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Impact of Online Consumer Reviews on Amazon Books Sales: Empirical Evidence from India

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Abstract: This study aims to assess the effect of online reviews on online book sales performance in the Indian context. A sales rank was used as a proxy measure for sales. The total sample size was 2028 books from the 'bestseller' and 'recent' book categories on Amazon.in. Cross-sectional analysis and difference-in-difference analysis approaches were adopted for data analysis. The results revealed that online reviews shared by the Indian consumers impact books sales, as the consumers prefer to analyze the books on the basis of available online reviews before making their purchase decision. Overall, the results indicated that reviews had a positive impact on the sales in both book categories.

Keywords: electronic word-of-mouth (eWOM); online reviews; online books sales; Amazon.in; India

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1. Introduction

With a continued plethora of offerings by various companies, and encouragement by the government of India, the purchase of online products and services facilitated by digital media has shown tremendous growth in India [1]. The increase in internet usage has encouraged the emergence of various online avenues such as digital shopping, where users' engagement levels and activities have increased substantially [2]. The online shopping penetration in India has accelerated from 33 percent in 2016 to 48 percent in 2018 [3]. Consumers prefer online shopping for a broader range of products available over various e-commerce platforms. A significant share of the 84% of customers in India highly prefer Amazon for online book shopping [4]. As per the Nielsen India Book Report, 2015 [5], India's book market is the sixth-largest book market in the world and was worth INR 261 billion in 2015. A global consumer survey conducted by Statista in 2020 [6], found that the purchase intention for online books and other similar products was reported by a significant 33 percent of Indian consumers. It is a fact that the consumers make real-time purchase decisions using the available online information, primarily in the forms of product reviews and ratings, which are an essential element of word of mouth [7].

The innovation of internet technology has transformed the traditional word of mouth (WOM) to electronic word of mouth, generally referred to as 'eWOM' [8,9] or 'online consumer reviews' [10]. The eWOM has a significant influence on consumers' product appraisal process since potential customers prefer to go through the reviews shared by other customers to know more about a product before purchasing it [11–13]. The experience shared by consumers with the help of online reviews helps the users to reduce their uncertainties while making online purchase decisions [14]. eWOM has become one of the rising channels of communication that individuals utilize to share their experiences and opinions about various products and services they have bought by sharing messages through internet-based platforms such as websites, blogs, and social media [15–18].

Almost all online consumers search for information about the product or services before making their online purchase decisions [19]. Online reviews are one of the most vital sources of information for consumers while making their purchase decisions [20–23].

According to the BCG report 2019 [24], 85 percent of Indian consumers look for product reviews along with other types of product information before buying a product.

eWOM is an emerging and new phenomenon in India that has gained the attention of both practitioners and researchers. However, one question that needs to be answered is: Do online reviews result in higher sales, and what aspects of online reviews are likely to impact online sales? This is an important topic to be studied due to increasing popularity and access to online reviews platforms. The firms are under competitive pressure to maintain a sound online reputation management system [25]. Under the online reputation management system, the firms not only reply to consumers' concerns but also encourage them to share their experiences in the form of online reviews. They need empirical evidence to justify their decision to invest in an online reputation system, which would probably impact sales. The users' positive or negative online reviews determine the efficacy of the firm's online reputation management, which has a material impact on sales [26,27]. Thus, the present study aims to examine the relationship between online reviews and their components, such as average stars, number of reviews, the fraction of five-stars and one-star reviews associated with sales. The novelty of the present study can be established by the fact that the study utilized the actual data of 'online reviews' and 'sales' which were scrapped from a website to assess the relationship between the variables. The study refrained from collecting any opinion-based data by conducting surveys. This also makes the results of the study more reliable and authentic as it is based upon original data.

The study's empirical findings are assumed to have important implications for marketers targeting Indian consumers, or those who are planning to target the Indian markets in the future. The empirical evidence shows the effectiveness of relevant measures on increasing the impact of eWOM on online consumers' purchase intentions. The findings also have relevance for multiple stakeholders, with instructional insight for the marketing of products online. Further, this study contributes to the literature by filling the gaps found in the literature. Thus, the present study aims to further strengthen the findings of previous studies. Firstly, this study is one of the rarely conducted studies in the Indian context considering 'books' as a product. Secondly, the study contributes to the existing literature by measuring the impact of various significant components of online reviews on online book sales. Thirdly, the study also makes methodological contributions to identify the relationship between online reviews and online books sales by using proxy measures to estimate books sales.

The paper has been organised into the following sections. Firstly, it reviews available literature on the impact of electronic word of mouth on sales. Secondly, it discusses the research approach and methodology. This is followed by a detailed description of data analysis and findings, and a discussion of the conclusions and limitations of the study.

2. Review of Literature

2.1. Electronic Word of Mouth

eWOM is an innovative form of social communication stimuli that involves both communicators (information sharing customers) and receivers (information-seeking customers) [28]. Researchers [29] have proposed a definition of eWOM as "the dynamic and ongoing information exchange process between potential, actual, or former consumers regarding a product, service, brand, or company which is available to a multitude of people and institutions via the internet". The growing utilization of the internet, allowing surfers to communicate rapidly with relative ease, has developed a contemporary version of 'word-of-mouth' called electronic word-of-mouth, which is also known as Word of mouse, Internet w-o-m, or viral marketing [30]. In terms of measurability in eWOM, the consumers can easily measure and observe the quality and quantity of negative and positive opinions as they are available in written format [31]. Online consumer reviews are defined as one of the forms of eWOM that are generated by customers on the basis of their personal experiences, and that help users to find the best match to their needs [32]. Retail websites like Amazon.in allows the consumers to post online product reviews in various forms,

such as star ratings and open-ended comments [33]. Thus 'online reviews' is one of the types of eWOM which has been used in the present study for analyzing impact on sales.

2.2. eWOM Impact on Sales

With the country's increasing cashless transactions of around 44 billion in 2021 [34], the internet-online retail sector has advanced over time and faces tremendous pressure to deliver better products and services online [35]. Marketers and sellers must assess the impact of eWOM on the sales of their products to make effective strategies for the future [36]. Researchers have conducted studies to determine the effect of eWOM on the sales of various products, such as online games [37], entertainment goods [38] and books [39]. Researchers [37] have showed that online consumer reviews have a higher impact on less popular game sales than on more popular game sales. It was also found that the online review's impact on sales becomes more extensive after the early months. Researchers [38] conducted a study for sales forecasting in entertainment goods. Their study found that the reviews valence, volume, and diffusion of online movie reviews significantly predicted future sales. A study [38] based on online book sales patterns found that the increase in positive reviews at one site leads to the additional book sales at that site relative to other sites.

The researchers in previous studies concentrated not only on quantitative aspects but also on various qualitative aspects of online reviews, such as the reviewer's identity, sentiments and textual content to understand its impact on users' online purchase decision making. In the context of online communities, a study conducted by researchers [40] suggested that the revelation of information related to the reviewer's identity is utilized by consumers to substitute information about products while evaluating reviews helpfulness and making purchase decisions. Researchers [41] extracted 'sentiments' from online product reviews and carried out a study to understand the impact of ratings and sentiments on product sales. They found that sentiments and ratings had a differential influence on product sales because of variations in cognitive processing by the users. Another study [42] revealed that the product review's textual content was more important than numeric information such as product price, trends, and the valance and reviews volume for consumers' product choices.

A review of previous studies showed that the majority of the studies were conducted in developed nations like the US and Europe. Hence, the findings of the studies identified in the previous literature cannot be generalised to other developing nations like India. Western theories and models may not be relevant to the Indian circumstances [43]. In this light, the present researcher identified an immense opportunity to understand whether these methods attain the expected adequate results when applied to people from other developing nations like India that can have significant contributions in this area of research. Further, most of the recent research studies in this field have focused on the electronic product category, including products such as televisions, cameras [44], tablet computers [45] and antivirus software [46]. These studies stated that there is a need to conduct research for other product categories as well. Also, a scarcity of literature in measuring the impact of eWOM on sales was found after reviewing studies, which may be because of non-availability of actual sales data [39,47–50]. Thus, the present research study focuses on addressing these gaps and therefore aims to analyze the impact of online consumer reviews on online book sales performance in the Indian context.

3. Methodology

The effect of the eWOM on sales performance was analysed, where 'sales rank' was used as a proxy measure for the estimation of sales performance, following the methodology developed by Chevalier and Mayzlin [39]. This methodology has also been favoured by other studies [51,52] for estimating sales volume from sales rank. The methodology is discussed below.

3.1. Criteria for Selection of Product and Website

For the present study, 'books' was selected as a product category as it is one of the major online sales categories and of course, the most-studied retail category [44,45,53]. Moreover, online sales for books and consumer electronics are even greater than the sales of other consumer packaged goods [54]. It was further decided to map the data from www.Amazon.in, an Indian e-retailer, because of its popularity and coverage. Amazon is an e-commerce giant that has made a total investment of US$ 2.7 billion in the Indian market and is one of the leading firms in the online-retail sector [55].

3.2. Sample Size of Books

In the present study, to include online books from diverse genres, researchers selected two broad categories, i.e., 'Recent' books and 'Bestseller' books. The 'recent' books category included 1026 books that were released within the last ninety days, and the 'bestseller' books category included 1002 books that were the most popular books based on sales as calculated by Amazon. Overall, a sample of 2028 books was selected randomly from Amazon's website to generate a representative sample. Approximately the same number of books was taken by Chevalier and Mayzlin [39]. The books were selected using multi-stage random sampling. In the first stage, 28 common genres were selected from both categories. In the second stage, ten genres were selected using random sampling based on the random number table [56]. Audio format books with no sales rank were removed from the final sample size. Therefore, the final sample size of books was reduced to 1893 books consisting of 920 books from the 'recent' and 973 books from the 'bestseller' books category.

3.3. Data Collection, Preparation, and Analysis

For each book, publicly available data on Amazon.in like the book title, Amazon's retail price, sales rank, average reviewers' ratings, number of reviews, fraction of one-star and five-stars were collected. Data were collected for three periods of five days in December 2018, February 2019, and April 2019. In the first period, a free Google Chrome extension called 'Scraper', a web-scraping tool, was used to extract the data from Amazon.in. As there was no sales data, sales ranks of the books that represent an inverse of actual sales were used for approximating sales values of books. The collected data were coded and entered into an SPSS sheet (IBM SPSS Statistics.20.0).

The relationship between change in online reviews and change in sales over the period of December 2018–February 2019 and December 2018–April 2019 was examined. Since sales rank represents the sales value of a book, the study was based on sales-ranking data which were converted into sales. Researchers [53,57] stated that the ln(sales) and ln(ranks) relationship is linear. Although the actual amount of book sales could not be observed directly, Schnapp and Allwine's [58] technique was used to estimate sales amount from sales rank, which showed an approximately linear relationship between log (sales) and log (sales rank). A cross-sectional analysis and difference-in-difference analysis approach was adopted for data analysis.

3.4. Descriptive Statistics

The descriptive statistics of all the selected book variables are presented in Table 1. The total number of observations across the three time periods was 920 and 973 books for the category 'recent' and 'bestseller' books, respectively.

Table 1. Book Category-wise descriptive statistics (Mean and Standard Deviation).

Variables	December 2018		February 2019		April 2019	
	Recent Books	Bestseller Books	Recent Books	Bestseller Books	Recent Books	Bestseller Books
Sales Rank	89,839.53 (2,252,633)	6365.70 (14,747.3)	136,930.91 (206,746.8)	24,734.32 (62,989.7)	148,739.85 (198,129.3)	30,621.62 (81,668.49)
Price	673.95 (810.62)	333.67 (442.22)	657.69 (839.01)	366.64 (659.43)	630.44 (813.71)	343.47 (500.06)
Number of review	29.01 (251.69)	269.24 (621.57)	35.21 (258.44)	304.91 (739.31)	38.71 (264.24)	337.56 (1045.27)
Average Star Rating	2.96 (2.21)	4.01 (1.15)	3.37 (2.01)	4.10 (1.00)	3.49 (1.93)	4.11 (0.97)
Five-star rating	20.02 (175.06)	180.90 (423.02)	24.60 (181.30)	206.84 (517.34)	26.86 (185.72)	233.25 (812.73)
Four star Rating	4.75 (44.40)	50.18 (122.13)	5.65 (45.17)	55.40 (134.51)	6.24 (46.15)	59.09 (151.18)
Three-star Rating	2.04 (19.31)	17.63 (49.23)	2.38 (19.65)	19.61 (54.09)	2.57 (19.79)	20.98 (59.25)
Two-star Rating	0.95 (7.93)	7.44 (19.55)	1.08 (8.16)	8.28 (21.88)	1.13 (8.23)	8.41 (22.58)
One-star Rating	1.26 (8.89)	13.09 (30.97)	1.72 (10.45)	14.79 (35.68)	1.95 (11.08)	15.83 (39.13)
Incremental reviews per book	-	-	6.22 (26.48)	35.67 (345.11)	3.50 (13.82)	32.65 (565.04)
Change in average stars	-	-	0.41 (1.40)	0.08 (0.65)	0.12 (0.77)	0.01 (0.29)
Fraction of books with no reviews	0.34	0.06	0.24	0.04	0.21	0.04
Total Observations	920	973	920	973	920	973

Note: The primary data is the mean value, and standard deviations are shown in parentheses.

Table 1 depicts that the mean value of the selected variables increased from one period to another for both the book categories. Furthermore, the mean five-stars rating was found to be highest for both the book categories. There was an increase in the average number of reviews from December 2018–February 2019 (6.22 and 35.67) and from February 2019–April 2019 (3.5 and 32.65) in case of 'recent' books and 'bestseller' books categories, respectively. Similarly, there was a trivial increase in the average stars from December 2018–February 2019 (0.41 and 0.08) and from February 2019–April 2019 (0.12 and 0.01), again in case of both the categories respectively.

3.5. Model Specification

In the study, the dependent variable was the log of sales rank of books which was used to estimate approximate sales value of the books. The log specifications were used instead of actual figures following the study by Chevalier and Mayzlin [39], as the log-linear specification estimates the impact of change in the unit of independent variables on the percentage change of the dependent variables. The sales ranks for books at Amazon were used as the proxy measure for books sales, similar to previous research studies focusing on Amazon [53,59–61]. The prior studies revealed that the relationship between sales and sales rank follows a power law of Pareto distribution [62–65], depicting an approximately linear relationship between ln(sales rank) and ln(sales). i.e.,

$$\ln(\text{sales}) \approx a + b^{*}\ln(\text{sales rank}) \quad (1)$$

Assuming the approximate Pareto distribution relationship, the only difference between the linear model using ln(sales rank) and the linear model using the ln(sales) was that a constant value scaled the standard errors. Their estimated coefficients values and the approximate intercept were changed by an additional constant [66]. These changes do

not affect the significance or signs of the values of the coefficients. This relationship was parameterized by observing sales levels and sales rank, which was similar to the previous study [59]. Thus, for sales approximation, the model used was ln(*Sales*) = 9.61 − 0.78ln(sales rank), in which the natural logarithm was used to estimate the sales. A similar method was used to estimate sales from sales rank by researchers in previous studies [39,40,50]. These studies adopted the difference-in-difference strategy which was also adopted in this study. Similar to the study by Chevalier and Mayzlin [39], logarithms of sales rank, price and quantity of reviews were utilized.

The model specifications to measure the effects of the price (*p*), number of reviews (*rv*), average star ratings (*as*), fraction of five-star (*fs*) and fraction of one-star (*os*) on sales rank of books (*sr*) in the first time period (*t*1) have been stated below:

$$\ln(sr_i^{t1}) = \alpha + \beta_1 \ln(p_i^{t1}) + \epsilon_i \quad (2)$$

where, superscript *t*1 denotes the first time period of data collection; *i* denotes book, sr_i^{t1} and p_i^{t1} denotes the sales rank and price of book at time *t*1, respectively. The coefficient β_1 is a measure of the impact of the book price on ln(sr).

$$\ln(sr_i^{t1}) = \alpha + \beta_1 \ln(p_i^{t1}) + \beta_2 \ln(rv_i^{t1}) + \beta_3(as_i^{t1}) + \beta_4 D_i^{t1} + \epsilon_i \quad (3)$$

where, rv_i^{t1} and as_i^{t1} denotes the number of reviews and average star of book *i* in time *t*1 respectively. D_i^{t1} denotes dummy for book *i* with no reviews in time *t*1. The coefficient β_2, β_3 and β_4 represent the effect impact of number of reviews, average star ratings and dummy for books with no reviews on the book sales rank.

$$\ln(sr_i^{t1}) = \alpha + \beta_1 \ln(p_i^{t1}) + \beta_2 \ln(rv_i^{t1}) + \beta_4 D_i^{t1} + \beta_5(fs_i^{t1}) + \beta_6(os_i^{t1}) + \epsilon_i \quad (4)$$

where, fs_i^{t1} and os_i^{t1} denotes fraction of five-star and one-star reviews for book *i* in time *t*1. The coefficients β_5 and β_6 measure the effect of the fraction of five-star reviews and one-star reviews on the books sales rank, allowing more varied observation of the effect of review valence on books sales rank.

The books that had at least one review were identified, the "no-review" variables were eliminated from the sample, and the regression equation was specified as follows:

$$\ln(sr_i^{t1}) = \alpha + \gamma_1 \ln(p_i^{t1}) + \gamma_2 \ln(rv_i^{t1}) + \gamma_3(as_i^{t1}) + \epsilon_i \quad (5)$$

The coefficient γ_1 measures the effect of price on sales rank; γ_2 measures the effect of the number of reviews on the sales rank; γ_3 signifies the effect of the average star ratings on the books sales rank.

$$\ln(sr_i^{t1}) = \alpha + \gamma_1 \ln(p_i^{t1}) + \gamma_2 \ln(rv_i^{t1}) + \gamma_4(fs_i^{t1}) + \gamma_5(os_i^{t1}) + \epsilon_i \quad (6)$$

where, the coefficients γ_4 and γ_5 measure the effect of the fraction of five-star and fraction of one-star reviews on the books sales rank.

The next model specifications included the total change in books sales rank from the time period December 2018 to February 2019. By subtracting the variables of the first time period (*t*1) from the second time period (*t*2) (disregarding coefficients), the regression equations are:

$$\ln(sr_i^{t2}) - \ln(sr_i^{t1}) = [\ln(p_i^{t2}) - \ln(p_i^{t1})] + [\ln(rv_i^{t2}) - \ln(rv_i^{t1})] + [(as_i^{t2}) - (as_i^{t1})] + \epsilon_i \quad (7)$$

where, superscript *t*2 denotes the second time period of data collection; s_i^{t2}, p_i^{t2}, rv_i^{t2} and as_i^{t2} denotes the sales, price, number of reviews and average star of book *i* at time *t*2, respectively.

$$\ln(sr_i^{t2}) - \ln(sr_i^{t1}) = [\ln(p_i^{t2}) - \ln(p_i^{t1})] + [\ln(rv_i^{t2}) - \ln(rv_i^{t1})] + [(fs_i^{t2}) - (fs_i^{t1})] + [(os_i^{t2}) - (os_i^{t1})] + \epsilon_i \quad (8)$$

where, fs_i^{t2} and os_i^{t2} denotes fraction of five-star and fraction of one-star reviews of books i in time $t2$.

$$\ln(sr_i^{t2}) - \ln(sr_i^{t1}) = [\ln(p_i^{t2}) - \ln(p_i^{t1})] + [\ln(rv_i^{t2}) - \ln(rv_i^{t1})] + nfs_i^{t2} + nos_i^{t2} + \epsilon_i \quad (9)$$

where, nfs_i^{t2} and nos_i^{t2} denotes new five-star and new one-star reviews of book i in time $t2$, revealing the addition in number of reviews in the second time period.

The model specifications that included the total change in books sales rank from the time period December 2018 to April 2019 have been shown below. By subtracting the variables of the first time period ($t1$) from the third time period ($t3$) (disregarding coefficients), the regression equations are:

$$\ln(sr_i^{t3}) - \ln(sr_i^{t1}) = [\ln(p_i^{t3}) - \ln(p_i^{t1})] + [\ln(rv_i^{t3}) - \ln(rv_i^{t1})] + [(as_i^{t3}) - (as_i^{t1})] + \epsilon_i \quad (10)$$

where, $t3$ denotes the third time period of data collection; s_i^{t3}, p_i^{t3}, rv_i^{t3} and as_i^{t3} denotes the sales, price, number of reviews and average star of book i at time $t3$, respectively.

$$\ln(sr_i^{t3}) - \ln(sr_i^{t1}) = [\ln(p_i^{t3}) - \ln(p_i^{t1})] + [\ln(rv_i^{t3}) - \ln(rv_i^{t1})] + [(fs_i^{t3}) - (fs_i^{t1})] + [(os_i^{t3}) - (os_i^{t1})] + \epsilon_i \quad (11)$$

where, fs_i^{t3} and os_i^{t3} denotes fraction of five-star reviews and one-star reviews of book i in time $t3$.

$$\ln(sr_i^{t3}) - \ln(sr_i^{t1}) = [\ln(p_i^{t3}) - \ln(p_i^{t1})] + [\ln(rv_i^{t3}) - \ln(rv_i^{t1})] + nfs_i^{t3} + nos_i^{t3} + \epsilon_i \quad (12)$$

where, nfs_i^{t3} and nos_i^{t3} denotes new five-star and new one-star reviews of book i in time $t3$.

4. Impact of Online Review on Books Sales

The following section discusses the estimation results for the above-stated regression equations.

4.1. Cross-Sectional Analysis of Models

Sales rank for books at Amazon.in was considered as the dependent variable and was inversely related to sales. Hence, the variables that had negative signs were related to more robust sales and variables with positive signs were detrimental to sales. The resulting estimates for the regression Equations (2)–(6) measuring the impact of online reviews on sales for the 'bestseller' books category in the first time period (December 2018) have been shown in Table 2 below:

Column 1 presents the results of the regression Equation (2). The price coefficient was found to be statistically significant and positive (ß =0.366, $p < 0.01$), which signified that sales rank increased (i.e., sales decreased) with an increase in the price of books.

Column 2 represented Equation (3). The books with no reviews were also considered, and a dummy variable valued as 1 was taken for denoting number of reviews. The negative coefficients of number of reviews (ß = −0.424, $p < 0.01$) and average stars (ß = −0.107, $p < 0.01$) were significant, and suggested that the sales increased with the increase in the number of reviews and average star ratings for the 'bestseller' books category.

Column 3 showed the results of the regression Equation (4), which emphasized a varied way of estimating review valence by replacing the average star measure by fraction of five-star and one-star reviews. The coefficients values revealed that five-star online reviews were statistically significant and highly correlated with book sales (ß= −0.89, $p < 0.05$). This implied that an increase in the number of five-star reviews increased the sales of books.

Table 2. The effect of reviews on sales of the 'bestseller' book category.

Amazon.in	1	2	3	4	5
	Coeff. (SE.)	**Coeff. (SE.)**	**Coeff. (SE.)**	**Coeff. (SE.)**	**Coeff. (SE.)**
ln(price)	0.366 *** (0.062)	0.267 *** (0.053)	0.271 *** (0.053)	0.304 *** (0.057)	0.306 *** (0.057)
ln(number of reviews)		−0.424 *** (0.034)	−0.445 *** (0.033)	−0.441 *** (0.027)	−0.441 *** (0.027)
No reviews dummy		−0.059 * (0.000)	−0.049 (0.000)		
Average star rating		−0.107 *** (0.052)		−0.066 ** (0.099)	
Fraction of five-star reviews			−0.89 ** (0.232)		−0.051 * (0.282)
Fraction of one-star reviews			0.022 (0.515)		0.038 (0.545)
Number of observation		973		915	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

For assessing the robustness of the effect of the number of reviews on sales, the specification of column 2 was repeated in column 4, with a sample size of 915 books which had minimum one review. Average star ranking estimates were also included for the sub-sample. The value of the coefficients of the variables showed that price harmed books sales (ß = 0.304, $p < 0.01$) whereas, an increase in the quantity of reviews (ß = −0.441, $p < 0.01$) and average star ratings of the books (ß = −0.066, $p < 0.05$) increased the sales of the book.

Similarly, in column 5, the specification of column 3 was repeated on a sub-sample of 915 books. The coefficient values suggested that a fraction of five-star reviews had a positive impact on book sales (ß = −0.051, $p < 0.10$).

Table 3 below shows the 'recent' books category estimation results that were also based on the regression Equations (2)–(6) specifications:

Table 3. The effect of reviews on sales of the 'recent' books category.

Amazon.in	1	2	3	4	5
	Coeff. (SE.)	**Coeff. (SE.)**	**Coeff. (SE.)**	**Coeff. (SE.)**	**Coeff. (SE.)**
ln(price)	0.258 *** (0.052)	0.268 *** (0.048)	0.270 *** (0.049)	0.273 *** (0.073)	0.272 *** (0.073)
ln (number of reviews)		−0.281 *** (0.045)	−0.300 *** (0.044)	−0.241 *** (0.047)	−0.241 *** (0.047)
No reviews dummy		0.039 (0.000)	0.043 (0.000)		
Average star rating		−0.131 *** (0.030)		0.021 (0.103)	
Fraction of five-star reviews			−0.102 *** (0.146)		0.017 (0.285)
Fraction of one-star reviews			−0.044 (0.541)		−0.015 (0.635)
Number of observation		920		606	

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The results of the regression Equation (2) are shown in the first column of Table 3. The coefficient values were statistically significant and positive (ß = 0.258, $p < 0.01$), which showed that sales rank increased (i.e., sales decrease) with an increase in price for the books.

The results of Equation (3) are represented in column 2. A dummy variable for the books having no reviews was considered. The coefficients values of number of reviews (ß = −0.281, $p < 0.01$) and average stars (ß = −0.131, $p < 0.01$) were negative and statistically significant. This suggested a positive impact from an increase in number of reviews and average star ratings on the sales of books in the 'recent' books category.

Column 3 showed the regression Equation (4) results that included a fraction of five-star and one-star reviews of the books. This coefficient value implied that an increase in the number of statistically significant five-star reviews increased sales of books (ß = −0.102, $p < 0.01$).

The specification of column 2 was also repeated in column 4 with a sample size of 607 'recent' books category, which had a minimum of one review. The coefficient values of variables showed that price (ß = 0.273, $p < 0.01$) impacts books sales negatively, whereas an increase in the number of reviews of the books increases the books sales (ß = −0.241, $p < 0.01$).

Column 5 had the specification of column 3 repeated on a sub-sample size of 606 books. The coefficients are values statistically non-significant for a fraction of five-star and one-star reviews.

4.2. Differences-in-Differences Regression Analysis

The impact of online reviews over the period of two-months and four-months differences on books sales in the 'bestseller' and 'recent' books categories were analyzed by employing the differences-in-differences regression analysis discussed as follows:

4.2.1. Impact of Two-Month Change in Reviews on Sales

To measure the effect of two-month changes in reviews on book sales, the data related to the variables of interest were collected in the second period (February 2019), and the change in the values from their initial values measured in the first period (December 2018) was analysed. This formulation eliminated the impact of categories' biased mean and any other unobserved immeasurable fixed effects. The dependent variable in the regression model was the value of change in books sales rank from the time period December 2018 to February 2019, i.e., $ln(sr_i^{t2})$-$ln(sr_i^{t1})$. The sample size of the books was identical to the sample size of books in the initial time period. The differences-in-differences regression model results of Equations (7)–(9) for the two books category has been shown in Table 4 below:

Table 4. Effect of two-month change in reviews on sales of books.

Category	**Bestseller Books**			**Recent Books**		
Amazon.in	**1**	**2**	**3**	**4**	**5**	**6**
	Coeff. (SE.)	**Coeff. (SE.)**	**Coeff. (SE.)**	**Coeff. (SE.)**	**Coeff. (SE.)**	**Coeff. (SE.)**
Δ ln(price)	0.162 *** (0.067)	0.162 *** (0.067)	0.163 *** (0.067)	0.099 *** (0.108)	0.098 *** (0.108)	0.099 *** (0.109)
Δ ln(number of reviews)	0.155 *** (0.015)	0.155 *** (0.015)	0.152 *** (0.015)	−0.040 (0.065)	−0.044 (0.065)	−0.049 (0.066)
Δ Average star-rating	−0.022 (−0.706)			−0.037 (0.026)		
Δ Fraction of five-star reviews		−0.039 (0.282)			0.010 (0.011)	
Δ Fraction of one-star reviews		0.044 (0.842)			−0.028 (0.378)	
New five-star			−0.109 (0.000)			0.002 (0.002)
New one-star			0.082 (0.008)			0.011 (0.011)
Number of observation	973			920		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Columns 1 and 4 presented the results of the regression Equation (7) for the 'bestseller' and 'recent' books category, respectively. This included differences in values of price, number of reviews, and average star ratings. Column 1 showed that coefficients of changes in prices (ß = 0.162, $p < 0.01$) and number of reviews (ß = 0.155, $p < 0.01$) were significant. The positive coefficient values showed that an increase in the difference in values of price and number of reviews was associated with lower relative sales of books in the 'bestseller' books category over two-months. Column 4 analysis for the 'recent' books category showed that the number of reviews and average star ratings were not statistically significant. The positive coefficient values of price (ß = 0.099, $p < 0.01$) showed that an increase in difference in the price values was linked with lower relative sales of books over two-months. Columns 2 and 5, representing Equation (8) showed that the coefficient values of fraction of five-star and one-star reviews were not significant for both the books categories.

Columns 3 and 6 showed the results of the regression Equation (9), which included differences in values of price, number of reviews. It was evident from the results that new five-star reviews had a positive impact on book sales (ß = −0.109, $p < 0.10$) for the 'bestseller' books. For 'recent' books category, it was found that the number of new one-star and five-star reviews was not significant.

4.2.2. Impact of Four-Month Change in Reviews on Sales

To measure the impact of four-month changes in reviews on sales, the dependent variable in the regression model was considered to be the value of change in books sales rank from the time period December 2018 to April 2019 i.e., $ln(sr_i^{t3})$- $ln(sr_i^{t1})$. The differences-in-differences regression model results of Equations (10)–(12) for the 'bestseller' and 'recent' books category has been shown in Table 5 below:

Table 5. Effect of four-month change in reviews on sales books.

Category	Bestseller Books			Recent Books		
	1	2	3	4	5	6
Amazon.in	Coeff. (SE.)	Coeff. (SE.)	Coeff. (SE.)	Coeff. (SE.)	Coeff. (SE.)	Coeff. (SE.)
Δ ln(price)	0.057 ** (0.105)	0.072 ** (0.105)	0.053 * (0.106)	−0.066 ** (0.030)	−0.064 * (0.030)	−0.065 ** (0.030)
Δ ln (number of reviews)	−0.182 *** (0.160)	−0.185 *** (0.157)	−0.107 *** (0.172)	0.054 (1.632)	0.050 (0.055)	0.051 (0.057)
Δ Average star-rating	0.169 *** (0.114)			−0.057 * (−1.697)		
Δ Fraction of five-star reviews		0.181 *** (0.532)			−0.049 (0.124)	
Δ Fraction of one-star reviews		0.125 *** (1.709)			0.002 (0.365)	
New five-star			0.118 (0.000)			−0.058 (0.001)
New one-star			−0.195 *** (0.009)			0.058 * (0.009)
Number of observation	973			920		

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Columns 1 and 4 presented the regression Equation (10) results for 'bestseller' and 'recent' books category, respectively. Column 1 analysis revealed that the magnitude and significance values of change in price coefficients (ß = 0.057, $p < 0.05$) were less than the magnitude and significance values in the cross-sectional specification. The coefficients of changes in number of reviews (ß = −0.182, $p < 0.01$) and average star ratings (ß = 0.169, $p < 0.01$) were statistically significant. The negative coefficient values of the number of reviews showed that an increase in the difference of number of reviews was associated with higher relative sales of books over a period of four-months. The change in price

and average star rating showed an inverse relationship with book sales. In column 4, the negative coefficient values showed that an increase in difference in the values of price (ß = −0.066, $p < 0.05$) and average star ratings (ß = −0.057, $p < 0.10$) was linked with relatively greater sales of books in the 'recent' books category over a period of four-months. The rise in difference in the number of reviews over the four-months time period was linked with relatively lower sales of the books.

Columns 2 and 5 represented Equation (11), including the difference in values of price, number of reviews, and the fraction of five-star and one-star reviews of the books. Column 2 analysis revealed that the coefficient value of fraction of five-star reviews (ß = 0.181, $p < 0.01$), which was significant, showed unexpected results as it signified a decrease in sales which was not true in the cross-sectional specification. The values of coefficients of the fraction of one-star reviews (ß = 0.125, $p < 0.01$), which was significant, showed that an increase in the difference in the fraction of one-star reviews over four-months was associated with diminishing books sales. For the recent books category, the coefficient values of the fraction of five-star and one-star reviews were found to be non-significant.

Columns 3 and 6 show the regression Equation (12) results. The number of new five-star and new one-star reviews over the period of four-months were included, along with the difference in values of price and number of reviews variables, which enabled the impact of the additional number of five-star reviews and one-star reviews in the third time period on books sales to be ascertained. For the 'bestseller' books, it was evident from the results that new one-star reviews (ß = −0.195, $p < 0.01$) had a positive impact on book sales, whereas, in 'recent' books category, somewhat significant coefficient values of number of new one-star reviews (ß = 0.058, $p < 0.10$) decreased book sales.

5. Discussion

The overall findings of the study to understand whether online reviews impacted online books sales at Amazon.in revealed that in both the books categories (bestseller and recent), the online reviews shared by the users had an impact on books sales. Analysis of detailed information related to individual books, such as average stars, number of reviews, and fraction of five stars and one star reviews over different time periods, has made a significant contribution in this area of research. The results stated that the sales of books in the 'bestseller' and 'recent' books categories increased with an increase in the number of reviews. It is obvious that a potential customer tends to access a wide variety of information before making the final decision to avoid any kind uncertainty. Easy access to the information shared by other consumers shortens the time to make a decision, and instils more confidence among the consumers to make an informed decision that ultimately results in higher sales.

Similarly, the effect of the number of reviews on books sales rank was more substantial in the 'bestseller' books as compared to 'recent' books category. As the Amazon system does not recommend recently launched books until they are rated or reviewed by a substantial number of customers [67], the increasing number of reviews impact on the 'bestseller' is significantly higher. Recent books often receive fewer reviews and sales as compared to bestseller books, which is evident from the present finding too.

Further, the average star ratings and the fraction of 'five-stars' had a positive impact on book sales. The average star rating provides a quick summary of valence in all the reviews and helps the buyers form an opinion either in favour or against the product just before they start reading reviews. The high average star rating and a greater fraction of five stars depict positive valence in online reviews [16]. Subsequently, positive valence in reviews results in higher sales that have also been proved in the previous studies [39,50,68–70].

The results measuring the effect of two-month and four-month changes in the variables of interest on book sales of both the book categories showed a negative impact of price on the sales. The findings are consistent with the fundamental principle of the law of demand, which states that the consumers' demands are lower when prices are increased [71]. Thus, for any type of books the consumers would prefer to make the purchase only when the

prices are lowered or they are provided with various discounts and offers by the online retailers.

6. Conclusions

Overall, the regression estimates analysis revealed mixed results and suggested that the sales of the two book categories were associated with the differences in the number of reviews, average star ratings, and fraction of five-stars and one-star reviews across the two book categories. Through the application of proxy measures for estimating 'sales' using 'sales rank', the study made a methodological and theoretical contribution to this field of study by measuring the impact of various key components of online reviews on online books sales. The findings of the study can increase the managers' and online retailers' understanding of the role of online reviews in influencing online books sales. The results show the importance of online reviews, and enables understanding on which components of the online reviews have more influence on the consumer's decision process. For example, the results have revealed that the average star ratings and the fraction of 'five-stars' had a positive impact on book sales. Therefore, online retailers should encourage more consumers to share average star or five-star ratings for their products. Moreover, as the study found that the sales of books in the 'bestseller' and 'recent' books categories increased with an increase in number of reviews, online retailers should stimulate more consumers to share online reviews. Thus, the present study has some implications for managers and practitioners, which are discussed as follows:

7. Managerial and Practical Implications

An empirical understanding of the impact of various significant elements of online reviews on online book sales is a prerequisite for online marketers and retailers to target their online consumers. The online book retailers for recently launched books can adopt price discounting strategies to increase their customers, as the results of the present study clearly indicated that higher prices lead to lower books sales. Growing a customer base by providing attractive discount rates and offers may lead to an increased number of reviews for the books, ultimately boosting its sales (improving sales rank). As the impact of the increasing number of reviews, average star ratings and five star ratings are the most important determinants of online book sales, online book retailers and marketers should try to nudge the purchasers to write online reviews to increase the volume of reviews for the books. The negative reviews do not affect the book sales as significantly as the volume of positive reviews. This may possibly be due to books not being considered as high-value products. Hence, online retailers/managers should focus more on increasing positive reviews and need not worry about the impact of negative reviews unless their number is large. Overall, the study's findings suggest that global online retailers, marketers, companies, and consumers can effectively use eWOM communication as a marketing technique and help other users make an optimum online purchase decision.

8. Limitations and Future Research

As the sales data for Amazon books were not available, the sales variables in this data are proxies for the actual measure, which is one of the limitations of the study. This study considered only one product category, books, at only one e-commerce retailer. Hence, the results may vary for different e-commerce retailers across different varieties of products. Moreover, the data collection method adopted for the study was very costly and time-consuming. The sales variables in the data are proxies for the actual measurements, which would need more advanced empirical modelling in further studies. Future research on this topic can be carried out by comparing the impact of online reviews on book sales on two different websites. Further studies can compare the influence of online reviews among multiple products. Researchers also suggest the development of a culture-specific methodology for estimating book sales.

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