Promoting consumers' online brand attention: The study of spatiotemporal analysis in regional apples

Tingting Zhang
University of Science and Technology Beijing, tzhang@ustb.edu.cn

William Yu Chung Wang
University of Waikato, New Zealand, william.wang@waikato.ac.nz

Promoting consumers' online brand attention: The study of spatiotemporal analysis in regional apples
(Work-in-Progress)

Tingting Zhang [1]
William Yu Chung Wang [2,*]

_____
*Corresponding author
[1] University of Science and Technology Beijing, tzhang@ustb.edu.cn
[2] University of Waikato, william.wang@waikato.ac.nz

ABSTRACT
With the application and promotion of agricultural products e-commerce, it is of great significance to increase the popularity of brand recognition to promote the market value of agricultural products. Online attention is an important form of regional brand awareness of agricultural products on the Internet. Taking the apple industry as an example, this paper uses 6 years of data from the Baidu search index to analyze the spatiotemporal characteristics of apple brands in China. The study has demonstrated a way to analyze online brand attention and its relationship with regional brands. Further studies are to be made in more detailed attributes associated with the forming of attention to enhance the online brand attention and promote agricultural products.

Keywords: Agricultural products, online brand attention, regional brand, spatiotemporal analysis.

INTRODUCTION
In recent years, the rapid development of e-commerce technologies has facilitated to build of new marketing channels for agricultural products. In addition, with the popularity of e-commerce and mobile payment, the online market scale of agricultural products has gradually expanded. At the same time, the e-commerce market competition for agricultural products is intensifying. As the carrier of agricultural product information, Internet has gradually become another core competitiveness of brand promotion for agricultural products in addition to price and quality (Mina Tajvidi et all, 2020). Brand image is an important clue for consumers to judge product quality and plays a positive role in promoting sales and consumers' willingness to buy (Ng & Wang, 2013; Zhang, 2015). The production of agricultural products has strong regional characteristics and resource dependence (e.g., wine products: see Johnson and Bruwer, 2007 & Canziani, & Byrd, 2017). A regional brand of local agricultural products directly reflects the origin characteristics, cultural characteristics, unique quality and reputation value of agricultural products in the region. Thus, the regional brand is of great significance to transform the industrial advantage of regional agricultural products into market value (Wang et al., 2022). Online promotion of agricultural products provides a favorable environment for the construction of regional brands of agricultural products. Improving the regional brand images of agricultural products via Internet platforms such as e-commerce sites and social network apps, has become a topical issue that draws much attention from academia and the industries.

The regional brand of agricultural products can be defined as "the sum of the goodwill of the brands of agricultural enterprises (or families) with considerable scale, strong production capacity, high market share and influence formed in a certain region, usually in the form of 'regional name + category name" (Pyzhikova, et al. 2020). Existing studies have shown that product quality, service quality and social experiences are the key factors affecting the regional brand building of agricultural products in the e-commerce environment (Tolba, 2015; Margarisová, & Vokacova, 2016; Zhang et al., 2019). Agricultural products with a strong regional brand image generally have a better market value (e.g., a selling price) than others (Pyzhikova et al., 2020) as brand image can boost the brand equity which leads to revenues and profits (Faircloth et al 2001). When consumers have a sense of identity for certain agricultural products with a regional brand, such a regional brand can enhance the trust between consumers and producers (Shang et al., 2018). For consumers, the higher the brand awareness, the higher their perception of the brand value and the stronger their willingness to make online purchases (Wang et al., 2022). In this sense, brand attention on the Internet is a representative form of brand awareness (Huang et al., 2020). Therefore, a deep understanding of the agricultural product distributions with a regional brand on the Internet can enrich research on regional brand development of agricultural products from the perspective of consumers.

One of the high-value agricultural products is apple. Because of policy support, market incentives and the adoption of new agricultural technologies, there has been a major increase in the China's apple market productivity and thus tends to reach supply-demand balance and as a result, intensifies the competition in the apple market. Thus, accelerating the promotion of apple regional brand awareness is of great significance to ensure the income of apple growers and improve apple production efficiency. Therefore, the purpose of this paper is to reveal the spatial-temporal distribution of online brand attention for

China's region's apple brands. The findings can be used to formulate marketing strategies and have implications for further improving apple's brand promotion.

DATA SOURCES AND RESEARCH METHODS

Data source

China's apple planting area and yield account for about 50% of the world's total. The country has 25 out of 31 provinces that produce apples. The Bohai Bay and the Northwest Loess Plateau are two dominant apple production areas in China, from where this study selects four regional apple brands as the research objects, i.e., Luochuan apple, Yantai apple, Huaniu apple and Aksu apple.

By December 2021, China's search engine users reached 829 million, accounting for 80.3% of the nation's total Internet users with Baidu search ranking at the top in the search market share (China Internet Network Information Center, 2022). The user search behavior using Baidu search engine can reflect the user's attention on certain products to a certain extent. Therefore, this paper indirectly reflects the consumers' online attention to regional apple brands based on the search index data of relevant apple regional brands provided by Baidu Index (index.baidu.com). Baidu Index is a data-sharing platform based on the behavior data of millions of users. It shows the historical search volume of a certain keyword on Baidu. Users can use Baidu Index to study the trend of keyword searches, gain insight into changes in Internet users' demand, and analyze market characteristics from the perspective of consumers.

The data used in this study was collected from the Baidu Index platform. In particular, the Baidu composite index is considered as online attention of Apple brands in various regions. The data consists of the daily Baidu composite index of "Luochuan apple", "Qixia apple", "Gansu apple" and "Aksu apple" in 31 Chinese regions between January 2013 and December 2019 (note: data of other periods were affected by the subsequent Covid-19 pandemic).

Analysis method

Gini coefficient is a common indicator for measuring the income gap of residents in a country or region. In this study, Gini coefficient is used to measure inter-provincial differences in regional apple brands' online attention. Its formula is as follows:

$$G = \frac{1}{KW} \sum_{k=2}^{K} \sum_{j=1}^{k-1} (Q_k - Q_j)$$

(1)

Where: G is the Gini coefficient; W is the sum of a regional apple brand's online attention in K provinces; Q_k and Q_j are online attention of the kth and j^{th} provinces ranked from low to high, respectively. The greater the Gini coefficient, the greater the difference in attention on a regional apple brand among provinces.

Herfindahl index (H) is a comprehensive index to measure the degree of concentration, which reflects the degree of agglomeration of regional economic scale indicators. The value of Herfindahl index ranges from 0 to 1, where the closer to 1, the lower the degree of regional economic agglomeration.

$$H = \sum_{i=1}^{N} P_i^2$$

(2)

Where: P_i is the ratio of the total number of indicators in a certain region. The closer H is to 1, the higher regional concentration of the regional apple brand's online attention.

Temporal analysis of regional apple brands' online attention

Weekly variation analysis

The weekly distribution of each regional apple brand's online attention is calculated by averaging the weekly Baidu indexes of the four apple regional brands each year. As shown in Figure 1, the online attention of each regional brand is usually higher during weekdays with the highest level on Monday, a decline on Tuesday, slight fluctuation on Thursday and Friday and continuing to decline on Saturday and Sunday to reach the lowest level on Sunday. Such a trend is probably because most people work during the week and travel at the weekend. Thus, their online search behavior decreases, which leads to a decrease in online attention on regional apple brands.
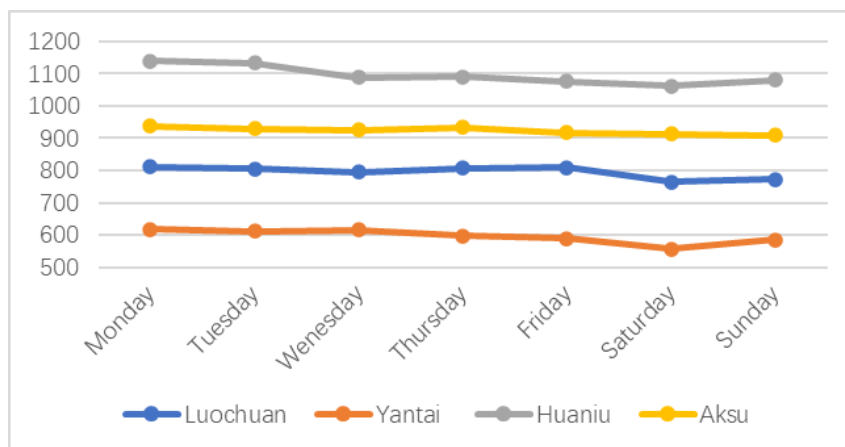
Figure 1: Weekly variation of online attention on four regional apple brands

Monthly variation analysis

The monthly average online attention of the four regional apple brands from 2013 to 2019 is shown in Figure 2. The results show that most online attention is from September to December every year, which is consistent with the time for apple picking and storage. From November to December and from January to February, Aksu apple receives the highest online attention. From March to October, Gansu apple's online attention is the highest, especially from September to October with the online attention being significantly higher than other regional apple brands. Yantai apple has the lowest online attention, which is similar to Luochuan apple which has a slightly higher monthly online attention figure than Yantai apple.
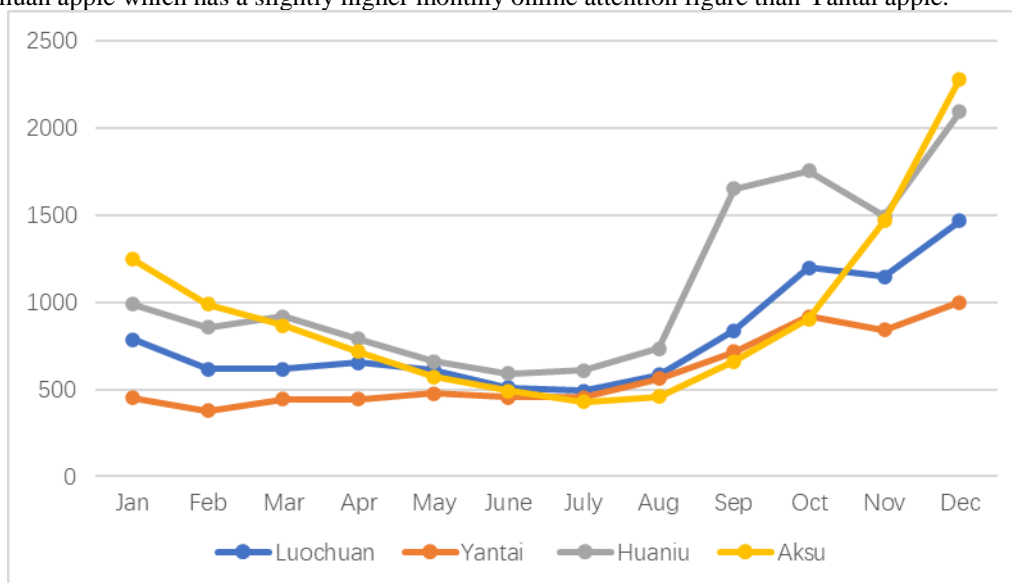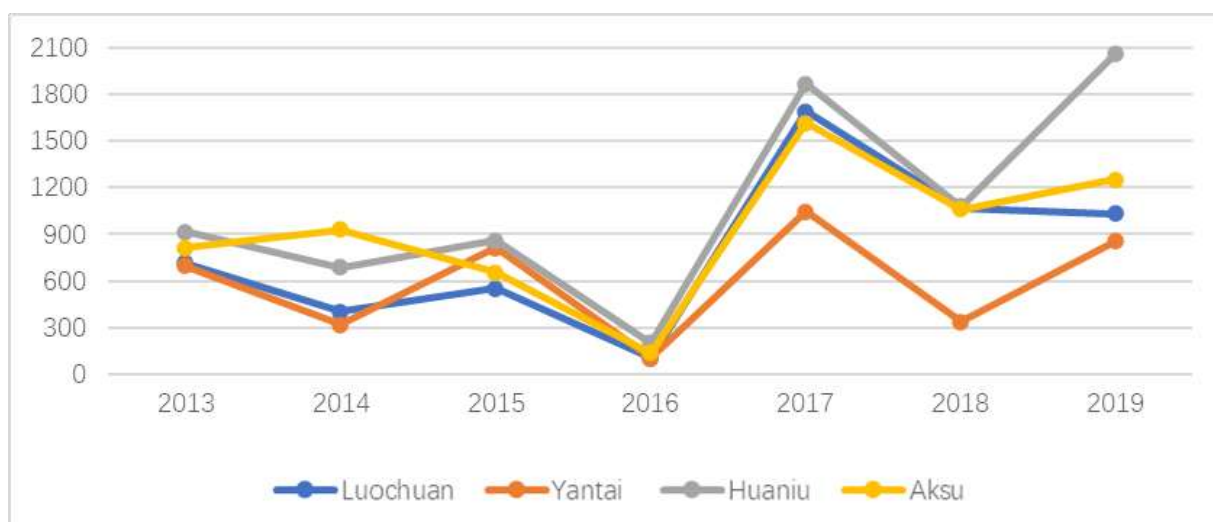

Figure 2: Monthly variation of online attention on four regional apple brands

Annual variation analysis

As shown in Figure 3, the annual online attention of Huaniu apple and Aksu apple is relatively high in general. Since 2017, online attention on Huaniu apple, Aksu apple and Luochuan Apple has significantly increased.

Spatial analysis of apple brands attention by regions
Regional differences
The Gini coefficient of Aksu apple is found to be the highest, while that of Huaniu apple is the lowest (see Table 1). High Gini coefficient indicates a great difference in online attention among provinces. It means that the online attention of a regional apple brand is mainly from netizens in one or a few provinces. In general, the inter-provincial Gini coefficient of each regional apple brand's online attention is high with a fluctuating growing trend. These results indicate that there is a large difference in inter-provincial online attention with a trend of gradual expansion.

Table 1. Gini coefficient of online attention on four regional apple brands

	Luochuan	Yantai	Huaniu	Aksu
2013	0.3256	0.3836	0.4181	0.4287
2014	0.6361	0.5944	0.5971	0.7177
2015	0.9545	0.8375	0.8892	0.9460
2016	0.3792	0.5309	0.4435	0.4624
2017	0.3698	0.4265	0.3810	0.4455
2018	0.5750	0.4894	0.3974	0.5440
2019	0.5332	0.5846	0.5503	0.5514

Source: This study.

The Heffendal coefficients are found to be close to 0.1, with little difference between different regional apple brands' online attention (see Table 2). Thus, the concentration of attention on regional apple brands is low and relatively scattered.

Table 2. Heffendal coefficient of online attention on four regional apple brands

	Luochuan	Yantai	Huaniu	Aksu
2013	0.0657	0.0647	0.0509	0.0541
2014	0.1307	0.1369	0.0947	0.0876
2015	0.1273	0.1151	0.0987	0.1280
2016	0.0472	0.2078	0.2711	0.0483
2017	0.0500	0.0693	0.0470	0.0491
2018	0.0742	0.0977	0.0887	0.0836
2019	0.0881	0.0926	0.0561	0.0669

Source: This study

National distribution of regional apple brands' online attention
This section used data from 27 provinces and 4 municipalities directly under the central government in the year 2019. The proportion of each province in the total search volume for each brand and the proportion of each regional apple brand in the total search volume for each province were analyzed and compared. The results are shown in Table 3. People from Beijing, Shandong, Guangdong, Zhejiang and Hubei pay high attention to the four regional apple brands. Luochuan apple receives the highest attention in Shaanxi, Ningxia and Guizhou. Yantai apple receives the highest attention only in Shandong. Huaniu apple has the highest attention in Gansu, Henan, Heilongjiang, Fujian, Qinghai and Tibet. Aksu apple has the highest attention in Xinjiang, Liaoning, Tianjin, Jilin, Shanghai and Hunan. From a regional perspective, the economy of provinces in eastern China is relatively more developed than other regions, which might lead to people's stronger willingness to consume apples. In

addition, in alignment with the law of distance decay, the closer the region is to the origin of a regional apple brand, the higher the online attention is on this regional apple brand.

Table 3. Provincial differences in online attention on four regional apple brands

	The proportion of each province in the total search volume of each regional apple brand				The proportion of each brand in the total search volume of the four regional apple brands in each province			
Province	Luochuan	Yantai	Huaniu	Luochuan	Yantai	Huaniu	Aksu	Luochuan
Shanghai	0.0468	0.0433	0.0344	0.0619	0.2356	0.1635	0.2388	0.3621
Yunnan	0.0173	0.0100	0.0147	0.0142	0.2812	0.1217	0.3292	0.2679
Inno Mogolia	0.0199	0.0143	0.0202	0.0177	0.2515	0.1353	0.3526	0.2607
Beijing	0.0831	0.0833	0.0739	0.0469	0.2752	0.2067	0.3377	0.1805
Jilin	0.0253	0.0157	0.0120	0.0301	0.2854	0.1326	0.1868	0.3953
Sichuan	0.0471	0.0334	0.0376	0.0256	0.3061	0.1627	0.3375	0.1937
Tianjin	0.0211	0.0312	0.0216	0.0424	0.1709	0.1892	0.2413	0.3987
Ningxia	0.0081	0.0020	0.0041	0.0029	0.4349	0.0819	0.3047	0.1784
Anhui	0.0312	0.0327	0.0363	0.0446	0.1977	0.1556	0.3176	0.3291
Shandong	0.0369	0.1592	0.0550	0.0579	0.1234	0.3987	0.2531	0.2248
Shanxi	0.0222	0.0282	0.0225	0.0085	0.2639	0.2506	0.3682	0.1172
Guangdong	0.0772	0.0742	0.0676	0.0752	0.2461	0.1776	0.2975	0.2788
Guangxi	0.0228	0.0221	0.0273	0.0337	0.1959	0.1427	0.3245	0.3369
Xinjiang	0.0048	0.0043	0.0161	0.0434	0.0593	0.0398	0.2753	0.6256
Jiangsu	0.0647	0.0778	0.0407	0.0652	0.2537	0.2289	0.2200	0.2974
Jiangxi	0.0220	0.0231	0.0260	0.0171	0.2312	0.1826	0.3770	0.2091
Hebei	0.0323	0.0471	0.0458	0.0394	0.1826	0.2002	0.3579	0.2593
Henan	0.0552	0.0252	0.0777	0.0309	0.2542	0.0872	0.4934	0.1652
Zhejiang	0.0621	0.0606	0.0549	0.0723	0.2323	0.1701	0.2835	0.3141
Hainan	0.0130	0.0044	0.0103	0.0078	0.3279	0.0829	0.3603	0.2289
Hubei	0.0434	0.0500	0.0460	0.0466	0.2186	0.1891	0.3195	0.2728
Hunan	0.0268	0.0236	0.0316	0.0427	0.1946	0.1286	0.3164	0.3604
Gansu	0.0115	0.0108	0.0537	0.0104	0.1090	0.0765	0.7005	0.1141
Fujian	0.0239	0.0246	0.0425	0.0381	0.1645	0.1272	0.4033	0.3049
Tibet	0.0008	0.0002	0.0006	0.0003	0.3612	0.0643	0.3944	0.1801
Guizhou	0.0177	0.0080	0.0087	0.0123	0.3551	0.1199	0.2397	0.2853
Niaoning	0.0265	0.0223	0.0241	0.0524	0.1931	0.1218	0.2416	0.4435
Chongqing	0.0256	0.0173	0.0154	0.0221	0.2994	0.1522	0.2478	0.3006
Shaanxi	0.0864	0.0341	0.0443	0.0151	0.4531	0.1342	0.3206	0.0921
Qinghai	0.0042	0.0011	0.0037	0.0025	0.3203	0.0628	0.3972	0.2197
Heilongjiang	0.0204	0.0159	0.0308	0.0198	0.2084	0.1222	0.4341	0.2352

Source: This study

Conclusion

People usually search for relevant information on goods in advance before making a purchase decision. To a certain extent, people's search behavior for regional apple brands on the Internet is representative of the popularity of a brand. Based on the Baidu search index, this study analyzes the spatiotemporal characteristics of online attention of four regional apple brands. The results show that regional apple brands' online attention is on the rise over time. In terms of weekly characteristics, the brands' online attention is high during weekdays and low during weekends, which is highly related to people's living and working habits. The monthly online attention shows a "U" shape with the peaks and troughs consistent with the seasonal characteristics of apple production. In addition, online brand attention of regional apples is unevenly distributed throughout the country, with more attention from provinces near each apple production region and economically developed provinces.

By analyzing the spatiotemporal characteristics of regional apple brands' online attention, this study provides a quantitative measurement of regional apple brands' popularity on the Internet. To promote a regional apple brand, future studies will be incorporating online celebrities on well-known platforms. In addition, further analysis can be made to investigate the spatial distribution of online brand attention of regional apples to find where most potential consumers are located. Finally, it is aimed

to target these regions and apply a series of marketing strategies to actively attract consumers and identify detailed factors influencing online brand attention.

REFERENCES

Canziani, B., & Byrd, E. (2017). Exploring the influence of regional brand equity in an emerging wine sector. Journal of Wine Economics, 12(4), 370-377.

China Internet Network Information Center, 49th statistical report on China's Internet development, 2022, http://www.cnnic.net.cn/hlwfzyj/hlwxzbg/hlwtjbg/202202/t20220225_71727.htm, accessed on 9 September 2022

Faircloth, J. B., Capella, L. M., & Alford, B. L. (2001). The effect of brand attitude and brand image on brand equity. Journal of Marketing Theory and Practice, 9(3), 61–75.

Finn, Adam. 1988. Print ad recognition readership scores: An information processing perspective. J. Marketing Res. 25 168–177.

Johnson, R. and Bruwer, J. (2007), "Regional brand image and perceived wine quality: The consumer perspective", International Journal of Wine Business Research, Vol. 19 No. 4, pp. 276-297.

Ladeira, Wagner & Santini, Fernando & Jardim, William. (2020). The influence of brand credibility on consumers' attention to sales promotions. Journal of Promotion Management. 26. 1-19.

Margarisová, Klára & Vokacova, Lucie. (2016). Regional branding: Building brand value. Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis. 64. 2059-2066.

Mina Tajvidi, Marie-Odile Richard, YiChuan Wang, Nick Hajli, (2020). Brand co-creation through social commerce information sharing: The role of social media, Journal of Business Research, 121, 476-486,

Ng, C. S.-P., & Wang, W. Y.-C., (2013). Best practices in managing social media for business". Paper presented at the International Conference on Information Systems (ICIS), Milan, Italy. Paper 39. Dec 15-18.

Pieters, R., Warlop, L., & Wedel, M. (2002). Breaking through the clutter: Benefits of advertisement originality and familiarity for brand attention and memory. Management Science, 48(6), 765–781.

Pyzhikova, Natalya & Smirnova, Tatyana & Chepeleva, Kristina & Shmeleva, Zhanna. (2020). The brand as a tool for agricultural product promotion in the region. Proceedings of the Ecological-Socio-Economic Systems: Models of Competition and Cooperation (ESES 2019) 10.2991/assehr.k.200113.036.

Zhang, Y. (2015) The impact of brand image on consumer behavior: A literature review. Open Journal of Business and Management, 3, 58-62.

Tolba, Ahmed. (2015). Factors affecting country brand equity: A business perspective. : The Sustainable Global Marketplace (pp.234-234).

Wang, Erpeng, Liu, Zhenzhen, Gao, Zhifeng, Wen, Qin, Geng, Xianhui. (2022) Consumer preferences for agricultural product brands in an E-commerce environment. 38(2): 312-327.