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The Boosting Effect of E-WOM on Macro-level Consumption: A Cross-Industry Empirical Analysis in Japan

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Abstract
In this study, we carry out an empirical analysis on how electronic word-of-mouth (hereinafter “e-WOM”) marketing on e-WOM websites and electronic-commerce websites on the Internet boosts consumption on a macro-level. In our analysis, we conduct a model analysis of consumer behavior using data composed of more than 30,000 questionnaire surveys and quantitatively find the elasticity coefficient of the boost to consumption by performing a two-step GMM (generalized method of moments), which uses instrumental variables. The results of the analysis show e-WOM significantly increased expenditures in six fields: computers, electrical appliances, etc.; music; hobbies; clothing, accessories, etc.; beauty products, etc.; and goods for everyday life, etc. Furthermore, there was no field that had a significantly negative value. These results showed that, in the majority of the target fields, e-WOM had not only the effect of winning customers from the competition, but also the effect of boosting consumption on a macro-level. In addition, even from people’s subjective evaluations, there were many in all the generational groups who said that e-WOM boosted expenditures.

Keywords e-WOM · Online review · Econometrics · Stimulative effect on consumption · Economic effect · Word-of-mouth websites

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1 Introduction

In our present society, the Internet, and the popularization of social media in particular, has made it possible for people to write and share various kinds of information at a low cost. One type of information that can be shared in such a way is “word-of-mouth.”

“Word-of-mouth” refers to information on products, services, or companies that is exchanged between consumers. Traditionally, this was information passed on orally from person to person. The extent that information was transferred was limited by the confines of social boundaries, and the effectiveness of word-of-mouth for a particular piece of information rapidly diminished as time passed [1, 2]. However, the recent popularization of social media has enabled information sharing with an unspecified large number of people. As one piece of information can persistently remain as a string of text on the Internet, word-of-mouth can now reach much further than the limits of the conventional word-of-mouth [3]. This new Internet-based word-of-mouth is referred to as online reviews or e-WOM (electronic word-of-mouth).

By having knowledge of a product or service beforehand through word-of-mouth, the consumer can purchase that product or service with reduced risk and have access to the information he or she wanted to know. Thus, economists point out that people pay attention to word-of-mouth information when they are buying something, to eliminate any information asymmetry. In fact, Litvin et al. [4], Kim et al. [5], and Gao et al. [6] all show that word-of-mouth contributes to eliminating the information asymmetry that consumers face. Moreover, especially on the Internet, a variety of word-of-mouth is shared, such as reviews on EC websites (hereinafter “EC”), and information sharing on e-WOM websites1 and via social networking services (hereinafter “SNS”). For example, it is commonplace behavior nowadays to look at reviews on e-WOM and EC websites and to take notice of various kinds of information before deciding to purchase.

For these reasons, economists conduct various kinds of empirical research to study the effect of e-WOM on consumer behavior and to provide insight for marketing, in particular. For example, Chevalier and Mayzlin [7] showed that reviews of books on EC websites had a significantly positive effect on sales. Duan et al. [8] conducted a study of movie box-office revenues by considering the endogeneity of reviews. Although the rating of the reviews did not affect box-office revenues, the quantity of review postings strongly affected these revenues. Results similar to those for the movie industry were obtained by Liu [9], as well. Similar studies showing the quantity of word-of-mouth postings positively affecting expenditures were reported by Park and Lee [10], Öğüt and Onur Taş [11], and Babić Rosario et al. [12]. Furthermore, Amblee and Bui [13] focused on the attributes of review posters and analyzed the effects of both professional reviews and general user reviews on the number of downloads of free software. This study obtained roughly the same results in

1 Internet services collect word-of-mouth related to products or services. TripAdvisor (https://www.tripadvisor.com/) and Tabelog (https://tabelog.com/) are WOM websites.
terms of both significance and importance for both types of reviews. Vermeulen and Seegers [14] demonstrated that word-of-mouth had a positive effect on people’s recognition and impression of hotels. Also looking at hotels, Ye et al. [15] conducted an empirical analysis on the effect of online reviews on the number of reservations in Chinese hotels and showed that the number of reservations increased by more than 5% when the review ratings of travelers rose by 10%.

However, although the empirical studies accumulated to date are so numerous, most of the studies took a micro-viewpoint in their analysis, focusing on the effect of reviews on the sales of individual services and products. Such an analytical viewpoint is most important in discovering what effect word-of-mouth has on the sales of specific products and services from the short-term perspective of marketing. However, these studies do not identify whether the customers have been snatched from the same market, or whether the reviews have served to stimulate consumer appetite and boost the level of consumption in the entire market. For example, in the case of word-of-mouth for restaurants, if people already thinking of finding a restaurant meal for 1000 yen on that day looked at word-of-mouth and selected a different restaurant for their 1000-yen meal, at a micro-level, the sales of a specific service rose as a result of a review. On the other hand, the amount of expenditures by the individual does not change, and in terms of the overall market, there has been no change in consumption.

The question arises, therefore, as to whether e-WOM affects the total expenditures of the market in the same way that e-WOM results in a positive effect on sales. There are two conceivable ways in which the effect of e-WOM could influence expenditures. The first is the potential effect of reducing expenditures by enabling consumers to find cheaper prices. For example, a person looking for a 1000-yen meal at a restaurant may, through word-of-mouth, find a meal of the same quality priced at just 800 yen, thereby reducing expenditures. The second is the potential effect of increasing expenditures by way of a person who was not planning to consume, or who was planning to eat more cheaply, looking at word-of-mouth and having his or her appetite for consumption stimulated resulting in a higher priced purchase. For example, a person searching for a 1000-yen meal in a restaurant may, through word-of-mouth, discover a restaurant offering exactly what he or she likes, leading to the purchase of a meal of 1500 yen or an increase in the frequency of eating out, thereby causing a rise in expenditures.

From a short-term marketing perspective, it is not important to identify whether “the customer was snatched from a competitor” or whether there was “a boost in the consumption in the overall market.” However, the following two points provide valid reasons to conduct an empirical analysis to test for the effect of the latter. The first point is that although winning a customer from the competition will lead to a profit for one’s own company in the short term, in the long term, it is important from even a marketing perspective to expand the overall market (broaden the base). The second point is that, from an economic perspective, although the former does not reflect GDP, the latter does affect GDP and, therefore, influences the macro economy. Many countries set a single target for GDP growth as part of their economic policy. In Japan’s case, the aim is to achieve 600-trillion yen GDP for 2020, and to achieve this goal, it will be necessary to boost consumption.
Furthermore, it is also important to analyze the boost in consumption on a macro-level from the perspective of Internet policy. That is because the Internet has a large number of users, and although it can be agreed that it is a useful tool, many online services are used for free, and it has, therefore, been pointed out that the economic contributions of the Internet are small. For example, Brynjolfsson and McAfee [16] estimated the value of Internet services in the United States to have a monetary base not exceeding 4.2 billion dollars. However, as mentioned earlier, Internet services are not confined only to the Internet. If Internet services were to stimulate consumption in other markets, they could be said to have a larger economic contribution. Presently, many countries around the world are considering a large range of Internet policies to address such issues as intellectual property infringement, protection of personal information, cyber security, innovation, protection of public safety, and freedom of expression. Among the developed countries, although there are voices asserting that freedoms must continue to be fundamentally protected in cyberspace, recently, there has been a strengthening of voices wishing for regulative policies, particularly among EU countries. When such policies are considered, there is a risk that if the value of the Internet is evaluated as diminishing, the effect of these policies on society will also be evaluated as diminishing.

In this study, taking the above into account, we carried out an empirical analysis of the effect of people’s e-WOM on e-WOM and EC websites on boosting consumption on a macro-level. The originality of this paper is twofold: First, we conduct a cross-industry, quantitative analysis using data from the same time period and quantitatively test for differences in the effect of e-WOM by industry. Second, in addition to analyzing consumer behavior using the survey data from more than 30,000 completed questionnaires, we calculate the elasticity coefficient of the boost to consumption on a macro-level using a precise two-step generalized method of moments (GMM), giving adequate consideration to endogeneity.

This paper is organized as follows: Sect. 2 describes the details of the analysis data and shows the correlation between rate of use of e-WOM and expenditures. Section 3 shows the model used in the analysis. Section 4 shows the result of conducting estimation that takes into account the endogeneity using the two-step GMM and clarifies the elasticity coefficient of e-WOM in each field. In Sect. 5, we analyze the boost to consumption provided by the subjective evaluation of people and supplement the results of Sect. 4. In Sect. 6, we state our observations based on the results obtained thus far.

2 Analysis Data

The data used for the analysis in this study are data from a questionnaire survey carried out by the Center for Global Communications (GLOCOM), International University of Japan, as part of the Innovation Nippon Project\(^2\) in September 2016. The

\(^2\) Research project promoted by the Center for Global Communications (GLOCOM), International University of Japan, and supported by Google Japan. http://www.innovation-nippon.jp/.
The subjects were 30,894 male and female individuals ranging in age from 20s to 60s, who completed the questionnaire via the monitoring website of the Internet research company MyVoice Communications, Inc.

Table 1 presents the sample and Internet users in Japan by gender and age. Ratio indicates the ratio of each gender age to the whole. Data on Internet users are calculated by multiplying the population statistics of 2016 by the rate of Internet usage by gender and age, as published by the Ministry of Internal Affairs and Communications. Comparing the gender sample with Internet users, we can observe that there are fewer twenties in the sample, while there are more forties males.

However, we did not use weight by Internet users as the main estimation result in this paper, because there are not extremely few samples. Furthermore, we checked for robustness and confirmed that the main estimation result does not change much even if sample biasing is controlled by weight.

In addition to providing expenditures (amount spent) and hours using e-WOM websites in the following 10 fields, the questionnaires also provided gender, age, and other attributes, such as income. Table 2 gives an outline of the variables obtained, and Tables 3 and 4 provide the descriptive statistics. Note that the calculations include observations with the amount spent and the hours using e-WOM websites being given the value “0” for the descriptive statistics, denoting the “spent nothing” and “did not use website” cases.

- Computers, computer peripheral devices, electrical appliances, and cameras.
- Books (including downloading of e-books).

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3 In this research, the statistical population is regarded as Internet users.

4 The significant six fields in the analysis with weight matched in Table 7 “e-WOM elasticity coefficient estimation results.” However, the coefficient changed a little; for example, 0.43–0.48 in the field of computers, electrical appliances, etc.

5 The selection criteria for fields are potential fields on which use of WOM websites and reviews could logically have an effect. For example, everyday foods that account for a large amount of consumption were excluded, as, in their case, the influence from the use of e-WOM is considered to be limited.
Table 2  Outline of obtained variables

| Variable      | Outline                                                                                                                                 |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| Expenditure   | Amount of money spent last week in the respective field. The value of 0 yen\(^a\) is given when no amount was spent                                                                 |
| e-WOM         | Hours spent\(^b\) reading reviews on e-WOM and EC websites last week for the respective field. The value of 0 h\(^c\) is given when such websites were not used |
| Household income | Household income                                                                                                                      |
| Male (man)    | Dummy variable. Value is 1 when male, 0 otherwise                                                                                      |
| Age           | Age                                                                                                                                 |
| Metropolitan areas | Dummy variable. Value is 1 when place of residence is in one of Japan’s metropolitan areas (Tokyo Prefecture, Osaka Prefecture, Aichi Prefecture, Kanagawa Prefecture), 0 otherwise |
| Families      | Number of persons living in the household                                                                                               |
| University Graduate | Dummy variable. Value is 1 if graduate from university or postgraduate school, 0 otherwise                                               |
| TV            | Average hours of TV watched (per day)                                                                                                   |
| Newspaper     | Dummy variable. Value is 1 if newspaper reader, 0 otherwise                                                                             |

\(^a\)In the actual question, choice options are given in the range of “under 1000 yen,” “1000–2999 yen,” “3000–4999 yen,” “5000–6999 yen,” “7000–9999 yen,” “10,000–14,999 yen,” “15,000–19,999 yen,” “20,000–29,999 yen,” “30,000–49,999 yen,” “50,000–74,999 yen,” “75,000–99,999 yen,” and “over 100,000 yen,” and the average of these is calculated for the analysis. However, we set it to 150,000 yen for “over 100,000 yen”

\(^b\)In this analysis, word-of-mouth via SNS is excluded from the sample. This was because, in the case of SNS, we thought that the respondent would find it difficult to distinguish between the hours reading word-of-mouth for the respective field and the hours reading other posts from friends, thereby making it difficult to give an accurate answer

\(^c\)In the actual question, choice options are given in the range of “under 30 min,” “30–59 min,” “60–119 min,” “120–179 min,” “180–299 min,” “300–419 min,” “420–599 min,” “600–899 min,” and “over 900 min”, and the average of this is calculated for the analysis. However, we set it to 1200 min for “over 900 min”

Table 3  Descriptive statistics for expenditures and e-WOM hours

| Expenditures (per week) | e-WOM hours (per week) |
|-------------------------|------------------------|
|                         | Ave  | SD  | Min | Max | Ave | SD  | Min | Max |
| Computers, appliances, etc. | 2837 | 17,450 | 0   | 150,000 | 0.10 | 0.68 | 0.00 | 20.00 |
| Books                   | 652  | 4916  | 0   | 150,000 | 0.05 | 0.39 | 0.00 | 20.00 |
| Music                   | 632  | 5615  | 0   | 150,000 | 0.04 | 0.37 | 0.00 | 20.00 |
| Games                   | 306  | 4150  | 0   | 150,000 | 0.03 | 0.31 | 0.00 | 20.00 |
| Hobbies                 | 270  | 4250  | 0   | 150,000 | 0.02 | 0.29 | 0.00 | 20.00 |
| Clothing, accessories, etc. | 2619 | 13,347 | 0  | 150,000 | 0.06 | 0.47 | 0.00 | 20.00 |
| Eating out              | 3953 | 14,400 | 0  | 150,000 | 0.07 | 0.46 | 0.00 | 20.00 |
| Travel                  | 6631 | 25,845 | 0  | 150,000 | 0.08 | 0.64 | 0.00 | 20.00 |
| Beauty products, etc.   | 1223 | 8668  | 0   | 150,000 | 0.04 | 0.38 | 0.00 | 20.00 |
| Everyday goods, etc.    | 1229 | 7814  | 0   | 150,000 | 0.04 | 0.35 | 0.00 | 20.00 |

Unit for expenditures is yen/week, and for e-WOM hours, it is h/week

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Table 4  Descriptive statistics for other attributes

|                        | Ave  | SD   | Min  | Max  |
|------------------------|------|------|------|------|
| Household income (million yen) | 5.99 | 4.00 | 0.00 | 20.00|
| Male                   | 0.52 | 0.50 | 0.00 | 1.00 |
| Age                    | 47.23| 12.17| 20.00| 69.00|
| Metropolitan areas     | 0.40 | 0.49 | 0.00 | 1.00 |
| Families (people)      | 2.87 | 1.31 | 1.00 | 8.00 |
| University graduate    | 0.49 | 0.50 | 0.00 | 1.00 |
| TV (h/day)              | 2.46 | 1.64 | 0.00 | 6.00 |
| Newspaper              | 0.70 | 0.46 | 0.00 | 1.00 |

Table 5  Number of e-WOM users, number of spenders, and proportion of e-WOM users among spenders

|                        | Users | Spenders | Proportion of users (%) | Correlation coefficient |
|------------------------|-------|----------|-------------------------|------------------------|
| Computers, appliances, etc. | 673   | 2437     | 28                      | 0.0768                 |
| Books                  | 745   | 6145     | 12                      | 0.1086                 |
| Music                  | 421   | 2876     | 15                      | 0.0562                 |
| Games                  | 276   | 1480     | 19                      | 0.1408                 |
| Hobbies                | 183   | 847      | 22                      | 0.0492                 |
| Clothing, accessories, etc. | 630   | 5685     | 11                      | 0.0557                 |
| Eating out             | 1243  | 13,213   | 9                       | 0.0507                 |
| Travel                 | 487   | 3655     | 13                      | 0.0862                 |
| Beauty products, etc.  | 497   | 3545     | 14                      | 0.0853                 |
| Everyday goods, etc.   | 511   | 7821     | 7                       | 0.0387                 |

- Music (CDs, paid downloads, live music, etc.) and movies (DVDs, paid downloads, cinemas, etc.).
- Games (home video games, social games, etc.).
- Hobbies (figures, plastic and cast models, trading cards, etc.).
- Clothing, footwear, watches, accessories, and bags.
- Eating out (restaurants, Japanese, Western, Chinese, bars, dining bars, etc.).
- Travel.
- Beauty products (cosmetics, beauty electrical appliances, etc.) and beauty services (beauty treatment, etc.).
- Goods for everyday life, kitchenware.

Table 5 shows three data columns: the number of people using e-WOM in the most recent week, the number of people who spent money in the most recent week, and the proportion of those who used e-WOM among those who spent, for each field. From the results shown in Table 5, we can see that the highest proportion of e-WOM users among the spenders in a specific field is in the computers, electrical appliances, etc.,
field. We think that this is because there are many consumers who are motivated to find purchase prices that are reduced as much as possible, because individual product prices are high. The field with the highest number of e-WOM users and the highest number of spenders was eating out.

Finally, Fig. 1 shows the correlation between hours using e-WOM and the amount of money spent, and after filtering the observations of spenders (observations with 0 expenditure eliminated), it is seen that the largest proportion of e-WOM users are from the field of computers, appliances, etc. From the data shown in Fig. 1, although not a monotonic increase, there is a general trend that people who engaged in e-WOM longer spent larger amounts of money. Thus, based on the above, we can see a positive correlation between hours of engaging in e-WOM and expenditure.

However, this is a correlation that includes both the effect of expenditures increasing from the number of hours using e-WOM and the effect of the expenditures and the number of hours using e-WOM increasing because of a liking for the respective field. Although the former is a specific issue that this study is looking at, the latter is a simple correlation that does not provide grounds that using e-WOM provides a boost to consumption, and it is, therefore, important to distinguish between the two. Furthermore, it is important to verify whether there is any statistical significance after controlling for the other attributes. Accordingly, beginning from the next section, we will proceed to extract the simulative effect on consumption by conducting model analysis using instrumental variables.

### 3 Analysis Model

In this section, we describe a model to investigate how e-WOM use boosts expenditures. We can begin by constructing the following demand model for the spending behavior of individual \( i \) in field \( j \):

\[
\ln(E_{ij}) = \alpha_j + \beta_j \ln(R_{ij}) + Z_i \gamma_j + \varepsilon_{ij},
\]

(1)

where the meanings of the variable symbols are as follows: \( E_{ij} \): Expenditure of individual \( i \) in field \( j \); \( R_{ij} \): Hours of using e-WOM by individual \( i \) in field \( j \); \( Z_i \): Attributes vector of individual \( i \) (gender, place of residence, household income, household members, etc.)

The intuitive interpretation of formula (1) is that the expenditures of individual \( i \) in field \( j \) are determined by individual \( i \)'s hours using e-WOM in field \( j \) and individual \( i \)'s attributes. Here, the point of interest is parameter \( \beta_j \) for each field, but \( R_{ij} \) and \( \varepsilon_{ij} \) are correlated, and there is a problem of endogeneity, as described in Sect. 1.6

In this case, \( \beta_j \) will be overestimated when estimating by ordinary least squares.

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6 For example, let us consider the field of Eating out. In that field, the people with unobservable attributes, such as a liking for eating out, will have higher values for \( R_{ij} \) and \( E_{ij} \). Even if we estimate the parameter \( \beta_j \) here, we will simply be limited to estimating its coefficient, and it will not be possible to extract the correct effect.
Here, we control the endogeneity with a two-step GMM that uses instrumental variables. Instrumental variables are required to be correlated with the endogenous variables, but not with the error term. In this study, we use “hours of using e-WOM in the other fields” as such an instrumental variable. This tells us whether the individual originally had a general liking for e-WOM. For example, although it is conceivable that an individual’s hours of using e-WOM for electrical appliances would be correlated with that individual’s hours of using e-WOM for eating out, the error term that has an influence on the eating out expenditures would not. By doing this, we can quantitatively obtain a $\beta_j$ after controlling for endogeneity.

4 Estimation Results

We use the method of instrumental variables based on the above to estimate formula (1) for the computers, electrical appliances, etc., field, and Table 6 shows these results. This analysis for the estimation of each field only includes individuals with expenditures within the most recent week for each field. This is done, because, as e-WOM cannot be observed, in most cases, for individuals with no expenditures (individuals with no intention to purchase), there is a large number of observations with e-WOM = 0 for expenditures = 0. However, these individuals were not used based on a judgment of whether or not e-WOM was observable, but, because it is not suitable to analyze the “influence of use of e-WOM on expenditures.”

![Fig. 1](image_url) Correlation between hours using e-WOM and expenditures (computers, appliances, etc., field)
We note that all p values are calculated from heteroscedasticity-robust standard errors [18], and the variables on expenditures, e-WOM, household income, TV, and other expenditures\(^7\) are log-transformed. Column <1> shows the estimation results of the ordinary least-squares regression, and column <2> the estimation results of the two-step GMM. In Table 6, we include some test results pertaining to instrumental variables; the results of the underidentification test, that is, the Kleibergen–Paap rk LM statistic, and the Hansen J statistic. The results of these tests show that the instrumental variables are not correlated with the error term, but sufficiently significantly correlated with the endogenous variables.

Comparing column <1> and column <2>, we find that the coefficients of endogenous variable e-WOM decline. This result indicates that ordinary least squares overestimate the parameters. Therefore, without a suitable identification strategy, our conclusions may be erroneous, so we discuss column <2> below.

First, when we look at the control variables, for older individuals, and for individuals living in the metropolitan areas, we see significantly increased expenditures for computers, electrical appliances, etc. Moreover, other expenditures were significantly positive. Although the variable for expenditures in fields other than computers, electrical appliances, etc., was expected to be significantly negative based on the consideration of budgetary constraints, another included element is whether there was a tendency to spend overall in the most recent week answered for in the questionnaire. For example, during the most recent week answered for in the questionnaire, individual \(i\) may have been on holiday, or it may have directly followed a payday. Thus, it is conceivable that other expenses could be positive if we consider that expenditures increased overall. We think that the significantly positive result was because the effect of the latter was stronger in the analysis.

Furthermore, the e-WOM value is significantly positive at the 5% level, and its elasticity coefficient is 0.43. In other words, when the hours using e-WOM increases by 1%, expenditures increase by 0.43%. Based on the above, using e-WOM is significantly positively correlated with expenditure, even though it is considered endogenous.

In addition, Table 7 shows the results for each field. Although control variables are not presented in Table 7, as in Table 6, control variables are included for all the fields. Columns <3>, <4>, <5>, and <6> show the OLS estimation results, two-step GMM estimation results, underidentification test \(p\) values, and Hansen J statistic \(p\) values, respectively.\(^8\) We can see that the control variables are valid for all the fields and the coefficients in column <4> are smaller than those in column <3>.

In column <4> of Table 7, we see that e-WOM has a significantly positive impact on the expenditure in six fields: computers, electrical appliances, etc.; music;

\(^7\) The other expenditures variable is total money spent by individual \(i\) in fields other than field \(j\).

\(^8\) For books field, Hansen J statistic \(p\) values are 0.06, which is insignificant at 5% level barely. Therefore, there is doubt about the validity of instrumental variables. However, it is not significant at least at the 5% level and the instrumental variables are valid in the other industries, respectively; in this research, it is necessary to adopt this result, because it is not significant at least at the 5% level and the operational variables are valid in the other industries, respectively.
hobbies; clothing, accessories, etc.; beauty products, etc.; goods for everyday life, etc. Moreover, there are no fields with a significantly negative value. Based on the above, we have shown that, for more than half of the target fields, the effect of e-WOM is not simply to win customers from competition, but also to boost consumption on a macro-level.

| Table 6  | Estimation results (computers, electrical appliances, etc., field) |
|----------|-------------------------------------------------------------------|
|          | OLS                                  | GMM                                  |
|          | Coef. | p value | Coef. | p value |                   |
| e-WOM    | 0.56  | 0.00**  | 0.43  | 0.04*   |                   |
| Household income | 0.03  | 0.21   | 0.03  | 0.19   |                   |
| Male (man) | 0.06  | 0.49   | 0.06  | 0.47   |                   |
| Age      | 0.02  | 0.00**  | 0.01  | 0.00**  |                   |
| Metropolitan areas | 0.16  | 0.04*  | 0.17  | 0.04*  |                   |
| Families | 0.02  | 0.58   | 0.02  | 0.59   |                   |
| University graduate | 0.01  | 0.93   | 0.02  | 0.84   |                   |
| TV       | −0.15 | 0.07   | −0.14 | 0.08   |                   |
| News paper | 0.11  | 0.27   | 0.11  | 0.25   |                   |
| Other expenditures | 0.05  | 0.00**  | 0.05  | 0.00**  |                   |
| Constant | 7.24  | 0.00**  | 7.25  | 0.00**  |                   |
| Underidentification test | 146.26 | 0.00**  |       |         |                   |
| Hansen J statistic | 4.23  | 0.24   |       |         |                   |
| N        | 2437  |         | 2437  |         |                   |

The p value is calculated from the robust standard error

**p < 0.01, *p < 0.05

| Table 7  | e-WOM elasticity coefficient estimation results (all fields) |
|----------|-------------------------------------------------------------------|
|          | OLS                                  | GMM                                  |
|          | Coef. | p value | Coef. | p value | p value | p value | p value | p value | N       |
| Computers, appliances, etc. | 0.56  | 0.00**  | 0.43  | 0.04*  | 0.00   | 0.24   | 2437   |
| Books    | 0.62  | 0.00**  | 0.51  | 0.25   | 0.00   | 0.06   | 6145   |
| Music    | 0.45  | 0.00**  | 0.31  | 0.04*  | 0.00   | 0.63   | 2876   |
| Games    | 0.86  | 0.00**  | 0.52  | 0.43   | 0.03   | 0.10   | 1480   |
| Hobbies  | 0.53  | 0.00**  | 0.37  | 0.04*  | 0.00   | 0.34   | 847    |
| Clothing, accessories, etc.| 0.41  | 0.00**  | 0.27  | 0.04*  | 0.00   | 0.10   | 5685   |
| Eating out | 0.55  | 0.00**  | 0.44  | 0.26   | 0.00   | 0.90   | 13,213 |
| Travel   | 0.24  | 0.00**  | 0.01  | 0.92   | 0.00   | 0.14   | 3655   |
| Beauty products, etc. | 0.43  | 0.00**  | 0.31  | 0.04*  | 0.00   | 0.10   | 3545   |
| Everyday goods, etc. | 0.81  | 0.00**  | 0.73  | 0.00**  | 0.00   | 0.12   | 7821   |
Why did e-WOM not have significant effects on nearly half of the fields? We can consider two of the e-WOM effects as mentioned in Sect. 1. First, the potential effect of reducing expenditure by enabling consumers to find cheaper prices; second, the potential effect of increasing expenditure by way of a person who was not planning to consume, or who was planning to eat cheaper food, viewing word-of-mouth, and having appetite for consumption stimulated resulting in a higher priced purchase.

Especially, e-WOM websites are popular in consumer services such as dining out and traveling. However, it is not possible to say that the effects of boosting consumption at the macro-level are significant in these six fields, at least the sample and analysis method of this research. The above two effects were canceled out.

5 Supplementation with Subjective Evaluation

In this section, we supplement the results of Sect. 4 with the results of directly asking for the subjective views of the individuals. The question regarded e-WOM and was asked without reference to specific fields and was similar to the following question:

Q. Do you think you changed how much you spent as a result of using e-WOM (e-WOM website reviews, EC website reviews)? Choose the most applicable answer from below.

1 = Spent considerably more.
2 = Spent slightly more.
3 = No change.
4 = Spent slightly less.
5 = Spent considerably less.

In addition, the individuals who answered 1 and 2 were asked how much more was spent, and the individuals who answered 4 and 5 were asked how much less was spent. The results are shown in Table 8 by age group. From Table 8, we can see that, regardless of age group, the proportion of individuals who felt they spent more (proportion of those who selected 1 or 2) is higher than the proportion of those who felt they spent less (those who selected 4 or 5). Furthermore, when giving tangible

| Age Group | Spent more (%) | Ave. increase | Spent less (%) | Ave. decrease | Net increase |
|-----------|----------------|---------------|---------------|--------------|--------------|
| Twenties  | 25             | 12,634        | 7             | 1073         | 11,561       |
| Thirties  | 20             | 8113          | 4             | 536          | 7577         |
| Forties   | 17             | 5045          | 5             | 1142         | 3903         |
| Fifties   | 13             | 3169          | 4             | 231          | 2938         |
| Sixties   | 13             | 3370          | 4             | 577          | 2793         |
| Total     | 17             | 5686          | 5             | 702          | 4984         |
amounts, those who thought the amount increased gave a higher amount than those who thought the amount decreased. The net increase column shows that, even when based on the subjective views of individuals, e-WOM is associated with having an effect of boosting consumption. The twenties age group had the highest proportion of individuals who felt that they had spent more and the highest proportion of individuals that felt they spent less, which informs us that the younger age groups are more greatly influenced by e-WOM.

6 Conclusion

In this study, we conducted an empirical analysis to ascertain the boosting effect that people’s use of e-WOM, such as e-WOM websites and EC websites on the Internet, has on consumption on a macro-level. In our analysis, in addition to conducting model analysis relating to consumer behavior using the data of more than 30,000 completed questionnaires, we quantitatively verified the elasticity coefficient of the boosting effect on consumption by applying a two-step GMM that used instrumental variables.

As a result of this analysis, we observed that e-WOM had significantly increased expenditures in six fields: computers, electrical appliances, etc.; music; hobbies; clothing, accessories, etc.; beauty products, etc.; goods for everyday life, etc. From this, we showed that, for more than half of the target fields, the effect of e-WOM is not simply to win customers from the competition, but also to boost consumption on a macro-level. In the subjective evaluations of individuals, as well, there were more people who felt that e-WOM had a boosting effect on expenditures in all the age groups.

However, there are some problems in this research. First, people who do not spend in each field are dropped from the sample. Specifically, a few “people saw e-WOM but no spending”, so there is a possibility that “people did not spend as a result of engaging in e-WOM.” However, we cannot identify it and “people did not plan to spend originally but saw e-WOM websites”. Furthermore, we cannot observe people who canceled their spending decision, because they did not see the e-WOM channels. Based on the above, in this research, people who did not have expenditure are excluded from our analysis.

Second, we did not consider the influence of stealth marketing, which is a strategy where consumers are unaware of the advertisement and do not recognize it as publicity. Stealth marketing may be concerned with influencing consumer behavior, because the basic premise e-WOM is neutral is broken.

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9 The individuals were asked to give tangible amounts for a 1-week period. These amounts were adjusted to annual estimates through multiplying by 52. We calculate the average value as the change in amount recorded as 0 yen when an individual did not feel that he or she has spent more or less as a result of using e-WOM.
Although there are some problems, a few previous studies examine the impact of e-WOM on consumption at a macro-level (cross-industry). Overall, we think that this is our contribution to this research.

In the future, we expect increased activity in the use of e-WOM to accompany an increase in the penetration rate of social media and smartphones, and consequently, a growth in the effect of e-WOM. Accordingly, the importance of activities in quantitatively measuring the value and economic effect of e-WOM is increasingly growing, not just from marketing and economic perspectives, but from a policy perspective, as well.

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**Compliance with Ethical Standards**

**Conflict of interest** The authors declare that they have no conflict of interest.

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**References**

1. Ellison, G., & Fudenberg, D. (1995). Word-of-mouth communication and social learning. *The Quarterly Journal of Economics, 110*(1), 93–125.
2. Bhatnagar, A., & Ghose, S. (2004). Online information search termination patterns across product categories and consumer demographics. *Journal of Retailing, 80*(3), 221–228.
3. Laroche, M., Yang, Z., McDougall, G. H., & Bergeron, J. (2005). Internet versus bricks-and-mortar retailers: An investigation into intangibility and its consequences. *Journal of Retailing, 81*(4), 251–267.
4. Litvin, S. W., Goldsmith, R. E., & Pan, B. (2008). Electronic word-of-mouth in hospitality and tourism management. *Tourism Management, 29*(3), 458–468.
5. Kim, E. E. K., Mattila, A. S., & Baloglu, S. (2011). Effects of gender and expertise on consumers’ motivation to read online hotel reviews. *Cornell Hospitality Quarterly, 52*(4), 399–406.
6. Gao, G. G., Greenwood, B. N., Agarwal, R., & McCullough, J. S. (2015). Vocal minority and silent majority: How do online ratings reflect population perceptions of quality? *MIS Quarterly, 39*(3), 565–590.
7. Chevalier, J. A., & Mayzlin, D. (2006). The effect of word of mouth on sales: Online book reviews. *Journal of Marketing Research, 43*(3), 345–354.
8. Duan, W., Gu, B., & Whinston, A. B. (2008). The dynamics of online word-of-mouth and product sales—An empirical investigation of the movie industry. *Journal of Retailing, 84*(2), 233–242.
9. Liu, Y. (2006). Word of mouth for movies: Its dynamics and impact on box office revenue. *Journal of Marketing, 70*(3), 74–89.
10. Park, D. H., & Lee, J. (2009). eWOM overload and its effect on consumer behavioral intention depending on consumer involvement. *Electronic Commerce Research and Applications, 7*(4), 386–398.
11. Öğüt, H., & Onur Taş, B. K. (2012). The influence of internet customer reviews on the online sales and prices in hotel industry. *The Service Industries Journal, 32*(2), 197–214.
12. Babić Rosario, A., Sotgiu, F., De Valck, K., & Bijmolt, T. H. (2016). The effect of electronic word of mouth on sales: A meta-analytic review of platform, product, and metric factors. *Journal of Marketing Research, 53*(3), 297–318.

13. Amblee, N., & Bui, T. (2007). Freeware downloads: An empirical investigation into the impact of expert and user reviews on demand for digital goods. *AMCIS 2007 Proceedings, 21*, 1–13.

14. Vermeulen, I. E., & Seegers, D. (2009). Tried and tested: The impact of online hotel reviews on consumer consideration. *Tourism management, 30*(1), 123–127.

15. Ye, Q., Law, R., Gu, B., & Chen, W. (2011). The influence of user-generated content on traveler behavior: An empirical investigation on the effects of e-word-of-mouth to hotel online bookings. *Computers in Human Behavior, 27*(2), 634–639.

16. Brynjolfsson, E., & McAfee, A. (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. New York: WW Norton & Company.

17. Wooldridge, J. M. (2010). *Econometric analysis of cross section and panel data* (2nd ed.). Cambridge: The MIT Press.

18. White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica: Journal of the Econometric Society*, 817–838.