

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

International Journal of Hospitality Management

journal homepage: www.elsevier.com/locate/ijhm

Research paper

Uncertainty risks and strategic reaction of restaurant firms amid COVID-19: Evidence from China

Jaewook Kim^a, Jewoo Kim^b, Yiqi Wang^{c,*}^a Conrad N. Hilton College of Hotel & Restaurant Management, University of Houston, 4450 University Drive Suite S2302, Houston, TX 77204, USA^b Department of Apparel, Events, and Hospitality Management, Iowa State University, 17 MacKay Hall, 2302 Osborn Drive, Ames, IA 50011, USA^c Department of Apparel, Events, and Hospitality Management, Iowa State University, 7E MacKay Hall, 2302 Osborn Drive, Ames, IA 50011, USA

ARTICLE INFO

Keywords:

COVID-19
Food delivery
Restaurant industry
Uncertainty reduction theory
Quality signaling cues
Brand

ABSTRACT

To contain the pandemic of coronavirus (COVID-19), social distancing, self-isolation and travel restrictions have been imposed globally. To shed light on how COVID-19 is affecting restaurant industry, this study aims to explore the factors that affect restaurant firms' financial turnaround for their sustainability after the business shutdowns amid the COVID-19 pandemic. By utilizing a total of 86,507 small- and medium-sized restaurant firms' sales data collected from nine cities in Mainland China, the exploratory approach of this study successfully determines positive impacts of three aspects of operational characteristics (i.e., delivery, discounts, and service type) and brand effects as uncertainty minimizing factors amid distinctive business shutdowns and restrictions. This is the first empirical study in the management realm on the impacts of COVID-19 on restaurant industry. This paper strengthens the extant literature by highlighting the impact of COVID-19 on the restaurant industry after the business restrictions are lifted.

1. Introduction

The world has previously experienced diverse disease outbreaks. However, the COVID-19 (a respiratory illness) pandemic has resulted in distinctive implications for the global public health and economy due to its unprecedented scale of impact on every aspect of human life (Gössling et al., 2020). The World Health Organization (WHO) declared a global pandemic as COVID-19 rapidly spread worldwide (Sohrabi et al., 2020). As of July 9, 2020, Johns Hopkins University and Medicine Corona Resource Center (2020) reported that nearly 12 million cases have been confirmed and more than 549,533 deaths in 195 countries, including approximately 2.98 million confirmed cases and 131,000 deaths in the US (Centers for Disease Control and Prevention (CDC), 2020).

To contain the extensive and rapid spread of COVID-19, travel and mobility restrictions and lockdowns were ordered first in Wuhan, China (local lockdown began on January 23, 2020) and then in most countries by the end of June 2020 (Gössling et al., 2020, CSSE at JHU, 2020). To slow down the spread of COVID-19, self-preventive practices, such as social distancing, have been strongly suggested and applied. However, these social methods have led to rapid and massive shutdowns and lockdowns in many cities and states, thereby ultimately resulting in

devastating impacts on the economy, including the hospitality and tourism industries (e.g., restaurants and hotels) (Ozili and Arun, 2020). For example, the gross domestic product (GDP) of the US significantly decreased at an annual rate of 4.8% in the first quarter of 2020 (Bureau of Economic Analysis, 2020). Similarly, GDP of China was contracted by 6.8% in the first quarter (Cheng, 2020). Specifically, GDP of Hubei, COVID-19 epicenter in China was shrank 40% in the first quarter (Tang, 2020).

COVID-19 has substantially changed normal life conditions and created a "new normal" that has forced economic and socio-behavioral changes in the absence of medical treatments and vaccines (Baum and Hai, 2020). While pursuing the new normal in the people's way of life, an increasing tendency has been observed to avoid consuming dine-in services, which involve physical contact with people. Given that restaurant customers are anxious of and concerned with safety issues throughout the food consumption process (Pressman et al., 2020), they may call for different types of contactless services from restaurants, which are essential to contain the spread of infections. Moreover, governments are requesting and monitoring restaurants and other service firms sourcing such direct physical contacts to self-preventive practices (Watanabe and Omori, 2020).

The key issues for the restaurant industry include how business

* Corresponding author.

E-mail addresses: jkim65@uh.edu (J. Kim), jjawoo@iastate.edu (J. Kim), yiqiw@iastate.edu (Y. Wang).<https://doi.org/10.1016/j.ijhm.2020.102752>

Received 22 July 2020; Received in revised form 8 October 2020; Accepted 30 October 2020

Available online 15 November 2020

0278-4319/© 2020 Elsevier Ltd. All rights reserved.

restrictions and changed consumption patterns affect restaurant firms and how such new trends will change after restrictions are eased. In addition, the question on how restaurant firms can overcome the devastating financial impact of the COVID-19 pandemic should be answered. However, the extant studies on restaurant businesses during the COVID-19 pandemic have been piece-by-piece, with the main foci on the pandemic's negative impact (e.g., Kraus et al., 2020), magnitude of such an impact (e.g., Huang et al., 2020; Ozili and Arun, 2020), spillover of the negative impact (e.g., Baum and Hai, 2020; del Rio-Chanona et al., 2020), policies and behavioral protocols (e.g., Watanabe and Omori, 2020; Wen et al., 2020), and prediction of the situation after the pandemic (e.g., Huang et al., 2020). Limited to no study has been conducted in the areas of restaurant resilience and financial performance after easing restrictions in the market. Thus, the main purpose of the current study is to fill this research gap by exploring the factors that affect restaurant firms' financial turnaround for their sustainability after the COVID-19 pandemic.

Many marketing and risk management studies have introduced compelling theories that provide foundation for the determinants of restaurants' financial performance in crises. In restaurant studies, risk management strategies have been explored with respect to uncertainty and risk reduction behavior of restaurant customers. Given that this pandemic situation implies huge risks and immeasurable uncertainty regarding the safety and quality of food consumption, people are seeking additional critical cues to mitigate their risk averse attitude and behavioral patterns in the consumption process. From this standpoint, the current study focuses on the attributes of restaurant firms that have positively contributed to the turnaround of the restaurant industry amid the continuing business restrictions caused by the COVID-19 pandemic.

To elaborate the aforementioned aim, uncertainty reduction theory, which states the notion that people need information on the other party to reduce their uncertainty when interacting, provides the theoretical foundation of the current research (Berger and Calabrese, 1974; Turner and West, 2010). People utilize multiple information sources to set outcome expectancies based on uncertainty risks. While collecting information, customers explore diverse quality signaling cues to minimize the uncertainty risks associated with safety and quality of restaurant products. For quality signaling effects, previous studies have extensively investigated various cues from the customer standpoint, such as brand equity (Srinivasan et al., 2005), price (Mazumdar et al., 2005; Li and Hitt, 2010), advertising (Weber and Schweiger, 2017; McAlister et al., 2007), online review (Zhu et al., 2019), and discount (Philander et al., 2016; Zhu et al., 2019). Thus, restaurant firms should find effective cues in responding to the pandemic. However, no research has yet to be specifically conducted on the impact of such cues on business restrictions and aftermath.

1.1. Objectives of this study

The main purpose of this study is to explore restaurant firms' financial sustainability strategies amid the COVID-19 pandemic. To fulfill this research purpose, current study has three specific research objectives: (1) to empirically confirm the impacts of COVID-19 pandemic on financial performance of restaurant firms; (2) to investigate whether the degree of such impacts of COVID-19 pandemic was moderated by business restrictions correspondingly; and (3) to explore effective quality signaling cues that influence customers' perceived uncertainty risks, which ultimately affect restaurant performance after restrictions are eased. This study employs the exploratory approach to estimate the effects of the COVID-19 outbreak and the following business restrictions on restaurant sales from various perspectives. To this end, this study determines effective business factors and practices to mitigate losses from such external shocks and reverse declining financial performance so that suggest the way to strategize such findings for a turnaround in performance of restaurants during the global pandemic. This exploratory approach will contribute to the body of literature on

the impact of COVID-19 on the restaurant industry after the business restrictions are lifted. In particular, restaurateurs are suggested to implement business resilience measures and risk response strategies by utilizing their business characteristics.

2. Literature review

2.1. COVID-19 in China

In China, the COVID-19 pandemic broke out initially in Wuhan, one of the country's major cities. To control the spread of COVID-19, the Chinese central government completely locked down Wuhan on January 23, 2020. The city lockdown affected more than 9 million citizens, all types of local businesses, and a broad range of transportation. On January 25, 2020, 30 local governments temporarily prohibited inter-provincial transportations and closed all non-essential businesses not directly related to people's livelihood (Xinhuanet, 2020). Meanwhile, a nationwide complete lockdown was imposed, which is the world's most extensive home isolation that covers more than 1.2 billion people in China. Since late February, the central government has gradually resumed business operations and production with the decreasing daily confirmed cases, and scheduled to completely reopen the economy in the second quarter of 2020 (Ifeng, 2020). For the restaurant industry, more than 83% of restaurants have completely or partially resumed their operations as of March 31 (Meituan Research Institute, 2020).

During the lockdown period, various preventive restrictions were imposed at the national and local levels. The central government's restrictions include complete shutdowns of hard-hit regions, accompanying transportation suspension, traffic control in non-epidemic areas, closure of entertainment and leisure venues, wearing of masks, temperature checks, and stay-at-home order. Furthermore, local governments implemented extensive and specific preventive measures. These measures include bans on travel, mobility, mass gathering, closure of highways, reduction of public transportation services, and ban on wildlife and live poultry trade.

Business-related restrictions varied according to local COVID-19 situations. Some provinces and cities (e.g., Hubei Province and Wuhan) were completely locked down. Hence, only essential businesses, such as pharmacies and grocery stores, could operate. Some regions, including Shanghai, Beijing, and Guangdong Province, applied relatively loose business restrictions. Their local governments enabled even non-essential service businesses to operate during the lockdown. Thus, restaurants in these regions could partially operate their curb-side takeaway and/or delivery services, following new operation requirements, including employee health screening, temperature checks twice per day, mask-wearing, daily environment sanitization, and avoiding contact with wild animals and live poultry (Sohu, 2020). As the daily confirmed cases continue to decrease, local governments have lifted numerous restrictions and reopen their economy. An increasing number of restaurants can operate their dine-in services since the end of February.

2.2. Socioeconomic impact of the COVID-19 pandemic

As COVID-19 rapidly spread globally, travel restrictions and complete lockdowns have been adopted in most countries by the end of March (Gössling et al., 2020). More than 90% of the world's population have been affected by some level of international travel restrictions. Many countries (e.g., Italy, Spain, India, and the US) have also implemented some degree of restrictions on mobility, including limited air travel and stay-at-home orders.

The global economy has been severely affected with the continued spread of the COVID-19 pandemic. The restaurant industry appears particularly vulnerable to a long crisis. Bartik et al. (2020) summarized the vulnerability of restaurant entrepreneurs with a specific probability of survival relative to the duration of the crisis. They described that the

chance of survival substantially decreased from 72% (1-month crisis) to 15% (6 month-crisis; [Bartik et al., 2020](#)). This estimation indicates that small businesses can easily collapse from a significant crisis, such as the COVID-19 pandemic.

This vulnerability of the restaurant industry is likely to result from behavioral changes in response to the crises. Amid the COVID-19 pandemic, one of the distinctive behavioral changes is self-preventive practice (e.g., social distancing), which is considered crucial in flattening the infection curve (CDC, 2020). Such a practice has also been recommended by food safety authorities to maintain a space of at least 6 feet in restaurants. These critical preventive practices limited the operational capacity of restaurants, thereby resulting in an evident decrease in financial performance. Another reason of the economic devastation of the restaurant business during this pandemic is government lockdown and business shutdown orders. These stringent restrictions had led to the rapid closure of businesses, thereby resulting in billions of dollars' worth of business losses. In the US, a bailout package of \$150 billion was sought to overcome such a business devastation ([Ozili and Arun, 2020](#)).

Given the aforementioned reasons, uncertainty risks cause financial distress to restaurants with reduced customer influx. Although restaurants are allowed to remain open for take-away as an operational alternative for customers, only a few staff members are required to serve decreased customers, while people perform self-preventive practices that mitigate fear of infection. Along with government restrictions, this self-preventive behavior directly affects employment and the operation of restaurant firms ([Lund et al., 2020](#)). For example, approximately 3.6 million employees involve food preparation and serving (includes fast food businesses) and 2.6 million restaurant servers and 1.3 million restaurant cooks are recognized to be vulnerable to business restrictions amid the COVID-19 pandemic ([Lund et al., 2020](#)). Furthermore, many small restaurants were forced to decide to remain closed because the contracting restaurant market and strict business restrictions prevent these establishments from operating sustainably.

Despite the significant vulnerability from external shocks, restaurateurs have sought new opportunities based on the changed environment and new normal brought about by the COVID-19 pandemic. These opportunities include altering or adapting their business models to minimize customers' uncertainty toward the restaurant industry. For example, the rapid spread of COVID-19 has substantially increased delivery services. Due to fear of infection, many people have preferred to stay home voluntarily by practicing self-preventive measures and used delivery services to purchase restaurant meals. For example, a roasted duck restaurant in Beijing nearly doubled its daily takeaway orders in the first two weeks of March ([Chinanews, 2020](#)). In Wuhan, food delivery orders through Meituan.com tripled ([Luan, 2020](#)). After this pandemic, maximizing these new opportunities and consumption patterns from the perspective of customer risk reduction strategies aims to prepare for future external shocks caused by such disease-related risk situations.

2.3. Theoretical background of uncertainty risks

Due to fear of infection and uncertainties of safety and product quality, customers are reluctant to dine out and instead try to find alternatives to minimize uncertainties associated with quality/safety. Customer uncertainty could be theoretically explained by uncertainty reduction theory ([Berger and Calabrese, 1974](#)). This theory posits that people collect substantial information to minimize decision uncertainty, thereby enabling them to predict anticipated outcomes (e.g., behavioral changes, attitudes) before engaging in interactions ([Berger and Calabrese, 1974](#)). When individuals have high uncertainty, they are willing to collect additional relevant information to minimize the negative consequences of the uncertainty ([Tidwell and Walther, 2002](#)).

Customers make purchase decisions based on their expectations and the uncertainty of restaurant consumption amid the pandemic. Due to the uncertainty and anxiety about safety and fear of infection

throughout the consumption process, customers are reluctant to dine out and instead trying to find alternatives to minimize quality/safety associated risk uncertainty ([Bánáti, 2011](#)). In this context, restaurateurs need to identify what people's concerns are (cognitive uncertainty) and what customers' behaviors mean (behavioral uncertainty; [Berger and Calabrese, 1974](#)). This information could be cues of reducing risk uncertainty as well as signaling quality and safety of products that recover customers' sense of trust toward the restaurants ([Bandura, 2001](#); [Kim et al., 2020](#)). Given that customers assess uncertainty risks based on fear of infection and poor product quality, restaurateurs should provide numerous risk-reducing and quality-signaling cues on the restaurant operation to alleviate such risks of customers before they avail of the restaurant service ([Berger and Calabrese, 1974](#); [Larrimore et al., 2011](#)). In this context, restaurateurs must identify customers' concerns/uncertainty (cognitive uncertainty) and how they react to the perceived uncertainty risks (behavioral uncertainty) ([Berger and Calabrese, 1974](#)). In a pandemic situation, restaurateurs should communicate with customers regarding the actual risk uncertainty (i.e., COVID-19), their strategic plans for safety and sanitation, and how they can back up and diversify sales channels in considerably protective manner.

At present, the media (e.g., advertising, online community, company website, social media) excessively provides preferable cases (e.g., delivery, discount, curb-side pick-up, brand image) for customers in many different environmental settings ([Hardin and Greer, 2009](#); [Nabi and Clark, 2008](#)). Thus, customers access and share information (e.g., consumption experience, quality review) and quality signaling cues (e.g., brand image, sanitation score, service types) to minimize uncertainty risks. They also attempt to observe other customers who show similar outcome expectancies and/or what alternatives restaurants offer to customers for such expectancies. Information acquired from these search behaviors, including observations of other customers, serve as important references, thereby leading to attitude/behavior changes.

3. Method

3.1. Data

This study collected monthly average sales data for restaurant operations in 2019 and the first quarter of 2020 from Meituan.com, which is the largest delivery service provider in China. To thoroughly investigate how the influence of COVID-19 on the restaurant industry has changed depending on local restrictions, this study collected the information of local restrictive measures that affect restaurant operations from local government announcements and news releases. The information includes shutdown periods and economic reopening steps at the local level. This study used the restrictive measures on restaurant businesses as bases to exclude cities that did not allow restaurants to fully operate in March. As a result, 9 cities remained in the final sample (see [Table 1](#)). We collected a total of 86,518 observations from 9 cities and then excluded 11 outliers detected with clustering analysis ([Zhao, 2012](#)). Finally, 86,507 observations were used for data analysis. The cumulative confirmed cases and deaths were obtained from the National Health Commission of China. Data on restaurant attributes were also obtained from Meituan.com. Furthermore, this study derived the

Table 1
Regions with different restrictive business measures.

Regions with less strict business restrictions (Region 0)	Regions with extensive shutdowns (Region 1)
Chengdu	Changsha
Nanning	Hangzhou
Shanghai	Hefei
	Kunming
	Xi'an
	Zhengzhou

population data from the database of the Migrant Population Service Center, National Health Commission P.R. China.

3.2. Model and variables

To investigate the effects of COVID-19 on restaurant performance, the dummy for COVID-19 and the different restaurant attributes were regressed against monthly sales. The formulated model was estimated by performing fixed-effects analysis. The model is presented as follows:

$$\ln SALES_{i,t} = \beta_0 + \beta_1 PANDEMIC_t + \beta_2 REGION_i + \beta_3 REGION_i * PANDEMIC_t + \beta_4 RATE_{i,j,t} + \beta_5 MEAL_{i,j,t} + \beta_6 CATE_k + \beta_7 CAT-E_k * PANDEMIC_t + \beta_8 DELIVERY_{i,j,t} + \beta_9 DELIVERY_SQ_{i,j,t} + \beta_{10} FEE_{i,j,t} + \beta_{11} MINIMUM_{i,j,t} + \beta_{12} DISCOUNT_{i,j,t} + \beta_{13} DISCOUNTS_{i,j,t} * PANDEMIC_t + \beta_{14} DISCOUNT_{i,j,t} * REGION_i + \beta_{15} DISCOUNT_{i,j,t} * REGION_i * PANDEMIC_t + \beta_{16} BRAND_m + \beta_{17} BRAND_m * PANDEMIC_t + \beta_{18} REGION_i * BRAND_m + \beta_{19} REGION_i * BRAND_m * PANDEMIC_t + CITY_n + \epsilon_{i,t}$$

In this model, the dependent variable is average monthly sales (SALES) and the primary independent variable is PANDEMIC, which is defined as 1 for the year 2020 and 0 otherwise. Their relationship was explored to determine if there were changes in sales after the COVID-19 outbreak. The model also has REGION and its interaction with PANDEMIC (REGION*PANDEMIC) to investigate the influence of government restrictive interventions on restaurant performance during the health crisis. REGION is defined as 1 for cities where restaurants could not run their business during the shutdown period, and 0 for cities that did not completely close restaurants. Changsha, Hangzhou, Hefei, Kunming, Xi'an, and Zhengzhou were coded 1, and Chengdu, Nanning, and Shanghai were 0.

Brand equity (BRAND) and discount options (DISCOUNT) were the other foci of this analysis. Brand equity is net benefits that brands provide compared to non-brands (Kim et al., 2018). Discount serves as a small monetary incentive to customers. To examine the impact of brand equity and discount on restaurant purchase behaviors during the pandemic, we added their respective interactions with other variables to the model. Specifically, the interactions of BRAND*PANDEMIC, BRAND*REGION, DISCOUNT*PANDEMIC, and DISCOUNT*REGION were developed to determine how the effects of brand and discounts on restaurant purchases changed due to the pandemic and business restrictions. In addition, three-way interactions of BRAND*REGION*PANDEMIC and DISCOUNT*REGION*PANDEMIC were analyzed to check whether the regional differences in brand and discount effects were sustained after the pandemic.

This analysis includes restaurant category (CATE) and its interaction with PANDEMIC (CATE*PANDEMIC) to investigate the impact of the service types of restaurant operations on sales and the changes in the impact caused by the COVID-19 outbreak. CATE is defined as 0 for fine dining restaurants, 1 for casual dining restaurants, 2 for fast casual restaurants, and 3 for fast food restaurants. In addition, this study included overall rating (RATE), delivery time (DELIVERY and DELIVERY_SQ), delivery fee (FEE), and minimum order amount (MINIMUM) to examine the influences of restaurant attributes on purchase behavior. City dummy (CITY) was added to the model to control for the geographic effects. Table 2 presents the detailed description of the variables.

3.3. Analysis

The presented model above was developed to complete three main objectives of this study. First, we regressed PANDEMIC against SALES to investigate the financial impact of COVID-19 in the restaurant industry. Second, the interaction of REGION and PANDEMIC was considered to see if the financial impact of COVID-19 varied according to regions that different business restrictions were instituted. Third, we explored the role of quality signaling cues in determining restaurant performance (SALES) during the pandemic crisis by looking at the interactions of

Table 2
Description of variables.

Variable	Description
<i>ln</i>	Logarithmic transformation indicator
<i>SALES</i>	Average monthly sales in RMB (¥)
<i>REGION</i>	0 for cities where restaurants can run their pick-up and delivery services, 1 for cities where restaurants cannot run their pick-up and delivery services due to extensive shutdowns
<i>PANDEMIC</i>	0 for 2019, 1 for 2020 (1 st quarter)
<i>RATE_i</i>	Average overall ratings of OCRs
<i>MEAL</i>	Average check amount in RMB (¥) per order
<i>CATE</i>	Types of restaurant operations: 0 for fine dining, 1 for casual dining, 2 for fast casual, and 3 for fast food
<i>DELIVERY</i>	Average delivery time in minutes
<i>DELIVERY_SQ</i>	Quadratic term of <i>DELIVERY</i>
<i>FEE</i>	Average delivery fee in RMB (¥)
<i>MINIMUM</i>	Minimum order amount in RMB (¥) for delivery service
<i>DISCOUNT</i>	0 for no discounts, 1 for discount options
<i>BRAND</i>	0 for weak brands, 1 for strong brands
<i>CITY</i>	Dummy for cities

BRAND, CATE, and DISCOUNT with PANDEMIC. Further, these signaling cues' three-way interactions with REGION and PANDEMIC were analyzed to investigate how the relationships between signaling cues and restaurant performance changed depending on imposed business restrictions amid the COVID-19 pandemic.

4. Results

4.1. Descriptive statistics

Table 3 illustrates the descriptive statistics of the variables. The average monthly sales per restaurant (SALES) is RMB 635.45. The means of the average order amount (MEAL) and minimum amount for delivery service (MINIMUM) are RMB 26.58 and RMB 21.96, respectively. The average delivery time (DELIVERY) was 41.86 min with standard deviation of 17.44, indicating that most orders (99%) were delivered in approximately 1 h and 35 min. However, there is a huge difference between the maximum and minimum time, indicating that some ordered meals may take nearly two weeks to deliver from restaurants to customers. Given that all restaurants with unreasonably long delivery time of over one day characterized the operations in 2020, this condition may mean that business restrictions amid COVID-19 may have prompted many restaurants to start offering delivery services. Moreover, some of them may even ask customers to order their meals one to several days prior to the date when meals are delivered to them. The mean of the average delivery fee (FEE) is RMB 4.84. A total of 116 restaurants charged high delivery fees (i.e., more than RMB 50), and 85 (73.28%) of them were from Chengdu, Shanghai, and Hangzhou. This result may suggest that FEE is highly associated with the local economy and labor cost, given that the average income of the three cities are substantially higher than the national average (Xinchou.com, 2020).

The annual growth in variables between 2019 and 2020 is provided in Fig. 1. The average annual growth in SALES was 26.29%, and the highest growth was observed in Changsha (34.11%). DELIVERY considerably increased from 38.10 min to 46.80 min on average. That is,

Table 3
Descriptive statistics.

	Mean	STD	Min	Max
<i>SALES</i>	635.45	1,104.31	0	9999
<i>RATE</i>	2.92	2.11	1	5
<i>MEAL</i>	26.58	14.18	6	547
<i>DELIVERY</i>	41.86	17.44	2	882
<i>FEE</i>	4.84	3.95	0	200
<i>MINIMUM</i>	21.96	28.19	0	1500

Note. SALES, MEAL, FEE, and MINIMUM in RMB (¥); DELIVERY in minutes.

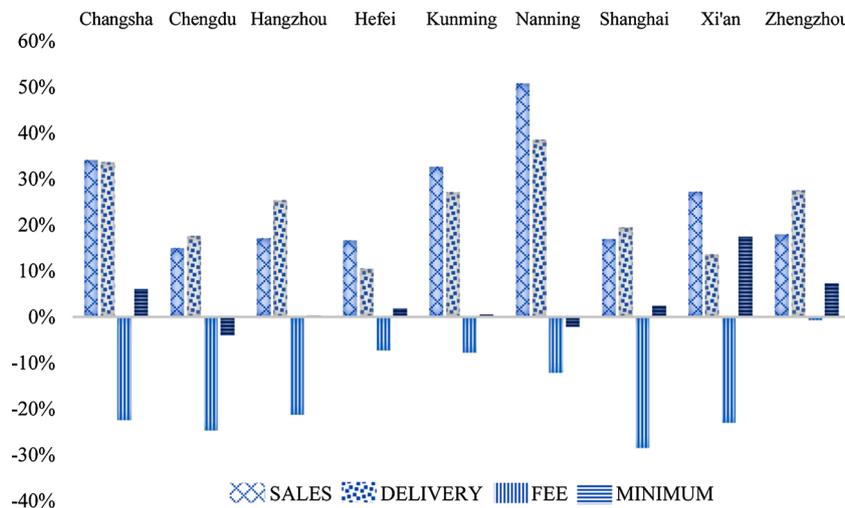


Fig. 1. Annual growth in attributes by cities.

the substantially increased demand significantly slowed down the pace of delivery services. In particular, food deliveries were delayed by over 30% in Changsha and Nanning. *MINIMUM* increased by an average of 2.78%, and 7 out of 9 cities had slight increases. This result suggests that restaurants required customers to include additional dishes into their delivery orders in 2020 to increase their operation efficiency and financial performance. Although delivery time and minimum order amount increased in the shutdown period, *FEE* decreased in all cities and the average growth was -8.44%. Unlike other variables, there were no noticeable changes in *MEAL* (0.25% increase).

4.2. Estimation results

Table 4 shows the coefficient estimates of the variables. *PANDEMIC*

Table 4
Estimation results of single variables.

	SALES		SALES
<i>PANDEMIC</i>	0.15** (0.001)	<i>REGION*PANDEMIC</i>	0.254*** (0.000)
<i>REGION</i>	-0.386*** (0.000)	<i>CATE*PANDEMIC</i>	
<i>RATE</i>	0.478*** (0.000)	<i>Casual dining</i>	0.496*** (0.000)
<i>MEAL</i>	0.001** (0.009)	<i>Fast casual</i>	0.129** (0.003)
<i>CATE</i>		<i>Fast food</i>	0.051 (0.241)
<i>Casual dining</i>	0.098*** (0.001)	<i>DISCOUNTS*PANDEMIC</i>	-0.425*** (0.000)
<i>Fast casual</i>	0.129*** (0.000)	<i>REGION*DISCOUNT</i>	0.220*** (0.000)
<i>Fast food</i>	0.111*** (0.001)	<i>REGION*DISCOUNT*PANDEMIC</i>	-0.265*** (0.000)
<i>DELIVERY</i>	0.005*** (0.000)	<i>BRAND*PANDEMIC</i>	0.269*** (0.000)
<i>DELIVERY_SQ</i>	-0.000* (0.036)	<i>REGION*BRAND</i>	0.086** (0.005)
<i>FEE</i>	-0.006*** (0.000)	<i>REGION*BRAND*PANDEMIC</i>	-0.064 (0.162)
<i>MINIMUM</i>	-0.003*** (0.000)		
<i>DISCOUNT</i>	0.071*** (0.000)		
<i>BRAND</i>	0.341*** (0.000)		
<i>CITY</i>	-0.018*** (0.000)		

***0.001, **0.01, *0.05.

($\beta = 0.153, p = 0.001$) was positively significant on *SALES*, showing that restaurants generated 16.5% ($= e^{0.153} - 1$) more average monthly sales in the first quarter of 2020 than in 2019. This result means that restaurants offering food delivery services benefited from the COVID-19 crisis.

REGION ($\beta = -0.386, p < 0.000$) was negatively related to *SALES*, indicating that restaurant sales in Region 1 were 32.1% lower than those in Region 0. It implies that the restaurant market in Region 0 was more vibrant than that in Region 1 regardless of COVID-19. The interaction of *PANDEMIC* and *REGION* ($\beta = 0.254, p < 0.000$) was positive on *SALES*, indicating that Region 1 where the massive business shutdown was ordered had higher sales growth than Region 0 which imposed less strict business restrictions. Evidently, Fig. 2 shows that the difference in monthly sales between Regions 0 and 1 decreased in 2020 compared with 2019.

Results of this study also revealed that casual dining ($\beta = 0.098, p = 0.001$), fast casual ($\beta = 0.129, p < 0.000$), and fast food ($\beta = 0.111, p < 0.000$) restaurants had higher sales (10.3%, 13.8%, and 11.7%, respectively) than fine dining restaurants. However, their interactions with *PANDEMIC* were not consistently significant on *SALES*. This result indicates that the effects of the pandemic on sales were different according to the service types of restaurants (see Fig. 3). In the first quarter of 2020, casual dining restaurants ($\beta = 0.496, p < 0.000$) and fast casual restaurants ($\beta = 0.129, p = 0.003$) had higher sales than fine dining restaurants. Note that after the outbreak of COVID-19, the difference in sales between casual dining and fine dining restaurants substantially increased from 10.3%–81.1%. The sales difference between fast casual and fine dining restaurants also increased from 13.8%–29.4%. However, the difference in sales between fine dining and fast food restaurants did not significantly change.

This study found that *DISCOUNT* ($\beta = 0.071, p < 0.000$) was positively related to *SALES*, indicating that restaurants offering discount options had higher sales than others without discounts. Unlike the individual effects of *DISCOUNT*, the interaction of *DISCOUNT* and *PANDEMIC* ($\beta = -0.425, p < 0.000$) was negatively related to *SALES*. In particular, when restaurants offered discount options after the COVID-19 outbreak, their sales became lower than those of restaurants without discounts. The positive effect of *REGION*DISCOUNT* ($\beta = 0.220, p < 0.000$) on *SALES* presented that small monetary incentive promoted restaurant performance more effectively in Region 1 than Region 0. The three-way interaction of *REGION*DISCOUNT*PANDEMIC* ($\beta = -0.265, p < 0.000$) was negatively related to *SALES*. This result suggests that discount-based promotion strategies in Region 1 was no longer effective during the COVID-19 crisis and may be detrimental to the restaurants.

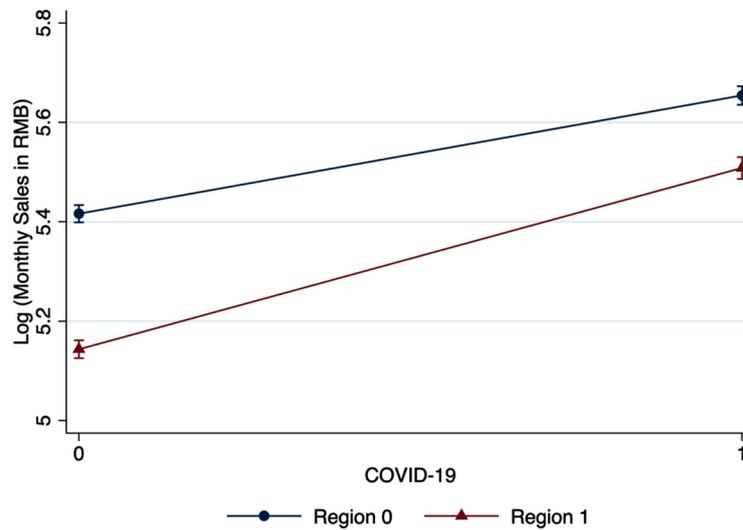


Fig. 2. Interaction of REGION and PANDEMIC.

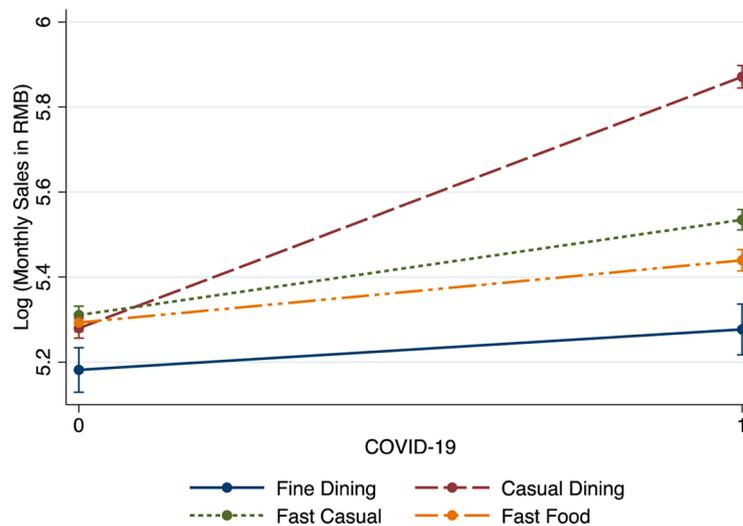


Fig. 3. Interaction of PANDEMIC and CATE.

BRAND ($\beta = 0.341, p < 0.000$) was found to be positive on SALES, showing that strong branded restaurants had 40.6% higher sales than weak-branded ones. The interaction of BRAND and PANDEMIC ($\beta = 0.269, p < 0.000$) was positive on SALES, indicating that brand effects on restaurant performance continued after the COVID-19 pandemic. The interaction of REGION*BRAND ($\beta = 0.086, p = 0.005$) was also positively related to SALES. This result indicates that strong brands were more persuasive among customers in Region 1 than Region 0. However, the three-way interaction of BRAND*REGION*PANDEMIC was not significant on SALES. This result may imply that regional differences in brand effects may disappear after the COVID-19 pandemic started. A more detailed discussion on their relationship is provided in the conclusion section.

RATE ($\beta = 0.478, p < 0.000$) and MEAL ($\beta = 0.001, p = 0.009$) were positively related to SALES, indicating that increases in review ratings and average order amount significantly contributed to restaurant performance. FEE ($\beta = -0.006, p < 0.000$) and MINIMUM ($\beta = -0.003, p < 0.000$) also affected SALES. This result specifically indicates that when delivery fees and minimum order amount increased by 1 RMB, restaurant sales decreased by 0.4% and 0.3%, respectively. In addition, DELIVERY ($\beta = 0.005, p < 0.000$) was positive on SALES, indicating that as the delivery time increased, restaurant sales also increased. However,

they were not linearly associated but quadratic. We found that DELIVERY_SQ ($\beta = -0.000, p = 0.036$) was negative on SALES. This result shows that food delivery time increased with higher sales, but longer delivery time beyond a certain point significantly reduced restaurant sales.

5. Conclusion

The general impact of COVID-19 and the associated business restrictions were empirically tested on the basis of the main purpose of this study. First, the severity of the pandemic and the total number of confirmed cases are related to the degree of restrictions and shutdown.

Table 5
Descriptive statistics of cities.

	Number of Operation	Operations w/o sales	Proportion of ops w/o sales	Confirmed case	Cases per million
Region 0	82,969	8,926	10.76%	512	12.25
Region 1	73,688	13,283	18.03%	985	15.97

This study showed that areas with extensive shutdown had more confirmed cases than areas with less strict business restrictions (see Table 5).

The finding that Region 1 with more confirmed cases showed higher sales growth than Region 0 during the pandemic (see Table 4) may suggest that fear of infection plays an important role in boosting sales of restaurants offering contactless and/or risk minimizing consumption options, such as delivery and pick-up services. This fact may also be associated with the total number of restaurants. Restaurateurs decide whether to run restaurant operations during the crisis according to the perceived risks of the COVID-19 pandemic. A less competitive environment was established with the closure of restaurant operations led by restaurateurs' risk averse attitudes. This change in competition was higher in Region 1 (18.03% closed) than Region 0 (10.76% closed), and may help restaurants in the areas with extensive shutdown have better performance than those in areas with less strict business restrictions. Thus, the finding of higher sales growth of restaurants in Region 1 after easing extensive shutdown could be comprehended.

Second, service type showed significant differences in terms of financial performance after the COVID-19 pandemic. The finding indicates that casual and fast casual dining restaurants had significantly higher sales than fine dining restaurants after the restriction eased. Given that restaurant type (i.e., casual and fast casual) was considered a representation of price, these relationships imply that restaurant type can be a critical quality signaling cue in the pandemic crisis. Accordingly, customers prefer to consume at higher priced restaurants than fast food restaurants to secure safety and positive food quality expectancies. However, the financial effects of service types did not apply to fine dining restaurants even though they signal the highest food quality and safety in the market. Fine dining restaurants, which are likely destination-dining establishments, are particularly vulnerable to customers' self-quarantine. When people take these self-imposed stay-at-home measures, the understanding is that consuming fine dining menu items is not the first consideration among restaurant options. The considerably low sales increase of fine dining restaurants may also result from the limited customer pool and negative outcome expectancy due to high price. This negative expectancy violation became a huge constraint for fine dining restaurants to extend and strengthen their delivery and pick-up services. Given the gap between price-based outcome expectancy and the perceived quality of delivery foods of customers, the quality signaling effect of price/service type is likely to generate negative expectancy violation. Consequently, people who stay home prefer to consume reasonably good quality and safe foods with more home food-like foods amid a long self-restricted period. Furthermore, increased financial uncertainty due to the economic turmoil may reduce the demand for fine dining. Overall, these changes yield the most distinctive differences between fine dining and casual/fast casual restaurants.

Third, delivery positively contributes to the sales of restaurants no matter what restrictions the city imposed. Given that dine-in services were restricted, restaurant should secure additional potential customers through their curb-side pick-up and delivery services, thereby extending their delivery areas. Hence, average delivery time gets longer to reach out to customers far from the operations. However, delivery efficiency was also determined as a quadratic formula. Quadratic function identifies the axis of symmetry of the parabola delivery time and sales graph. The negative coefficient of the quadratic formula indicates that the efficiency of delivery goes down when the delivery time consumed for each delivery is beyond the vertex (axis of symmetry of a reversed U-shape). Thus, finding the vertex is the key to optimizing restaurant delivery services.

Fourth, restaurants with discount options showed higher sales than those without discount options. However, the positive contribution of discount options was overturned after business restrictions have been eased, showing the negative effects of discounts on sales during the pandemic crisis. In addition, the difference in firm performance between restaurants with discounts and those without discounts was larger in

Region 1 than Region 0 (see Fig. 4). These results indicate that discount strategies that were effective in boosting sales in the pre-pandemic period failed to revamp the stagnant restaurant sales after the pandemic started. This phenomenon ends up representing minimized effects of discount strategy at the end. The large positive effects of discount strategy on restaurant performance before the restriction clearly offset the negative effects of it (e.g., reducing the check amount per order). Along with the finding on the interactions with service types and COVID-19, this negative effect of discounts demonstrate that perceived risk becomes a main determinant of restaurant selection instead of perceived value or financial incentives after the pandemic outbreak. This finding reaffirmed the role of price as a quality signaling cue that mitigate perceived risks on product quality uncertainty as well as behavioral uncertainty. During the pandemic, customers are less price sensitive and purposively consumed selected menu items that provide best value of safety and health throughout the consumption process. These pursued values significantly affect consumers' behavior of searching quality-signaling cues. In this cognitive process, customers rely more on health and safety with highest product quality than financial incentives and/or monetary discounts. This can be interpreted that restaurant customers consume foods from selected restaurants that provide highest quality with different quality signaling cues, rather than quality cues that minimize financial loss when customer fail to consume correct products and/or to perceive what they expected to get. This finding further explains that discounts should be carefully used as a sales generator and is not a quality signaling cue for financial performance after selectively and temporarily easing restrictions.

Fifth, brand is a crucial quality signaling cue for risk uncertainty (Berry, 2000). As such, branded restaurants showed higher sales than non-branded ones in the current study. Moreover, sales of branded restaurants remained higher than that of non-branded ones after the COVID-19 pandemic (see Fig. 5). Brand evidently plays a quality signaling role in the situation of high uncertainty on safety and quality. Furthermore, this study found the difference in brand effects on financial performance between regions with different business restrictions. However, the regional difference in brand effects was diminished during the COVID-19 pandemic. As shown in Fig. 5, there appears to be a prior significant sales performance difference between branded (or unbranded) restaurants in different regions. However, such a difference has become small and minimal after the pandemic. Note that regional differences in brand effects failed to generate significantly distinctive group differences during the pandemic, even though positive brand effects on business performance remain identified from all regions. While business shutdown and other less strict business restrictions have been imposed with self-preventive practices for containing pandemic situation, most of markets have suffered from diminished volume of customers. In sum, this study demonstrates that in this economic turmoil, brand plays quality signaling cues for customers' decision-making process. Consequently, customers are likely to choose branded restaurants over unbranded ones no matter where they are located and what restrictions are imposed.

6. Discussion

6.1. Theoretical contributions

First, this study is one of the first attempts to empirically estimate the impact of pandemic diseases on restaurant firms' financial performance, and investigate if the financial impact is different according to unique restaurant aspects and functions (e.g., brand equity measures and operational characteristics). The exploratory approach of this study successfully determines three aspects of operational characteristics (i.e., delivery, discounts, and service type) and critical brand effects as uncertainty minimizing factors.

Second, this research used small- and medium-sized restaurant firms' sales data collected from nine cities in Mainland China for data analysis.

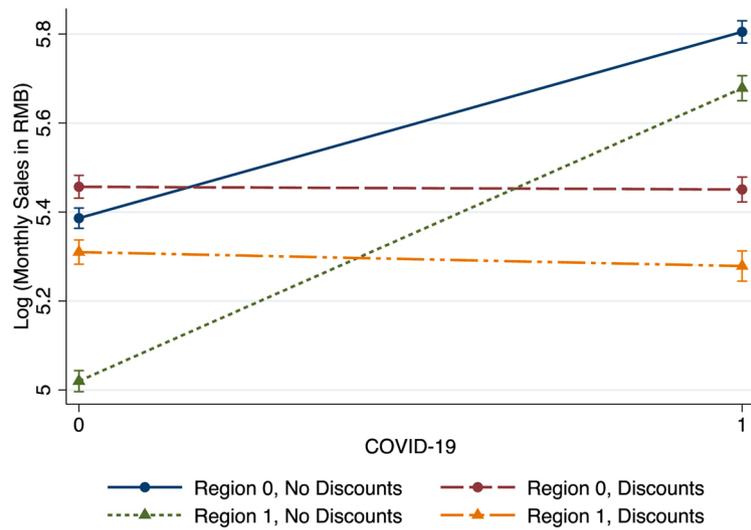
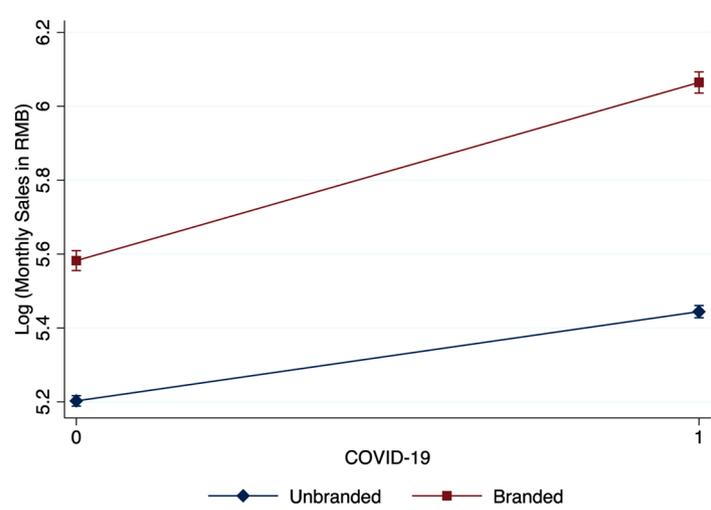


Fig. 4. Three-way interaction of PANDEMIC, REGION, and DISCOUNT.



(a) Interaction of BRAND and PANDEMIC

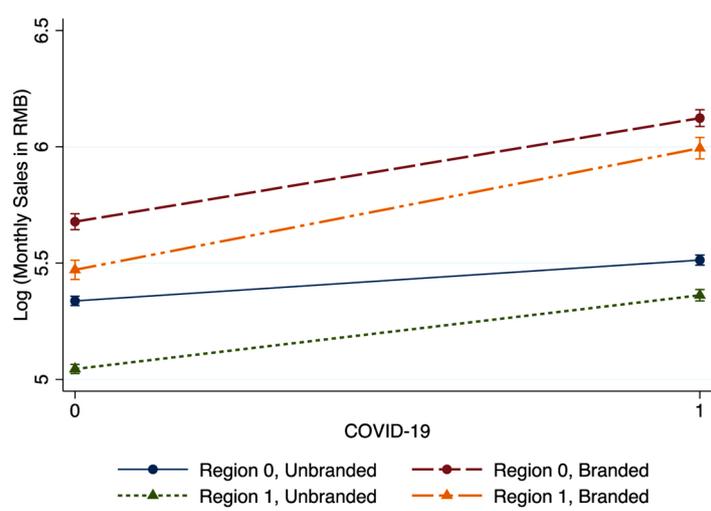


Fig. 5. Interactions of BRAND.

This data enabled the empirical testing of the impact of COVID-19 and the associated business restrictions on financial performance of restaurant firms. In particular, monthly data were considerably valuable in an attempt to precisely measure such an impact and strategize the findings for the situation after easing business restrictions.

Thirdly, business shutdowns and less strict business restrictions were distinctively analyzed to determine the promising uncertainty minimizing and risk mitigating factors on restaurant firms amid the COVID-19 pandemic. The monthly data enable this study to empirically confirm the dynamics caused by different types of restrictions. These findings indicate that operational characteristics and brand effect could be strategized to safeguard the sales revenues of restaurant firms. Moreover, the findings validate that uncertainty reduction theory can be applied to restaurant industries amid the COVID-19 pandemic.

6.2. Practical implications

First, it is recommended to share information on the restaurant industry's current effort and actions taken to address financial difficulties amid the COVID-19 pandemic and to identify and implement effective ones among such industrial strategies. For example, Yum in China (i.e., Pizza Hut and KFC) offered contactless delivery in locations that remained open. With a strong partnership with mobile delivery platforms (e.g., DoorDash, Grubhub), delivery services and curb-side pick-up and other contactless delivery of the Yum brand could be a recommendation for the restaurant industry.

The findings of this study support the positive financial impact of this delivery service during the COVID-19 pandemic. At present, revenues of grocery delivery services, such as *FreshDirect* and *Instacart*, have skyrocketed. Due to fear of infection in the absence of vaccines, consumers will continue to replace restaurant visits with at-home consumption. This situation could be new opportunities for restaurateurs to maximize their delivery and pick-up services. Among the suggestions is that additional at-home consumption-friendly menu items be developed and delivered via contactless procedure with online delivery companies. Packaging, portion size, ready to reheat technologies, and vacuum packaging for safety and sanitation could be another considerable momentum for the business model conversion and sustainable development model of restaurant firms.

Fine dining could be transformed for business success amid the COVID-19 business restrictions. Our findings show that fine dining restaurants improved their sales via delivery service. However, the majority of fine dining restaurants are destination-dining establishments, even more than neighborhood-focused restaurants. Hence, the former is particularly vulnerable to stay-at-home orders and excessive restrictions. A media company reported that 75% of fine dining restaurant guests come from out of town for a special occasion or special trip (Pershan, 2020). Evidently, dining at restaurants is one of the lowest priorities when people are under self-preventive practices. This change in customers' mindset place fine dining restaurants in a substantially difficult position in the market. Hence, restaurateurs of fine dining restaurants should diversify their sales channels by adding takeout dishes and delivery options. To secure high-quality food, packaging and delivery technology should be optimized and new recipes must be seamlessly revised as backup for the business.

For the safety and quality uncertainty concerns of customers, restaurateurs should highlight their systemic benefits of contact-free curb-side pick-up and extensive delivery systems and the large volume of customers using the systems to chip away uncertainty risks derived from safety concerns and fear of infection. This communication should be made via online and offline channels for the point of purchase sales marketing. Thus, consistent message and information on their operation systems (e.g., delivery, curb-side pick-up) and benefits of such alternatives (e.g., discount coupons, special packaging, special family menus) should be delivered to customers through online platforms (e.g., websites, social network sites, emails) and offline platforms (e.g., standing

signboard, menu, paper brochure, banner).

Second, for safety concerns associated with dine-in allowance, restaurants should deliver clear preventive operation manuals, including social distancing, employee training, and communicating with customers' safety and sanitation protocols. Starbucks highlights its hand washing philosophy (Lucas, 2020). McDonald's advertises that their employees frequently clean surfaces, such as door handles, self-order kiosks, and tabletops. As the number of confirmed COVID-19 cases in the US increases, restaurateurs should elevate their in-store cleanliness effort, strategize their crisis manual, and prepare for long-term uncertainty risks in the business.

Third, given that strong brands symbolize high-quality service attributes and reliability, customers rely heavily on brands when they are concerned with quality uncertainty (Berry, 2000). Thus, restaurateurs should build a differentiated brand image with strong messages and behavioral activities, such as corporate social responsibility activities and community involvement with grassroots marketing standpoint. Since relational marketing has been effective in delivering service-/product quality, brand community and social networking sites should be judiciously used to manage and monitor customer experiences and perceived brand image. To further utilize this process in a pandemic situation, restaurateurs could also make intuitive and direct communications on risks, diseases, and restrictions to secure sustainable business operations supported by in-network customers.

Lastly, customer participation is highly recommended for building a safety culture and sanitation guidelines, which enables other customers to observe how restaurants deal with the pandemic and how restaurant customers reflect their best practices for safety and sanitation. In addition, restaurateurs should provide discount coupons or free meals for those who suggest innovative ideas related to securing safety and minimizing fear of infection. Discounted/free meal as awards could motivate customers to share their ideas and reflect their safety concerns, as well as make them set high and improve outcome expectancies (restaurant consumption). This activity could be an event on social network sites or websites, and recognize the award winner and specific suggestions they made. This strategy is a means to strengthen customer relationship and further elevate brand reputation in the market.

6.3. Limitations and future research

Even though this study made distinctive contributions to the body of literature, some limitations should be specified and promising future research topics must be discussed. First, this study includes extensive data solely from China. Although China is the first country that reported confirmed COVID-19 cases and imposed city lockdowns and business shutdowns, other countries are needed to explore macroscopic views on the COVID-19 impacts on the restaurant industry. This consideration in future studies is expected to further discover global dynamics with different restrictions under different geospatial characteristics.

Second, COVID-19 is an ongoing global pandemic. This study's main focal point is on the business restrictions. Thus, the time window of this study is considerably limited. Future studies with longitudinal approach with further data can explore the gradual resilience of multiple business segments and entire markets reflected by time variant factors. Hence, changes in confirmed cases, domestic socioeconomic status, and industry-specific changes could deepen the understanding of the impact of COVID-19 and the associated business restrictions.

Lastly, data limitations should be dealt with in future studies. This study focused on variables related to restaurant operation characteristics and brand equity aspects. Even though this research determined the impacts of such variables under a given situation, these variables remain limited. There could be numerous diverse risk-reducing factors based on characteristics of diseases (e.g., Ebola virus, O-157, H1N1 pandemic in 2009, SARS), customers (age, gender, experience, risk patterns), and restaurants (restaurateurs' personality, main menus, average price, size). It will be fruitful for future studies to include additional pandemic

disease cases and diverse risk reducing factors from the perspectives of restaurateurs and customers.

References

- Bánáti, D., 2011. Consumer response to food scandals and scares. *Trends Food Sci. Technol.* 22 (2-3), 56–60.
- Bandura, A., 2001. Social cognitive theory: an agentic perspective. *Annu. Rev. Psychol.* 52 (1), 1–26.
- Bartik, A., Cullen, Z., Bertrand, M., Glaeser, E.L., Luca, M., Stanton, C., 2020. How are small businesses adjusting to COVID-19? Early Evidence From a Survey (NBER Working Paper No. 26989). National Bureau of Economic Research.
- Baum, T., Hai, N.T.T., 2020. Hospitality, tourism, human rights and the impact of COVID. *Int. J. Contemp. Hosp. Manage.*
- Berger, C.R., Calabrese, R.J., 1974. Some explorations in initial interaction and beyond: toward a developmental theory of interpersonal communication. *Hum. Commun. Res.* 1 (2), 99–112.
- Berry, L.L., 2000. Cultivating service brand equity. *J. Acad. Mark. Sci.* 28 (1), 128–137.
- Bureau of Economic Analysis, 2020. Gross Domestic Product, 1st Quarter 2020 (advance Estimate). April 29. Retrieved from. <https://www.bea.gov/news/2020/gross-domestic-product-1st-quarter-2020-advance-estimate>.
- Centers for Disease Control and Prevention, 2020. Cases in the U.S. Retrieved from. <https://www.cdc.gov/coronavirus/2019-ncov/cases-updates/cases-in-us.html>.
- Cheng, J., 2020. China Records First Ever Contraction in Quarterly GDP on Coronavirus. April. Retrieved from. <https://www.wsj.com/articles/china-set-to-report-plunge-in-first-quarter-gdp-11587086697>.
- Chinanews, 2020. 探访北京餐馆:堂食陆续“解封”,外卖订单量明显增长 [Visits to Beijing restaurants: Dine-in foods have been “unblocked” and orders for takeaway have grown significantly]. March 13. Retrieved from. <https://m.chinanews.com/wap/detail/sp/sp/shipin/cns/2020/03-13/news9124575.shtml>.
- del Rio-Chanona, R.M., Mealy, P., Pichler, A., Lafond, F., Farmer, D., 2020. Supply and Demand Shocks in the COVID-19 Pandemic: an Industry and Occupation Perspective. *arXiv Preprint arXiv:2004.06759*.
- Gössling, S., Scott, D., Hall, C.M., 2020. Pandemics, tourism and global change: a rapid assessment of COVID-19. *J. Sustain. Tour.* 1–20.
- Hardin, M., Greer, J.D., 2009. The influence of gender-role socialization, media use and sports participation on perceptions of gender-appropriate sports. *J. Sport Behav.* 32 (2), 207.
- Huang, J., Wang, H., Xiong, H., Fan, M., Zhuo, A., Li, Y., Dou, D., 2020. Quantifying the Economic Impact of covid-19 in Mainland China Using Human Mobility Data. *arXiv Preprint arXiv:2005.03010*.
- Ifeng, 2020. 多省复工率开始大幅“回血”,中国离全面复工复产还有多远? [The Rate of Resumption of Work in Many Provinces Has Begun to “return Blood” Substantially. How Far Is China From Full-scale Resumption of Production?]. March 11. Retrieved from. <http://news.ifeng.com/c/7ukblJwjpOE>.
- Johns Hopkins University & Medicine Corona Resource Center, 2020. COVID-19 Dashboard by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU). Retrieved from. <https://coronavirus.jhu.edu/map.html>.
- Kim, J., Jun, J., Tang, L.R., Zheng, T., 2018. The behavioral and intermediate effects of advertising on firm performance: an empirical investigation of the restaurant industry. *J. Hosp. Tour. Res.* 42, 319–337.
- Kim, J., Kim, J., Lee, S.K., Tang, L.R., 2020. Effects of epidemic disease outbreaks on financial performance of restaurants: event study method approach. *J. Hosp. Tour. Manag.* 43, 32–41.
- Kraus, S., Clauss, T., Breier, M., Gast, J., Zardini, A., Tiberius, V., 2020. The economics of COVID-19: initial empirical evidence on how family firms in five European countries cope with the corona crisis. *Int. J. Entr. Behav. Res.*
- Larrimore, L., Li, J., Larrimore, J., Markowitz, D., Gorsk, S., 2011. Peer to peer lending: the relationship between language features, trustworthiness, and persuasion success. *J. Appl. Commun.* 39 (1), 19–37.
- Li, X., Hitt, L.M., 2010. Price effects in online product reviews: an analytical model and empirical analysis. *Mis Q.* 34 (4), 809–831.
- Luan, Y., 2020. 外卖平台的这些数据,让我们看看“解封”首日的武汉 [Through the data from food delivery platforms, let look at Wuhan on the first day of “unlocking”]. April 8. Retrieved from. <https://www.jfdaily.com/news/detail?id=234757>.
- Lucas, A., 2020. No Swiping Fries, Ditch the Reusable Cup. Restaurants’ Coronavirus Measures Go Beyond Extra Elbow Grease. March 6. Retrieved from. <https://www.cnbc.com/2020/03/06/us-restaurants-respond-to-coronavirus-with-more-cleaning-and-creativity.html>.
- Lund, S., Ellingrind, K., Hnacock, B., Manyika, J., Dua, A., 2020. Lives and Livelihoods: Assessing the Near-term Impact COVID-19 on US Workers. April 2. Retrieved from. <https://www.mckinsey.com/industries/public-sector/our-insights/lives-and-livelihoods-assessing-the-near-term-impact-of-covid-19-on-us-workers>.
- Mazumdar, T., Raj, S.P., Sinha, I., 2005. Reference price research: review and propositions. *J. Mark.* 69 (4), 84–102.
- McAlister, L., Srinivasan, R., Kim, M., 2007. Advertising, research and development, and systematic risk of the firm. *J. Mark.* 71 (1), 35–48.
- Meituan Research Institute, 2020. 餐饮商户复工速度加快,餐饮消费亟待提振 [Restaurant Merchants Resume Work Faster, and Restaurant Consumptions Need to Be Boosted]. Retrieved from. <https://about.meituan.com/news/institute>.
- Nabi, R.L., Clark, S., 2008. Exploring the limits of social cognitive theory: why negatively reinforced behaviors on TV may be modeled anyway. *J. Commun.* 58 (3), 407–427.
- Ozili, P.K., Arun, T., 2020. Spillover of COVID-19: Impact on the Global Economy. Available at SSRN 3562570.
- Pershan, C., 2020. Fine Dining Restaurants Are Pivoting to Takeout and Delivery. Retrieved from. <https://www.eater.com/2020/3/13/21178890/fine-dining-restaurants-react-coronavirus-covid-19-takeout>.
- Philander, K.S., Raab, C., Berezan, O., 2016. Understanding discount program risk in hospitality: a Monte Carlo approach. *J. Hosp. Mark. Manage.* 25 (2), 218–237.
- Pressman, P., Naidu, A.S., Clemens, R., 2020. COVID-19 and food safety: risk management and future considerations. *Nutr. Today* 55 (3), 125–128.
- Sohrabi, C., Alsafi, Z., O’Neill, N., Khan, M., Kerwan, A., Al-Jabir, A., Iosifidis, C., Agha, R., 2020. World Health Organization declares global emergency: a review of the 2019 novel coronavirus (COVID-19). *Int. J. Surg.* 76, 71–76.
- Sohu, 2020. 疫情防控期间,餐饮行业如何正确营业? [During the Epidemic Prevention Period, How Does the Restaurant Industry Operate Correctly?]. February 7. Retrieved from. https://www.sohu.com/a/371265977_99981993.
- Srinivasan, V., Park, C.S., Chang, D.R., 2005. An approach to the measurement, analysis, and prediction of brand equity and its sources. *Manage. Sci.* 51 (9), 1433–1448.
- Tang, F., 2020. Coronavirus: Economy in China’s COVID-19 Epicenter Hubei Shrank 40 Per Cent in First Quarter of 2020. April. Retrieved from. *South China Morning Post*. <https://www.scmp.com/economy/chineconomy/article/3081074/coronavirus-economy-chinas-covid-19-epicentre-hubei-shrank-40>.
- Tidwell, L.C., Walther, J.B., 2002. Computer-mediated communication effects on disclosure, impressions, and interpersonal evaluations: getting to know one another a bit at a time. *Hum. Commun. Res.* 28 (3), 317–348.
- Turner, L.H., West, R., 2010. *Introducing Communication Theory: Analysis and Application*. McGraw-Hill Education, NY.
- Watanabe, T., Omori, Y., 2020. How Much Did People Refrain From Service Consumption Due to the Outbreak of covid-19? Center for Advanced Research in Finance, Faculty of Economics, The University of Tokyo CARF F-Series, 477.
- Weber, P., Schweiger, W., 2017. Content effects: advertising and marketing. *Int. Encycl. Media Effects* 1–13.
- Wen, J., Kozak, M., Yang, S., Liu, F., 2020. COVID-19: potential effects on Chinese citizens’ lifestyle and travel. *Tour. Rev.*
- Xinchou.com, 2020. 全国城市工资排行榜[National City Salary Ranking]. Retrieved from. <https://averagewage.xinchou.com/Ranking/cities/>.
- Xinhuanet, 2020. 30省份启动一级响应,人员物资加速驰援武汉[30 Provinces Started the First-level Response, Personnel and Materials Accelerate the Support of Wuhan]. January 25. Retrieved from. http://www.xinhuanet.com/politics/2020-01/25/c_1125502232.html.
- Zhao, Y., 2012. *R and Data Mining: Examples and Case Studies*. Academic Impress, CA.
- Zhu, D.H., Zhang, Z.J., Chang, Y.P., Liang, S., 2019. Good discounts earn good reviews in return? Effects of price promotion on online restaurant reviews. *Int. J. Hosp. Manag.* 77, 178–186.