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The Signaling Effect of Critics: Do Professionals outweigh Word-of-Mouth? Evidence from the Video Game Industry

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Abstract Experience goods are characterized by information asymmetry and a lack of *ex ante* knowledge of product quality, such that reliable external signals of product quality are likely to be highly valued. Two potentially credible sources of such information are reviews from professional critics with expert reputations, as well as ‘word-of-mouth’ reviews from other consumers. This paper makes a direct comparison between the relative influence of both critic and user reviews on the sales of video games software. In order to empirically estimate and separate the effects of the two signals, we analyze a sample of 1,480 video games and their sales figures between 2004 and 2010. We find clear evidence to suggest that reviews from professional critics have a significantly positive influence on sales that outweighs word-of-mouth reviews. Consequently, we support the hypothesis that professional critics adopt the role of an influencer whereas word-of-mouth opinion acts merely as a predictor of sales.

Key words Signaling Theory; Information Asymmetry; Critics; Word-of-Mouth; Video Game Industry

JEL classification C31 · D82 · L14 · L82

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The Signaling Effects of Critics: Do Professionals outweigh Word-of-Mouth? Evidence from the Video Game Industry

1 Signaling in the Presence of Information Asymmetries

Experience goods represent an example *par excellence* of information asymmetry between consumers and producers, being characterized by a lack of *a priori* knowledge of product quality on the part of the consumer (Nelson 1970). An effective means by which to reduce this asymmetry is the transmission of credible signals of quality to the consumer. Two such examples are reviews written by professional critics and word-of-mouth from other consumers. However, despite a growing number of studies finding evidence that each signal might separately influence buyer behavior, no study has previously attempted to simultaneously analyze the influence of the two signals on sales performance. In order to fill this gap in the literature, the following research question is posed by this paper:

‘How do signals of quality from professional critics influence buyer behavior compared to signals originating from other consumers; and how do these signals interact with other observable indicators of product quality?’

According to Eliashberg and Shugan (1997), critics can either adopt the role of an influencer or a predictor. The influencer has the reputation of being an opinion leader for a group or individuals and has credibility derived from reliable expertise within a particular field (Weiman, 1991). In contrast, a predictor has no significant influence on buyer behavior or volume of sales and simply reflects the existing preferences of consumers. Consequently, customers will make consumption decisions based on other independent factors such as sales promotions, advertising or word-of-mouth. It may also be possible that both the influencing and predicting effects of critics exist simultaneously.

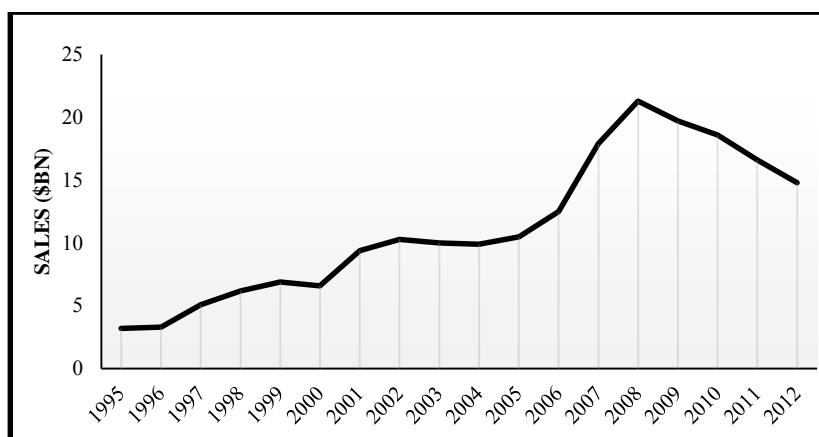
We control for two types of critical reviews in this study, namely the reviews from professional critics and online word-of-mouth reviews. Whereas reviews from professional critics are released *ex ante* of the product release, word-of-mouth reviews

are typically circulated *ex post*. Following the theory of Eliashberg and Shugan (1997), we therefore argue that critics will be more likely to adopt the role of sales influencers due to their reputation and the high costs associated with becoming an opinion leader, whereas online consumer reviews are more likely to predict sales figures. When both types of critical response are tested, we find no support that word-of-mouth positively influences sales once the influence of professional critics is separately controlled for. Consequently, we conclude that critics have an influencing effect that outweighs online word-of-mouth from consumers.

We therefore make a unique contribution to the literature both as a result of being the first study to directly compare the relative influence of the respective signals and also to investigate how interaction between these and other signals might affect sales performance. Additionally, whereas a majority of prior studies into the influence of critic or user reviews have focused on sales of motion pictures or books, this is the first study to explicitly focus on these factors in the context of the market for video game software.

While video gaming may have originally been perceived as the exclusive preserve of children and teenagers, the market has evolved into a multi-billion dollar global industry that attracts consumers from an increasingly broad range of ages, genders and socio-economic backgrounds. According to the Entertainment Software Association (2012), the average gamer is 30 years of age, while 47% of gamers are female. In fact, adult female gamers make up around twice the proportion of total US gamers than boys aged 17 or younger. Figure 1 illustrates both the upward trend and cyclical performance of the US video games market from 1995 to the present day, measured in terms of combined hardware and software sales revenues. A cyclical pattern is clearly demonstrated, with significant growth immediately following the launch of new hardware models, followed by flattening or declining performance in subsequent years. Despite the huge sales successes observed over much of the last decade, the market has begun a period of contraction from 2008-2013, possibly due to a combination of weak economic conditions, the rise in popularity of gaming on mobile phones and tablets and the approach of the end of the current generational hardware cycle. The pronounced decline in sales has resulted in a number of high-profile casualties within the industry, most notably the recent demise of major publisher THQ.

Figure 1: US Video Games Market Development from 1995 to 2012



This paper aims to provide theoretical and empirical evidence on the role of professional critics, online word-of-mouth from consumers and these patterns of sales performance in the video games industry. A small but growing body of literature has previously analyzed the relationship between the influence of critics and the sales performance of other experience goods. Those focusing on the motion picture industry typically find a positive correlation between film reviews and box office returns as a result of reduced information asymmetries (Litman 1983; Sochay 1994; Eliashberg and Shugan 1997; Basuroy *et al.* 2003; Boatwright *et al.* 2007; Moon *et al.* 2010). Additionally, Cui *et al.* (2010) examine a range of markets including DVDs, games and consumer electronics and find that negative reviews have a greater relative impact on sales than positive reviews.

By contrast, an alternate strand of the literature has found growing evidence that word-of-mouth advertising and online consumer reviews significantly associate with improved sales performance for other experience goods such as books and movies (e.g., Godes and Mayzlin 2004, Senecal and Nantel 2004, Chevalier and Mayzlin 2006, Dellarocas *et al.* 2007, Chintagunta *et al.* 2010, Archak *et al.* 2011). Dellarocas (2003) and Chen and Xie (2008) verified the existence of correlation between customer reviews and product sales in the online markets eBay and Amazon. These studies considered mostly either the average ratings of the sellers or the products. Consequently, only quantitative indicators were included as exogenous variables. Liu (2006) analyses the personal atmospheric levels of user reviews with the help of lexicographic analysis tools. In particular, the number of messages and the average number of sentences were used as an indicator of quality. Additionally, while a majority of studies highlight the

significance of the valence of online reviews upon sales, studies such as Duan *et al.* (2008) find that it is the volume of consumer reviews that actually associate more strongly with sales performance. Clemons *et al.* (2006) also finds that the consistency of online ratings offers the most significant predictor of sales growth among the craft beer industry, along with the strength of the most positive quartile of reviews.

A far smaller number of studies have examined the factors that influence sales of video games. The most comprehensive study of online user or word-of-mouth reviews in the video games market is by Zhu and Zhang (2010). This particular study finds that online user reviews are more influential for less popular games and for those consumers that are more experienced in their use of the internet. Despite a very comprehensive empirical analysis, a potential flaw in the study of Zhu and Zhang is the assumption that the same games released for different platforms are heterogeneous, due to differing tastes between installed user bases. However, this assumption does not appear to hold in our (more extensive and contemporary) database of games. Instead, the larger range of control variables used in our data set, especially the publisher fixed effects, are used to control for the influences of both product quality and review score. To our knowledge, no other studies exist where the roles of both professional critics and word-of-mouth in determining sales performance are simultaneously estimated.

2 The Influence of Signals from Critics and Word-of-Mouth

2.1 The Influence of Individual Signals

We contend that the expert and independent information contained within the reviews of professional critics is of particular importance before the release of a video game, whereas opinions shared through word-of-mouth are more likely to be shared after release. However, both opinion types have three things in common. First, more positive responses lower the uncertainty over product quality among prospective consumers. Second, if evaluations approach unanimity, consumers' certainty in their purchase decision will increase. Third, the greater the number of available evaluations, the lower is the evaluation insecurity among future buyers. Consequently, we formulate the following hypotheses:

- H_{1a}: More positive ratings (higher valence) from professional critics have a positive and significant effect on total sales.
- H_{1b}: A greater number of available reviews from professional critics positively influence total sales.
- H_{1c}: Greater consistency of the reviews from professional critics has a positive and significant effect on total sales.

Given that The Entertainment Software Association (2012) claim that 62% of gamers play games with others and that a third of gamers play social games; the views of peers and word-of-mouth advertising are becoming increasingly important factors in the determination of sales success. Dellarocas and Narayan (2006) find that, compared to professional reviews, consumer reviews tend to be either very positive or very negative, resulting in a bi-modal ‘u-shaped’ distribution of scores. A growing body of literature has found evidence that word-of-mouth advertising and online reviews significantly associate with sales performance for other experience goods such as books and movies (e.g., Godes and Mayzlin 2004, Senecal and Nantel 2004, Chevalier and Mayzlin 2006, Dellarocas *et al.* 2007, Chintagunta *et al.* 2010, Archak *et al.* 2011). Dellarocas (2003) and Chen and Xie (2008) verified a correlation of customer reviews and product sales in the online markets eBay and Amazon. These studies considered mostly either the average ratings of the sellers or the products. Consequently, only quantitative indicators were included as exogenous variables. Liu (2006) analyses the personal atmospheric levels of user reviews with the help of lexicographic analysis tools. In particular, the number of messages and the average number of sentences qualified themselves for quality criterion. While a majority of studies highlight the significance of the valence of online reviews upon sales, studies such as Duan *et al.* (2008) find that it is the volume of consumer reviews that actually associate more strongly with sales performance. Additionally, Clemons *et al.* (2006) find that the consistency of online ratings offers the most significant predictor of sales growth among the craft beer industry, along with the strength of the most positive quartile of reviews. Accordingly, we hypothesize the following:

- H_{2a}: More positive ratings (higher valence) from users have a positive and significant effect on total sales.
- H_{2b}: A greater number of available reviews from users positively influence total sales.
- H_{2c}: Greater consistency of the reviews from users has a positive and significant effect on total sales.

2.2 The Interaction of Signals

Economic studies in the marketing and especially entertainment industry mostly concentrate on the evaluation of distinct types of signals. In reality, individual signals are unlikely to appear independently. Consequently, customers have to simultaneously evaluate the credibility and reliability of a range of distinct signals. Kirmani and Rao (2000) illustrate the interaction of independent types of signals in their theoretical framework, although Basuroy *et al.* (2006) are among the first studies to empirically estimate interaction effects among signals of quality in the entertainment industry. Using movie industry data and a dynamic simultaneous-equations model, they show that the simultaneous occurrence of expenditure on advertising and product sequels have a significant positive interaction effect on box office revenues. Following these findings and the principles of signaling theory, we consider the marginal contribution of additional signals and their interactions and propose the following hypotheses:

- H_{3a}: The interaction between professional and user rating scores has a positive effect on total sales.
- H_{3b}: The interaction between the consistency of expert and user opinions has a positive influence on total sales.
- H_{3c}: The interaction of the valence of expert opinion and additional signals (sequels, re-releases, and video game age ratings) positively affect total sales.
- H_{3d}: The interaction of the valence of users' opinion and additional signals (sequels, re-releases and video game age ratings) positively affect total sales.

3 Empirical Analysis

3.1 Data

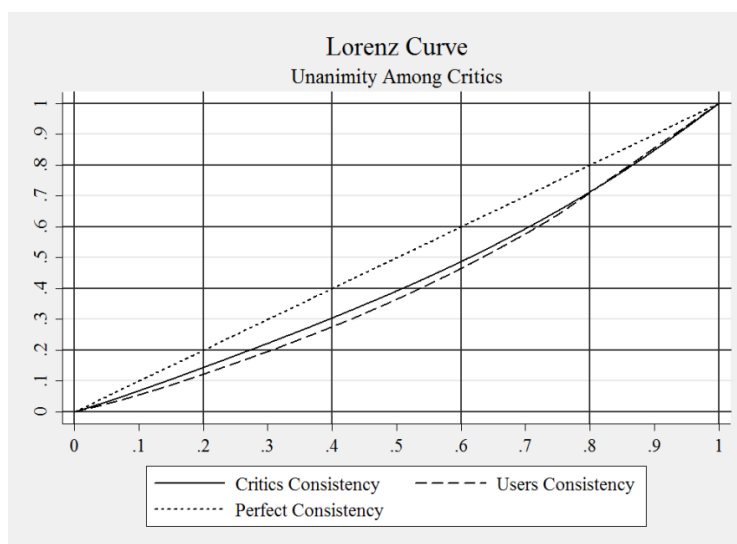
In order to empirically test the influence of critic reviews on market success, we construct a sample consisting of 1,480 video games and their sales performance between 2004 and 2010. Sales figures were obtained from VGChartz, while other characteristics (genre, age rating etc.) were obtained from the MobyGames database. We concentrate our analysis on the five mainstream console and handheld devices available during this period: Nintendo DS, Nintendo Wii, Sony PlayStation 3, Sony PSP and Xbox 360. Reviews are obtained from the Internet portal Metacritic, a website that reviews music, movies, TV shows and especially video games on the basis of a

weighted average of mainstream critical responses. We measure the metascores from professional critics, as well as the metascores generated from the reviews of other users as a proxy for online word-of-mouth. In both cases, the review scale ranges from 0-100, with higher scores indicating a more positive assessment of quality. There is significant and widespread regard for the validity of this resource among consumers and within the industry itself. Wingfield (2007) states that game publishers are even beginning to explicitly refer to metascores in their contracts with development studios, with penalties if a game fails to achieve an agreed score.

We gather three different main factors to model the influence of both professional critics and word-of-mouth on total market success – valence, volume and consistency. Valence represents the weighted average review score from Metacritic and consequently acts as the valuation standard for consumers, as the two scores are directly visible and comparable. User and critical valence both have a very similar average of approximately 70/100 within our data set and the two variables also show a relatively high correlation coefficient (0.63). In addition to the valence of critics, we also include the volume or total number of reviews in our analysis, with the expectation that greater numbers of total reviews lead to reduced levels of uncertainty among consumers. On average, users generate around twice the quantity of individual reviews compared to professional critics. Another important valuation factor for customers represents the consistency of ratings. Critic and user reviews are not only illustrated by their average rating score on total number of ratings but are also formally divided into numbers of positive, mixed and negative ratings by the Metacritic site. Higher levels of inconsistency in the opinions of professional critics and users will result in greater uncertainty of consumers, such that consumers will face reduced levels of uncertainty when critics reach near unanimity. Our measure of consistency is the sum of squares of the proportions of positive, negative, and mixed opinions among the total number of reviews. Accordingly, the consistency variable is analogous to the Hirschman-Herfindahl index which captures the degree of homogeneity or heterogeneity of any variable of interest, usually market concentration. Our consistency variable is bounded between a value of 1 (perfect consistency) and 0.33 (exactly equal proportions of reviews in each of the three opinion categories). Figure 2 illustrates the Lorenz curve of both consistency measures and shows that user reviews tend to demonstrate greater unanimity compared to those of professional critics; a condition that is also verified by

the means of the different consistency measures (0.65 for professional critics and 0.69 for user critics). Nonetheless, both Lorenz curves are fairly close to the 45° line, which suggests that there generally tends to be a high level of unanimity in the review of video games.

Figure 2: Lorenz Curve of Consistency Measures



Following the work of Basuroy *et al.* (2006), we include additional signaling effects that may influence total sales. Specifically, the sequel and re-release variables represent consumer-specific reputation effects and account for prior market success. Sequels represent 56% and re-releases 5.5% of our sample, where the former represents a significantly larger proportion than is seen in studies of other cultural and creative industries. Additionally, both DeVany and Walls (2002) and Ravid (1999) utilize an age-classification variable in their studies of the movie industry, each showing that R-rated movies serve as a signal of content and quality. We therefore include the variable *Rating M* in our analysis (reflecting 17.5% of all video games) as an observable signal of these same characteristics. Besides testing for the influence of critics and additional signaling effects, we also control for gameplay characteristics, release information and other available *ex ante* indicators of quality, publisher size and market share as well as genre and group effects and miscellaneous industry and time effects.

3.2 Estimation Results

In order to address the first research hypothesis, we initially conduct an auxiliary regression (see Table 1) to isolate the part of user reviews that do not overlap with professional reviewers. Consequently, we regress user valence directly on critics' valence, where the residuals obtained from this regression allow us to measure the extent to which critics predict the word-of-mouth ratings.

Table 1: Auxiliary Regression Result

<i>Dependent Variable Critics Valence</i>	
Independent Variable	
<i>Word-of-Mouth</i>	
Valence (Weighted Average Rating)	.655*** (.021)
N	1480
F	978.01
R ²	0.3982

Significance: 0.01 '***' 0.05 '**' 0.1 '*'

Note: Robust standard errors in parentheses.

No additional control variables included.

The residuals of the auxiliary regression (significant at $p < .01$, $R^2 = .39$, no indication of a non-linear relationship) represent the part of word-of-mouth judgments that do not overlap with professional evaluations. These residuals are included as an independent variable in several of the logarithmic video game sales regressions outlined below. This variable can be interpreted as measuring the deviation of word-of-mouth assessment of quality from those of professional critics and therefore enables us to separate the moderating effects of professional critic judgments.

Table 2 summarizes the estimations of the influence of professional critics, using the auxiliary regression approach and additional interaction effects of professional and word-of-mouth judgments. Regression output from seven different model specifications are presented, where models I-V estimate the relationship between sales and a range of alternative combinations of critical and user response, thereby testing hypothesis H₁ and H₂. Models VI and VII include interactive terms to capture the interrelationships between external signals of product quality, which allow for the testing of H₃. The regression output is remarkably consistent between model specifications, indicating that our findings are broadly robust. However, some important distinctions can be made, most notably between the specifications that do and do not include the residuals from

the auxiliary regression and/or the interaction terms.

Table 2: Final Regression Model Results

Independent Variable	Dependent Variable LN US Unit Sales						
	I	II	III	IV	V	VI	VII
Professional Critics							
Valence (Weighted Average Rating)	.0156*** (.0027)		.0172*** (.0031)	.0115*** (.0035)		.0051 (.0040)	
Volume (No of Ratings)	.0189*** (.0019)		.0144*** (.0020)	.0187*** (.0019)		.0176*** (.0019)	
Variance (Consistency of Rating)	1.1299*** (.1623)		.9588*** (.1666)	1.0909*** (.1627)		1.0201*** (.1643)	
Word-of-Mouth							
Valence (Weighted Average Rating)		.0177*** (.0023)	.00001 (.0026)		.0187*** (.0022)		.0143*** (.0034)
Volume (No of Ratings)		.0013*** (.0002)	.0007*** (.0002)		.0010*** (.0002)		.0010*** (.0002)
Variance (Consistency of Rating)		-.6745*** (.1275)	-.6207*** (.1228)		-.6365*** (.1239)		-.6491*** (.1241)
Influence of Critics							
Auxiliary Regression Residuals (Influence of Critics)				.0077* (.0040)	.0308*** (.0028)	.0068* (.0040)	.0311*** (.0029)
Interaction Effects							
Prof Valence x Reputation Effects (Sequels)						.0096*** (.0036)	
Prof Valence x Reputation Effects (Re-Release)						-.0097 (.0084)	
Prof Valence x Discrimination Effects (Rating M)						.0165*** (.0036)	
User Valence x Reputation Effects (Sequels)							.0081** (.0038)
User Valence x Reputation Effects (Re-Release)							-.0022 (.0084)
User Valence x Discrimination Effects (Rating M)							.0042 (.0043)
Additional Signals							
Reputation Effects (Sequel)	.1829*** (.0516)	.2412*** (.0536)	.1699*** (.0504)	.1736*** (.0516)	.1357*** (.0516)	-.4898* (.2563)	-.4553 (.2822)
Reputation Effects (Re-Release)	.2150* (.1105)	.3905*** (.1138)	.2678** (.1084)	.2108** (.1106)	.2779** (.1135)	.9479 (.6403)	.4432 (.6438)
Discrimination Effects (Rating M)	.0446 (.0638)	.0788 (.0731)	-.0135 (.0621)	.0431 (.0636)	.0562 (.0668)	-1.1243*** (.2616)	-.2573 (.3131)
N	1480	1480	1480	1480	1480	1480	1480
F	28.15	22.65	29.43	27.70	27.02	26.96	25.56
R ²	0.4747	0.4210	0.5021	0.4762	0.4700	0.4854	0.4721

Significance: 0.01 **** 0.05 *** 0.1 **

Note: Robust standard errors in parentheses.

The following additional variables represent control variables: Constant term, Gameplay characteristics, release information and other ex ante indicators of quality (genre and group effects), Size/Market Share (2k activision atari capcom disney eidos ea konami microsoft midway nameco nintendo rockstar sony sega thq squareenix ubisoft), Genre and Group Effects (maxplayers online licensed accessory ltdedition multiplatform wii ps3 psp x360 adventure educational racing rpg simulation sports strategy platform isometric sidescrolling topdown thirdperson), Linear Time Trend (yearreleased)

Focusing on the model specifications that do not include interaction terms, it is apparent that every measure of professional critical response (valence, volume and consistency) associates positively and significantly with sales. A one unit increase in valence, which is equivalent to a 1% increase in the review score, is found to increase unit sales by an average of around 1.6%, while every additional review from a professional critic associates with an average increase in sales of around 1.9%. A one

unit increase in the consistency of reviews posted by professional critics associates with an average increase in unit sales of around 113%, although because this variable is bounded between 0-1 the 'elasticity' is best regarded as approximately 1.13. Clearly, unit sales are relatively elastic to all measures of professional critical response.

When taken in isolation, the equivalent independent variables representing the response of users look relatively similar. A one unit increase in the average user review increases unit sales by around 1.8%. The association with volume of user reviews is around 0.01% increase in sales for every one user review, revealing that the marginal effect of an additional review from professional critics is significantly greater than that of a single additional user. Perhaps contrary to theoretical expectations, a statistically significant negative relationship is observed between the consistency of user reviews and unit sales, with an elasticity of approximately -0.67. As there is a negative correlation between these two variables (coefficient -0.14), the only reasonable interpretation for this finding is that users tend to be more consistent in their assessment of poorly selling games and less consistent in their assessment of successful titles.

When the two sets of variables (critics and users) are combined in model III, a somewhat different pattern emerges, especially with regards to the influence of valence. The estimated elasticity of sales to critical valence remains relatively unchanged, while the elasticity of sales to user reviews is found to be equivalent to zero. These results suggest that if user and critical valence are controlled for simultaneously, the influence of professional critical response on sales dominates that of users. The influence of other measures of critical response (volume, consistency) do not dramatically change in this particular model specification. This finding is further reinforced by the results from model specifications IV and V, where the residuals from the auxiliary regression are included to capture divergence between critic and user valences. The positive and significant coefficients estimated in both model specifications show that in cases where the professional critics are more positive in their assessment of a particular title than users, sales are found to increase accordingly. This could either be interpreted to mean that professional critics influence sales whereas users merely predict sales, or could also show that the influencing effect on sales from professional critics exceeds that from user word-of-mouth. We therefore find strong evidence in support of H₁, leading us to reject the argument that online word-of-mouth positively influences sales in this particular market context once the influence of professional critics is separately controlled for.

It should also be noted that in all but one of model specifications I-V, the effect of two other credible *ex ante* signals of quality (whether the respective title is a sequel and/or a re-release) are found to significantly increase unit sales, with the average of the coefficient estimates suggesting average increases in unit sales of around 18% and 27% respectively. The final quality signal (an 'M' or 'Mature' age rating) is not found to significantly affect unit sales in these specifications.

Models VI and VII include interaction terms which capture the interrelationship between both critic and user valence and other signals of quality available to buyers, which allow for the formal testing of hypothesis H₃. We find a significant positive association for variables capturing the interactions between the valence of reviews from professional critics and other indicators of quality, especially sequels and titles that have mature ratings. The coefficient estimates show that every unit (equivalent to percentage) increase in critical review score increases unit sales for sequels by 1% and 1.7% respectively. Comparatively, interaction terms involving user valence either produce lower or statistically insignificant coefficient estimates. These findings suggest that video game consumers typically do make purchasing decisions based upon multiple reliable indicators of quality, such that disproportionately greater sales tend to be observed where a two or more credible signals are found together. Reviews from professional critics are found to interact more strongly than consumer word-of-mouth with other observable indicators of quality.

Overall, our findings clearly indicate that reviews from professional critics have a significantly greater effect on buyer behavior than consumer word-of-mouth in the market for video games software. Indeed, the effect of the latter disappears entirely once the former is controlled for. This is somewhat surprising given that the existing literature on word-of-mouth advertising consistently finds evidence of a positive influence upon sales, although typically also fails to simultaneously control for the influence of professional critics. Nonetheless, the finding may be plausible due to the release of reviews of professional critics *ex ante* of the purchase decision, with user reviews become available only after release. This disparity, combined with the empirical findings presented in this paper, lead us to conclude that critics do indeed have an influencing effect on sales, which outweighs the word-of-mouth generated by other users, who are more likely to simply predict sales.

4 Conclusion and Managerial Implications

From a business perspective, it is of vital importance to forecast product sales efficiently, in particular those of new products in the early stages of their life cycle. Thus, it is important to understand the range of relevant signals that influence the purchase decision of customers and how the information contained in these signals can be measured and evaluated in order to optimize managerial decisions and strengthen competitive advantages.

The findings of this study reinforce the hypothesis that the reviews of professional critics influence sales as opposed to merely predicting them. Their independence and reputation serves as a credible signal that helps consumer to minimize uncertainty and consequently support the decision making process. Consequently, our results are somewhat counterintuitive to a commonly held belief in the value of consumer word-of-mouth and emphasize the greater importance of reviews from professional critics in this particular market context. The results also suggest that measures of valence, such as the Metacritic score, should be of critical importance to video games developers and publishers. We therefore also suggest that publishers should make increasing use of contracts with development studios whereby royalties are paid or received based on the Metacritic score achieved by a given title, as this is shown to be a major factor in determining sales performance.

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