a number of newspapers and magazines and readers can use these reviews to help form a judgement on their expected utility of viewing the film. Increasingly, these reviews are summarised by easy-to-read numerical scores out of five or 10 to aid readers with high opportunity cost of time. A growing empirical literature is devoted to analysis of the impacts of third-party reviews in diverse settings such as Broadway shows (Reddy, Swaminathan and Motley, 1998) and books (Chevalier and Mayzlin, 2003; Sorensen and Rasmussen, 2004).

Critical reviews are important to the industry. Where favourable, extracts from critics' reviews are used in advertising the film, especially in press and outdoor advertising. Some US research has highlighted the helpful role that positive reviews play in raising box office revenues (Eliashberg and Shugan, 1997; Reinstein and Snyder, 2005). As proposed by Eliashberg and Shugan, strong critical acclaim can mean either of two things. First, a positive review could be read by filmgoers and could *influence* their decision to view a film. Second, a positive review could simply be a proxy for film quality and so critical acclaim is a *predictor* of film success. Reinstein and Snyder (2005) distinguish empirically between these two functions of critics. They find a small but statistically significant influencing role for ratings for dramas and small-release films offered by two high-profile film critics in the US which they identify as an influence effect, with positive reviews having a significantly larger effect on revenues than negative or mixed reviews.

We offer several innovations missing from the typical treatment of critical reviews in previous work. The first of these is to model the *spread*, or entropy, of reviews.

Studies have typically focussed on average or total critic scores with less attention to dispersion of opinions (Chang and Ki, 2005; Elberse and Eliashberg, 2003; Litman and Kohl, 1989). A relevant question is whether a consensus of reviews, with a narrower range, influence box office returns positively or negatively. While Basuroy *et al.* (2006) address spread of reviews; their analysis of this issue is constrained by more limited review data.²

A further related question, which we consider below, is which critics, if any, command attention from the cinema-going public. Collins *et al.* (2002) use critical reviews based on a UK film magazine, *Empire*. This magazine is oriented towards cinema fans and its readership is more specialised and probably less representative of audiences than that of national newspapers. Moreover, the reviews published in *Empire* tend to be less critical and more enthusiastic than counterparts in several newspapers. Looking at the predictive effect of reviews, it could be the case that some critics are more in tune with the majority of the film-going audience than others. If so, this may mean that greater dispersion of critical opinions could be correlated positively with box office revenues, since some critics are better barometers of public opinion. We address this issue directly below.

The overwhelming majority of films in our sample are American productions that have been released in the US prior to UK opening. It is pertinent to ask whether there are spillover effects from American critical acclaim to British audience response. This can be tested using a measure of aggregate US critic score.

² Basuroy, Chatterjee and Ravid (2003) investigate the impacts of critical reviews on US opening box office revenues and find that the adverse effects of negative reviews are greater than the beneficial

Nelson (1974) argued that advertising can be a signal of quality, as a firm will only be willing to invest in large advertising expenditures if confident about the quality of the product being promoted and the long run sales return to the advertising expenditure. Nelson's argument rests on the assumption of repeat purchases but, for films, an analogous occurrence is amplification of customer responses through 'word of mouth' recommendation. However, there are numerous motives for advertising. Schmalensee (1978) developed a model in which advertising can signal product quality, but unlike later analyses he assumes a fixed industry price. Given the low variability in the price of cinema admissions tickets, his model may aid understanding of film advertising and its consequences. An important outcome in his 1978 model is that perverse equilibria may exist, in which low quality firms may have the largest advertising expenditure, sales and profits. While high quality firms may enjoy a greater long run sales effect of advertising, low quality firms can offset this if they have lower costs of production, giving rise to higher price cost margins.

The effectiveness of alternative forms of advertising, as quality signals, is open to question. It may be the case that advertising is undertaken simply because stakeholders, including producers and actors, expect this to happen.³ Alternatively, Salop and Scheffman (1983) suggest that firms will engage in advertising to raise their rivals' costs as competitors are forced to copy advertising expenditures to avoid risking market share. Nelson (1974) also argued that advertising will help consumers make better informed choices, such that purchases more closely match their preferences. Hence, the variety of advertising media used may reflect attempts being made to ensure that advertising has a coordination role, better coordinating

impacts of positive reviews.

individuals' film preferences and consumption.⁴ Ultimately, film advertising may serve one or more of a number of potential roles of which a quality signal is only one. Hence, while the analysis below can identify the impact of advertising on box office success, it is impossible to conclude whether the effectiveness of advertising reflects the use of advertising as a quality signal.

Although some research has found a positive influence of *total* advertising on box office revenues (Elberse and Eliashberg, 2003, Prag and Casavant, 1994) few studies have been able to disaggregate total advertising into its components.⁵ In the film industry, advertising comprises four main types. First, there are advertisements placed in local and national press. Second, films selected for wide-scale national release are typically pre-announced by advertising posters on a large number of billboards and on buses. Third, films are advertised on commercial radio stations. Fourth, a selected number of films will be advertised on commercial television by means of short trailers. This paper offers a contribution to the literature on modelling box office returns as the modelling permits the impacts of advertising in these four media to be distinguished.

To date, Elberse and Eliashberg (2003) are the only authors to separate the impacts of total advertising on box office revenue through supply-side effects (number of screens allocated to particular films) and demand-side effects (customer response, controlling for number of screens). They did this using a structural three equation model, estimated not just for the US but four European countries as well, including the UK.

³ Quite often, actors will sign contracts for appearances in films on the understanding that the film will receive substantial advertising promotion.

⁴ Although note that an assumption that firms behave in this way contradicts the perverse equilibria result of Schmalensee (1978).

In this paper, we offer a parsimonious instrumental variables model of (log) total box office revenues in which (log) opening screens is the endogenous variable. The convention in the literature is to assume that advertising is exogenous to box office revenues (Elberse and Eliashberg, 2003). Arguably, advertising should also be treated as an endogenous variable within a system of equations. In our case, this can only be achieved by using a single total advertising variable. This would entail a considerable loss of information given that we have data on each of the four main advertising media expenditures. Moreover, these expenditures may vary in size of effects on box office revenues. Given the vastly different advertising expenditures across films, we predict that an endogenous total advertising variable will have an insignificant impact on total box office revenues. This is confirmed by a three stage least squares regression model (not reported due to space constraints) with log opening screens, log advertising and log total box office revenues as dependent variables.⁶

Various authors have tackled the problem of modelling determinants of box office success. Papers have focused on the roles of stars (Ravid, 1999, Elberse (2005)), R-rated films (Ravid and Basuroy, 2004) and the impact of winning Oscars (Nelson *et al.* 2001). So far, the literature on determination of box office revenues has given greater attention to the impacts of critical reviews than to the effectiveness of advertising (see Table 1). Moreover, very few studies consider critical reviews and advertisements as joint determinants of box office revenues. In this paper we consider both advertising and critical reviews. The essential research questions analysed here are, first, to what extent advertising expenditures can influence box office revenues

⁵ A notable exception is Robertson's (2003) report for the UK Film Council.

⁶ Results are available on request.

when other quality signals are available and, second, the extent to which critical reviews are predictors of film success.

We also examine the potential for interaction between advertising expenditure and some of the other quality signals mentioned above. For example, it might be the case that heavy advertising could offset the adverse effects on box office returns from bad reviews. Alternatively, distributors may decide to cut their losses following bad reviews and actually reduce advertising expenditure. Advertising effort may be particularly strong for films that are nominated for awards as distributors see the opportunity to cash in on the greater prestige and recognition that awards bring about. Far-sighted distributors may spot award-winning potential in advance and may promote films more heavily in anticipation of a film gaining awards.

2. Model Selection and Data

The UK film industry comprises production companies, distributors and exhibitors. We focus on the relationship between distributors and exhibitors. Distributors and producers share the expenses of promoting a film; most of the advertising budget is spent by distributors. The distribution sector is dominated by a small number of major studios.⁷ In the UK, the exhibition sector is also oligopolistic, with the six largest exhibitors owning 70 per cent of screens (Robertson, UK Film Council, 2003).

We estimate an instrumental variables model of the determination of total revenues (TR), with opening screens (OS) treated as endogenous and each variable expressed in

⁷ These are: Buena Vista, Columbia Tristar, Paramount, 20th Century Fox, Universal International Pictures and Warner. Note that each studio has its own subsidiary studios and is part of a bigger media conglomerate. For example, Buena Vista owns Miramax and Walt Disney Productions while New

logs. The specification of the model underlying the two-stage least squares estimates is:

$$TR = a_1 OS + CRITICb_1 + X_1b_2 + ADVb_3 + Prize*ADVb_4 + u_1 \quad (1)$$

$$OS = CRITICb_5 + X_1b_6 + ADVb_7 + Prize*ADVb_8 + Wp + u_2 \quad (2)$$

where:

CRITIC is a vector of measures of critical review

ADV is a vector of advertising values

*Prize*ADV* is a vector of advertising values interacted with nomination for a major award

X₁ is a vector of controls that appear in both equations

W is a vector of instruments that influence opening screens but do not directly affect box office revenues

u₁ and *u₂* are random errors

a, *b* and *p* are vectors of parameters to be estimated.

The model recognises the sequential structure of industry decision-making: opening screens are determined before revenues. Instruments were selected by prior inspection of the correlation matrix for all variables and then checked using preliminary regression analysis. Instruments for opening screens include log budget, log US opening revenues and dummy variables for major studios, for UK productions distributed by major studios and for genres.

Data on opening screens, US opening revenues and total UK box office revenues were obtained from the box office section of the Internet Movie Database (www.imdb.com),

Line, which distributed the highly successful *Lord of the Rings* trilogy, is owned by Warner, itself part of Time-Warner AOL.

henceforth IMDb, which is a rich source of information about current and older films. All monetary values were converted to real sterling at 1996 prices. We found consistent data for 546 films released between 1999 and 2003. Descriptive statistics for our continuous variables are shown in Table 2.

Explanatory Variables

Indicators Determined by Producers and Distributors

In equation (2), we allow the (log) number of opening screens to depend on *log budget* of the film and log US opening weekend revenue (*log US open*) as reported in the IMDb. If no US opening revenue was reported or the US opening was after the UK opening, we inserted a zero log value, essentially creating a slope dummy for films that open in the US before the UK. Dummy variables were created for genre of film by classifying the following types: *drama, comedy, romantic comedy, action and adventure, thriller, horror, science fiction and animation*. These categories are sometimes overlapping and blurred and we attempted to classify using a combination of the IMDb records and summary reviews offered by the Guardian newspaper website www.guardianunlimited.co.uk. The base category, also the most frequent, is drama. A further set of dummy variables identifies major studios separately, with all non-major distributors set at zero. UK and joint UK productions were identified by a *UK production* dummy variable to check if UK productions gained any sort of advantage in screen allocation or at the box office. UK independent producers and distributors sometimes complain that their films suffer a disadvantage in screen allocations compared to films distributed by major studios, an entry barrier in the UK film exhibition market. To test for such an effect we interact *UK production* with

another dummy variable for *major studio* to generate *UK major* and enter this variable in the screen equation alongside the separate major studio dummy variables.

Some films are released in the UK before the US; typically, these are of European or Asian origin. Such films are categorised by the dummy variable, *UK first*.

We also have dummy variables for films that represent a *sequel*, a *remake* (e.g. *Psycho*) and are derived from a *television show* (e.g. *Charlie's Angels*). We expect sequels to be particularly important. It is now the ambition of distributors and exhibitors to generate franchises for films, where audiences are committed to a long-lasting project with films as episodes. The *Harry Potter* and *Lord of the Rings* series are the highly successful role models in this regard. For the total revenue equation (1), dummy variables were also created for type of certificate (*cert U*, *Parental Guidance*, *cert 12*, *cert 15* and *cert 18*). Initially, the 15 category was omitted.

Nielsen ADC provided total amounts spent in the United Kingdom on each of four categories of advertising by year between 1999 to 2003, by film and by year. These categories are television, press, outdoor (poster campaigns) and radio. Care was taken to remove films for which advertising expenditure occurred in 1998 and 2004, to avoid censoring of the data. We also removed advertising data for years following a cinema release, which might capture advertising directed towards DVD and video sales or rentals. Again, values were expressed in log values at constant prices; zero log values were inserted where no advertising spending occurred. The resulting variables, are denoted by *log TV advertising*, *log outdoor advertising*, *log press advertising* and *log radio advertising* and this sequence is also the ranking of conditional mean values of advertising. As in the US, television advertising is both

the most expensive medium and the category attracting greatest expenditure (Elberse and Anand, 2005).

Films nominated for best actor, best actress or best film awards at the BAFTA and Oscar ceremonies each spring are represented by a dummy variable, *prize*; 48 such films were identified. It is possible that producers and distributors raise their advertising efforts for films that they perceive will win awards. Indeed, the mean level of (real) television advertising for films nominated for award is £426,627 compared with £299,291 for non-nominated films. A one-sided t-test rejects the null of equality of means (p value = 0.01)⁸. A similar t-test rejects equality of means of press advertising between nominated and non-nominated films (p value = 0.00). To explore this type of difference in a multivariate setting, we interact *prize* with each of our advertising types.

Critical Reviews

UK critical reviews were extracted from *The Guardian* newspaper's website www.guardianunlimited.co.uk. *The Guardian* compiles ratings from a selection of reviews on a scale of zero to 10⁹. The papers surveyed were *Daily Express*, *Daily Mail*, *Daily Mirror*, *Daily Telegraph*, *The Guardian*, *The Independent*, *The Times* and *The Sun*. Not all paper reviews were available for each film and in some cases only two reviews were reported. Nevertheless, this data base offers a reasonable cross-section of British newspaper reviews of films. All reviews were produced before or during

⁸ All t tests of differences in sample means permit unequal variance between the two sub-samples.

⁹ The appearance of stars for reviews of a number of leisure and entertainment goods is now a common feature of current UK newspaper reporting. Easy-to-read star summaries are published *inter alia* for films, music CDs, musical concerts, art exhibitions, stand-up comedy and restaurants. This is probably a response to higher marginal valuation of leisure time of increasingly busy readers. Film reviews are

opening weekend of release. As the host of this comparison, *The Guardian* has greatest review coverage followed by *Daily Mail*; coverage of reviews by *The Sun* was rather thin. Coincidentally or not, the newspapers with highest average scores (*Daily Mirror* and *The Sun*) also have larger circulations than their rivals, are more populist in tone and deliberately appeal to a readership of lower social class than the so-called ‘quality’ newspapers such as *The Times* or *The Guardian*.¹⁰ A kernel density plot reveals an approximately normal distribution of average scores; all critics used a full range of marks from zero or one to 10 in their reviews. Average scores by newspaper are between 4.38 and 6.22 while standard deviations vary between 2.36 (*Express*) and 2.78 (*Mail*). In our model, we use the average critics’ scores, from those available, denoted by *average UK critic*.

We also ask whether a greater diversity of critical review is good or bad for box office returns. On the one hand, if critics are more united in their opinions, given a particular average score, then filmgoers may have more confidence in the ability of reviewers to assess quality. This fits with the literature on consensus forecasting, in which a score based on uniform opinions has greater predictive content than scores from more diverse opinions.¹¹ On the other hand, if there is greater diversity of opinion this could mean that that some critics are more in tune with filmgoer opinions than others. Since some critics write for mass circulation newspapers while others report for lower circulation, upmarket ‘quality’ papers this is a distinct possibility. It is also just possible that critics representing mass-market newspapers might offer generally more

usually compiled on a score of one to five stars but the *Guardian* site adapts these to a score of zero to 10 based upon its interpretation of review content.

¹⁰ *The Sun* is Britain’s best selling daily newspaper with over 3 million readers per day in 2004 (www.media.guardian.co.uk). This is followed by the *Daily Mirror* with 1.7 million daily readers. *The Guardian* and *The Independent* had 360,000 and 266,000 daily readers.

favourable reviews in order to attract greater press advertising from producers and distributors (Moul and Shugan, 2005).

We construct a variable, *spread*, which is the range (maximum minus minimum) of critics' scores for a particular film. A higher spread denotes greater diversity of opinion. If consensus forecasting is an important consideration in filmgoers' attendance decisions then the coefficient on spread is predicted to be negative. If some critics are more in line with popular opinion than others, and offer more favourable reviews, we expect the coefficient on spread to be negative. We note that the correlation coefficient between the *spread* and *average UK critic* is a mere 0.05. In the US, Reinstein and Snyder (2005) focused on the information contained in reviews by two celebrated US film critics who presented their evaluations on television. We must caution that the critics whose reviews are summarised here are certainly not household names. Indeed, some newspapers use more than one critic. We find the predictive role for film critics, as barometers of public opinion, more persuasive than an influential role, *a priori*. Nevertheless, quotations from UK critics' reviews often appear, when favourable, in press and outdoor advertising.

Another measure of critical acclaim is the average US critic rating, which is known prior to UK release for all but a few films in our sample. The web site, www.metacritic.com, offers a summary score (from zero to 100) of a set of 50 American film reviews drawn from major US newspapers, denoted here by *average US critic*. Like the UK critics, a wide range of scores is used.¹² We divide the scores by 10 to make these comparable with *average UK critic*. The correlation coefficient between

¹¹ See Forrest and Simmons (2000) for an application of consensus forecasting to prediction of soccer results by a set of newspaper pundits.

average US critic and *average UK critic* is high, at 0.77, so there is a risk of multicollinearity when including both as explanatory variables.

De Vany and Walls (1999, 2002) show that US cinema revenues follow a non-standard (i.e. non-normal) distribution in which the variance of log box office revenues is unbounded and high degrees of skewness are observed.¹³ The classical assumptions of well-defined mean and constant, finite variance are violated.

Accordingly, De Vany and Walls model US box office revenues using various non-standard statistical distributions, such as the Pareto distribution, to handle the excess kurtosis prevalent in box office revenues (see also Walls, 2005, who applies the *t*-skew distribution). The principal cost of imposing non-standard, but more appropriate, distributions is that it is only possible to estimate a reduced form model. Computational complexity rules out estimation of a structural model. We wish to model the interaction between supply-side and demand-side influences on box office revenues using a system of equations. In response to the critique of De Vany and Walls, we subject the standard errors of our estimated effects to bootstrapping, so as to generate reliable t-statistics for inference (Davison and Hinkley, 1997; MacKinnon, 2002). The advantage of the bootstrap method is that it facilitates computation of robust standard errors in the presence of both non-normality of residuals and heteroskedasticity. Importantly in our context, the bootstrap method does not necessitate imposition of a particular distribution on our dependent variables.

¹² www.metacritic.com does not reveal maximum, minimum or standard deviation for its scores.

¹³ See Collins, Hand and Snell (2002) who argue that UK box office revenues are subject to similar distributional problems. Their resolution is to use an ordered logit model in which they impose threshold revenue values. As they point out, this procedure does entail substantial loss of information.

3. Empirical Results

Our results from Two Stage Least Squares estimation, in log-linear form and with bootstrapped standard errors based upon 200 replications, are shown in Tables 3, 4 and 5¹⁴. Table 3 presents our preferred model with the highest number of observations across the three sets of results. R squared values for total box office and opening screens are 0.60 and 0.47, respectively. The high variation in opening screens is more difficult to explain by our model, even with low outliers removed. Looking first at the linkages between the endogenous variables, we find that the elasticity of total box office revenue with respect to opening week screens is 1.741. At first glance this value may appear rather high. But, if we assume that the elasticity from opening revenue to total revenue is one or higher, which seems plausible, then our estimate is comparable to the elasticity of opening revenues with respect to opening screens of 1.51 found by Elberse and Eliashberg (2003) in their model of UK opening weekend revenues for a sample of US films released in 1999.

Genre effects are pronounced for opening screens where, except for *animation* and *thriller*, all categories attract larger screen allocations than drama. Horror and science fiction films attract more screenings than dramas and also have significantly greater opening box office revenues (at 10 per cent). But action/adventure and comedy releases open with significantly more screens than dramas yet do not earn significantly greater opening or total box office revenues, suggesting a possible misallocation of screens by exhibitors. Studio effects for non-UK films are pronounced for screen allocations where, compared to independent distributors,

¹⁴ Two alternative functional forms were considered. One was a polynomial with endogenous variables entered as levels and continuous explanatory variables as powers up to cubic. The second form had endogenous variables as log odds ($\ln(y/(2*\max y - y))$) and continuous regressors as linear. Each of

significantly higher opening screenings (at five per cent on a one-tailed test) were granted to films from all the noted major studios. Interestingly, the impact of *UK major* on opening screens shows that UK films distributed by any of the major studios had an advantage of 26.2 per cent over UK films unattached to the majors. This reveals the extent of entry barrier to UK films distributed by independents in securing opening screen allocations.

Other instruments for opening screens include budget and US opening revenue and preliminary testing reveals that neither variable has a significant impact on total box office revenues. Higher US box office opening revenues and higher budgets each translate significantly into greater screen allocations and then into higher total box office revenues.

Impacts of certificate appear on total box office revenues, where family-oriented *Cert U* films gain 52.5 per cent more total revenue than films with other certificates, *ceteris paribus*.¹⁵ This highlights the importance of family-oriented films for the industry; when a young child sees a film, he or she needs adult accompaniment and this will necessarily raise box office revenues. *U* rated films may represent a different market segment, as suggested by the alternative marketing vehicles used for these films such as product tie-ins and offers in conjunction purchases of cereals and fast food meals. We reran our model excluding *U* rated films. With 504 observations,

these had lower R^2 in all equations and much higher bootstrapped standard errors for the advertising and critical review variables.

¹⁵ For dummy variables and with log box office revenue as dependent variable, the impact is evaluated by the formula $e^\beta - 1$ where β is the estimated coefficient.

rather than 546, the results were robust and the explanatory power of each equation improved slightly.¹⁶

Sequels have a strong positive influence on both opening screens and total box office revenues. The combined effect on total revenues is 71.3 per cent, revealing the importance of successful ‘franchises’ for producers, distributors and exhibitors. Note that the coefficients on *remake* and *television show* were never found to be significantly different from zero so these variables were dropped from the analysis.

Advertising Impacts

Elberse and Eliashberg (2003) found that total UK advertising expenditure had a positive impact on UK opening screens but no effect on opening revenues. Our results substantially modify this finding. A significant supply-side impact of advertising, through opening weekend UK screens, is obtained for television advertising, but not the other categories, reflecting an impact of pre film release television advertising.¹⁷ Meanwhile, outdoor and radio advertising each have demand-side effects on total revenues. The impacts of outdoor and radio advertising, although significant statistically, are quite modest numerically. A 10 per cent increase in outdoor and radio advertising leads to higher box office revenues of 0.32 per cent and 0.30 per cent, respectively. On a proportionate comparison of revenue impacts, and setting aside cost considerations, television advertising is more effective than outdoor and radio advertising with a supply-side impact via opening screens of 0.89 per cent.¹⁸ As

¹⁶ Results are available from the authors on request.

¹⁷ More recently distributors have also increasingly invested in Internet advertising of film trailers, such that Internet film advertising may be expected to impact on opening screens in a similar way.

¹⁸ Some films have zero television advertising. This is consistent with a signalling model of advertising (Kihlstrom and Riordan, 1984, Milgrom and Roberts, 1986) in which films with low quality will not be advertised but films of high quality will be advertised.

noted above, one strand of game-theoretic literature in advertising economics suggests that advertising is used strategically as a means of sustaining a competitive position against rivals rather than being designed to raise revenues and/or profits. Compared with that view, we find that extra film advertising expenditures are more than just strategic and do help generate modest additional box office revenues. These effects on total box office revenues suggest that advertising does more than help stimulate initial audiences and can add to ‘word of mouth’ dissemination of film quality as film revenues grow beyond opening weekend values.

We also find that the impact of press advertising on total box office revenues is only apparent for films that are nominated for the prestigious BAFTA and Academy of Motion Picture awards (Oscars). For award-nominated films, an increase in press advertising of 10 per cent is estimated to result in a rise in total box office revenues of 5.82 per cent. We regard this as evidence of forward-looking behaviour by producers and distributors; films that are likely to win awards are more heavily promoted via press advertising. Our result on interaction of award nomination and advertising suggests first, that advertising is selectively determined by producers and distributors and is not imposed uniformly across films and second, that peer assessment by award nomination is itself a quality signal, capable of amplification by extra advertising. Potential filmgoers take notice of award nominations and are encouraged to view a film by the extensive press advertising built upon award nomination.

Critical Reviews

Higher average critic ratings are associated with increased box office revenues. The total effect of a one point increase in *average critic* is a 25.1 per cent gain in total box

office revenue. Of course, this is a one point gain across a set of reviewers which may be difficult to achieve when critics have diverse opinions. The positive and significant coefficient on *spread* shows that, for given average score, an increased range of ratings enhances gross revenues, seemingly contradicting the idea that consensus reviews help raise audience levels. Hence, although higher average ratings are generally correlated with greater box office revenues we have found substantial evidence modifying that simple relationship with significant roles for range of opinions.

Table 4 reports regression results with the addition of *average US critic* as an explanatory variable. Lack of availability of scores for all films reduce the sample size to 523.¹⁹ The coefficient on this variable in the total revenue equation is significant and positive, with a point estimate somewhat smaller than for *average UK critic*, which seems plausible as awareness of critical acclaim is likely to be greater when awarded by domestic sources.

The role of *spread* in the earlier results may conceal an ability of particular critics to act as a barometer of public opinion of a film. To check this, the model is rerun with *spread* replaced by score variables for each newspaper critic. Starting with the full set of eight critics and deleting insignificant terms (with *p*-value > 0.10) we find, in Table 5, that only the *Daily Mirror* remains with significant impacts on box office revenues over and above *average UK critic*. With this newspaper included, our sample size drops to 377. We face a trade-off between greater precision in identity of critic and

¹⁹ The excluded films are typically non-US productions. An interesting question is whether US critics have higher regard for US as opposed to UK films, leading to bias. Actually the reverse is true with mean score of 5.08 for US films and 5.79 for UK productions. This result itself reflects some selection

information loss incurred in order to include particular critics in the analysis. With the smaller sample size, some coefficients that were significant in the broader analysis are no longer so, such as the interaction terms between *prize* and press advertising. From the resulting parsimonious model, the *Daily Mirror* critic has an additional significant impact (at 5 per cent) on total box office revenues. A one point increase in *Daily Mirror* score is correlated with a 7.2 per cent rise in total revenues, for given average critic score. Hence, it appears that the *Daily Mirror* has much greater weighting than other newspapers in the impact of critical reviews, highlighting the relative importance of the mass-market UK newspaper critics as predictors of UK box office revenues.

4. Conclusions

The primary aim of this paper has been to assess the relative importance of different quality signals for success of films released in the United Kingdom. These signals include those under the control of the film companies themselves, and so may give an indication of the companies' perceptions of the quality of films they produce and distribute. These signals include budget devoted to a film, the amounts spent on different advertising media marketing films, and distribution by a major studio. A second set of quality signals is not ostensibly under the control of film companies, including critic reviews and the nomination for and award of prizes. The paper explores the different impacts of all of these quality signals on UK box office success, and the impact of variables constructed to capture the interaction between various pairs of quality signals. Our regression models also take account of factors such as certificate and genre of film and US box office success.

bias, though, as only the best UK productions are shown in the US and then reviewed by North American critics.

The analysis represents one of only a very limited number of papers to examine UK, rather than US, box office success, but also uses a larger dataset than has typically been the norm in examining the UK film industry. It has the advantage that unlike much of the literature modelling box office success, film advertising expenditures are divided according to advertising media used. Using a Two Stage Least Squares method, with standard errors bootstrapped, we find that television advertising has a supply-side, but not demand-side, effect while the other categories of advertising have demand-side effects only. The impact of press advertising is only apparent for films nominated for major Academy and BAFTA awards. We also undertook a thorough exploration of the impact of critic reviews using US as well as UK critics scores, and looking at spread as well as average scores. The role of dispersion of critics' review scores was firmly established and we have found that critics' scores from reviews in mass-market newspapers play a particularly important role as predictors of film success in the UK.

Table 1

Studies of advertising expenditure and critical reviews in box office revenues

Study	Place, time period and sample size	Revenue category	Findings (√ significant at 5%, X not significant)
<i>Studies using advertising</i>			
Elberse and Eliashberg (2003)	US, 1999, 164	Opening and weekly	√
Elberse and Eliashberg (2003)	UK, 1999, 138	Opening and weekly	X
Prag and Casavant (1994)	US, 1990, 195	Total	√
<i>Studies using critical reviews</i>			
Basuroy <i>et al.</i> (2003)	US, 1991-93, 162	Opening	√
Chang and Ki (2005)	US, 2000-02, 431	Total	√
Collins <i>et al.</i> (2002)	UK, 1998, 216	Probability > threshold	√
Elberse and Eliashberg (2003)	US, 1999, 164	Opening and weekly	√
Elberse and Eliashberg (2003)	UK, 1999, 138	Opening and weekly	√
Eliashberg and Shugan (1997)	US, 1991-92, 56	Opening and weekly	√
Litman and Kohl (1989)	US, 1981-86, 464	Total	√
Prag and Casavant (1994)	US, 1990, 195	Total	√
Ravid (1999)	US, 1991-93, 175	Total	X
Ravid and Basuroy (1999)	US, 1991-93, 175	Opening and total	X
Reinstein and Snyder (2005)	US, 1999, 609	Opening and total	√
Sawhney and Eliashberg (1996)	US, 1990-91, 101	Total	√
Sochay (1994)	US, 1987-89, 263	Total	√

Table 2

Descriptive statistics for continuous variables (conditional on positive values)

(monetary values in £m 1996 prices)

Variable	Mean	Standard Deviation	Minimum	Maximum
UK total box office revenue	4.82	7.75	0.14	60.1
US opening box office revenue	15.8	47.4	0.01	1140
UK opening screens	249.2	132.9	12	524
Budget	114.0	42.0	0.04	175
TV advertising	0.37	0.27	0.01	1.94
Outdoor advertising	0.33	0.43	0.01	4.01
Press advertising	0.12	0.13	0.01	0.82
Radio advertising	0.06	0.05	0.0001	0.27

Table 3

*Two Stage Least Squares Estimates: Main Model**N = 546**Dependent Variables*

Variable	Log Opening Screens	Log Total Revenue
<i>Log Opening Screens</i>		1.706 (16.21)
<i>Log outdoor advertising</i>	0.014 (2.95)	0.032 (3.99)
<i>Prize*log press advertising</i>	0.104 (0.98)	0.585 (2.25)
<i>Prize</i>	-1.435 (1.10)	-6.477 (2.06)
<i>Log radio advertising</i>	0.012 (2.12)	0.030 (3.43)
<i>Average UK critic</i>	-0.017 (1.23)	0.251 (9.55)
<i>Spread</i>	-0.008 (0.60)	0.057 (2.37)
<i>UK first</i>	-0.140 (1.30)	0.506 (2.23)
<i>Sequel</i>	0.187 (2.16)	0.394 (2.47)
<i>Cert U</i>	0.133 (1.06)	0.525 (2.04)
Instruments		
<i>Log TV advertising</i>	0.052 (8.46)	
<i>Log US open revenue</i>	0.029 (3.20)	
<i>Log budget</i>	0.188 (5.70)	
<i>UK major</i>	0.262 (2.18)	
Studio effects		
<i>Fox</i>	0.183 (2.05)	
<i>Buena Vista</i>	0.066 (0.77)	
<i>Columbia</i>	0.153 (1.70)	
<i>Paramount</i>	0.435 (2.55)	
<i>Universal</i>	0.285 (3.15)	
<i>Warner</i>	0.180 (2.12)	
Genre effects		
<i>Action/adventure</i>	0.212 (2.50)	
<i>Animation</i>	0.008 (0.06)	
<i>Comedy</i>	0.210 (2.63)	
<i>Horror</i>	0.296 (2.63)	
<i>Romantic comedy</i>	0.225 (2.12)	
<i>Science fiction</i>	0.213 (1.77)	
<i>Thriller</i>	0.061 (0.62)	
R ²	0.474	0.604

Note to Tables 3-5: Absolute *t* statistics in parentheses, computed using bootstrapped standard errors.

Table 4

*Two Stage Least Squares Estimates: With Average US critic**N = 523**Dependent Variables*

Variable	Log Opening Screens	Log Total Revenue
<i>Log Opening Screens</i>		1.733 (16.31)
<i>Log outdoor advertising</i>	0.013 (2.72)	0.033 (4.52)
<i>Prize*log press advertising</i>	0.097 (0.94)	0.582 (2.38)
<i>Prize</i>	-1.312 (1.03)	-6.568 (2.24)
<i>Log radio advertising</i>	0.010 (1.72)	0.030 (3.39)
<i>Average UK critic</i>	-0.018 (0.89)	0.185 (5.63)
<i>Spread</i>	-0.015 (1.11)	0.055 (2.26)
<i>Average US critic</i>	0.000 (0.02)	0.110 (3.25)
<i>UK first</i>	0.069 (0.57)	0.524 (2.07)
<i>Sequel</i>	0.184 (2.12)	0.410 (3.30)
<i>Cert U</i>	0.080 (0.64)	0.470 (1.83)
Instruments		
<i>Log TV advertising</i>	0.051 (8.25)	
<i>Log US Opening revenue</i>	0.059 (4.99)	
<i>Log budget</i>	0.182 (5.50)	
<i>UK major</i>	0.248 (2.02)	
Studio effects		
<i>Fox</i>	0.205 (2.34)	
<i>Buena Vista</i>	0.086 (1.01)	
<i>Columbia</i>	0.156 (1.76)	
<i>Paramount</i>	0.432 (2.58)	
<i>Universal</i>	0.276 (3.08)	
<i>Warner</i>	0.186 (2.22)	
Genre effects		
<i>Action/adventure</i>	0.169 (2.01)	
<i>Animation</i>	0.036 (0.26)	
<i>Comedy</i>	0.157 (1.97)	
<i>Horror</i>	0.260 (2.28)	
<i>Romantic comedy</i>	0.222 (2.10)	
<i>Science fiction</i>	0.188 (1.60)	
<i>Thriller</i>	0.091 (0.90)	
R ²	0.500	0.591

Table 5

*Two Stage Least Squares Estimates: With Particular UK Critics**N* = 377*Dependent Variables*

Variable	Log Opening Screens	Log Total Revenue
<i>Log Opening Screens</i>		1.648 (12.38)
<i>Log outdoor advertising</i>	0.009 (1.64)	0.041 (3.91)
<i>Log radio advertising</i>	0.007 (0.97)	0.046 (3.76)
<i>Average UK critic</i>	-0.029 (1.00)	0.149 (2.80)
<i>Daily Mirror</i>	0.000 (0.01)	0.072 (2.32)
<i>Average US critic</i>	0.001 (0.38)	0.130 (2.92)
<i>UK first</i>	0.093 (0.71)	0.532 (1.97)
<i>Sequel</i>	0.180 (1.86)	0.496 (3.87)
Instruments		
<i>Log TV advertising</i>	0.057 (7.78)	
<i>Log US Opening revenue</i>	0.065 (4.61)	
<i>Log budget</i>	0.163 (4.30)	
<i>UK major</i>	0.285 (1.99)	
Studio effects		
<i>Fox</i>	0.234 (2.34)	
<i>Buena Vista</i>	0.064 (0.63)	
<i>Columbia</i>	0.208 (1.96)	
<i>Paramount</i>	0.488 (2.53)	
<i>Universal</i>	0.317 (2.97)	
<i>Warner</i>	0.270 (2.69)	
Genre effects		
<i>Action/adventure</i>	0.176 (1.78)	
<i>Animation</i>	0.111 (0.85)	
<i>Comedy</i>	0.204 (2.18)	
<i>Horror</i>	0.350 (2.49)	
<i>Romantic comedy</i>	0.330 (2.59)	
<i>Science fiction</i>	0.195 (1.49)	
<i>Thriller</i>	0.140 (1.19)	
R ²	0.517	0.544

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References

Basuroy, S., S. Chatterjee, and S. A. Ravid (2003) How Critical are Critical Reviews? The Box Office Effects of Film Critics, Star Power and Budgets, *Journal of Marketing*, **67**, 103-117.

Basuroy, S., K. Desai, and D. Talukdar (2006) An Empirical Investigation of Signaling in the Motion Picture Industry, *Journal of Marketing Research*, **43**, 287-295.

Chang, B.-H., and E.-J. Ki (2005) Devising a Practical Model for Predicting Theatrical Movie Success: Focusing on the Experience Good Property, *Journal of Media Economics*, **18**, 247-269.

Chevalier, J., and D. Mayzlin (2003) The Effect of Word of Mouth on Sales: Online Book Reviews, *National Bureau of Economic Research Working Paper* 10148.

Collins, A., C. Hand, and M. Snell (2002) What Makes a Blockbuster? Economic Analysis of Film Success in the UK, *Managerial and Decision Economics*, **23**, 343-354.

Davison, A., and D. Hinkley (1997) *Bootstrap Methods and their Applications*. Cambridge: Cambridge University Press.

De Vany, A., and W. D. Walls (1999) Uncertainty in the Movies: Can Star Power Reduce the Terror of the Box Office?, *Journal of Cultural Economics*, **23**, 285-318.

De Vany, A., and W. D. Walls (2002) Does Hollywood Make Too Many R-Rated Movies? Risk, Stochastic Dominance and the Illusion of Expectations, *Journal of Business*, **75**, 425-451.

Elberse, A. (2005) The Power of Stars: Creative Talent and the Success of Entertainment Products, *Harvard Business School Working Paper* 06-002.

Elberse, A., and B. Anand (2005) The Effectiveness of Pre-Release Advertising for Motion Pictures, *Harvard Business School Working Paper*.

Elberse, A., and J. Eliashberg (2003) Demand and Supply Dynamics for Sequentially Released Products in International Markets: The Case of Motion Pictures, *Marketing Science*, **22**, 329-354.

Eliashberg, J., and S. Shugan (1997) Film Critics: Influencers or Predictors?, *Journal of Marketing*, **61**, 68-78.

Forrest, D., and R. Simmons (2000) Forecasting Sport: The Behaviour and Performance of Football Tipsters, *International Journal of Forecasting*, **16**, 317-331.

Kihlstrom, R., and M. Riordan (1984) Advertising as a Signal, *Journal of Political Economy*, **92**, 427-450.

Litman, B., and L. Kohl (1989) Predicting Financial Success of Motion Pictures: The 80s Experience, *Journal of Media Economics*, **2**, 35-50.

MacKinnon, J. (2002) Bootstrap Inference in Econometrics, *Canadian Journal of Economics*, **35**, 615-645.

Milgrom, P., and J. Roberts (1986) Price and Advertising Signals of Product Quality, *Journal of Political Economy*, **94**, 796-821.

Moul, C., and S. Shugan (2005) Theatrical Release and the Launching of Motion Pictures in Moul, C. ed. *A Concise Handbook of Movie Industry Economics*. Cambridge: Cambridge University Press.

Nelson, P. (1970) Information and Consumer Behavior, *Journal of Political Economy*, **78**, 311-329.

Nelson, P. (1974) Advertising as Information, *Journal of Political Economy*, **82**, 729-754.

Nelson, R., M. Donihue, D. Waldman, and C. Wheaton (2001) What's an Oscar Worth?, *Economic Inquiry*, **39**, 1-16.

Prag, J., and J. Casavant (1994) An Empirical Study of the Determinants of Revenues and Marketing Expenditures in the Motion Picture Industry, *Journal of Cultural Economics*, **18**, 217-235.

Ravid, S.A. (1999) Information, Blockbusters and Stars: A Study of the Film Industry, *Journal of Business*, **72**, 463-492.

Ravid, S.A., and S. Basuroy (2004) Managerial Objectives, the R-Rating Puzzle and the Production of Violent Films, *Journal of Business*, **77**, S155- S192.

Reddy, S., V. Swaminathan, and C. Motley (1998) Exploring the Determinants of Broadway Show Success, *Journal of Marketing Research*, **35**, 370-383.

Reinstein, D., and C. Snyder (2005) The Influence of Expert Reviews on Consumer Demand for Experience Goods: A Case Study of Movie Critics, *Journal of Industrial Economics*, **53**, 27-52.

Robertson, T. (2003) Advertising Effectiveness in UK Film Distribution, *Report for the UK Film Council*.

Salop, S. C., and D. T. Scheffman (1983) Raising Rivals' Costs, *American Economic Review Papers and Proceedings*, **73**, 267-271.

Sawhney, M., and J. Eliashberg (1996) A Parsimonious Model for Forecasting Gross Box Office Revenue of Motion Pictures, *Marketing Science*, **15**, 113-131.

Schmalensee, R. (1978) A Model of Advertising and Product Quality, *Journal of Political Economy*, **86**, 485-503.

Shapiro, C., and H. Varian (1999) *Information Rules: A Strategic Guide to the Network Economy*. Harvard Business School Press, Boston MA.

Sochay, S. (1994) Predicting the Performance of Motion Pictures, *Journal of Media Economics*, **53** 27-52.

Sorensen, A., and S. Rasmussen (2004) Is Any Publicity Good Publicity? A Note on the Impact of Book Reviews, Stanford University, mimeo.

Walls, W.D. (2005) Modelling heavy tails and skewness in film returns, *Applied Financial Economics*, **15**, 1181-1188.