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Sustainable Governance of the Sharing Economy: The Chinese Bike-Sharing Industry

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Abstract: Socialist countries, such as China, have stressed the importance of an equitable society where citizens work together. Thus, the sharing economy (e.g., the bike-sharing industry) could be one of the challenges determining the future of China, as the initial bubble of the bike-sharing industry collapsed in 2017, with many problems stemming from the users' deposits that were lost and the depletion of the investment funds, resulting in numerous malfunctioning bikes every day. This paper evaluates the bike-sharing industry in terms of sustainable governance in the future and identifies its factors. Therefore, we use the structural equation model based on survey questionnaires and find that most of the input variables of the perceived rational (PRV) and emotional values (PEV), perceived risk (PR), and externalities (EXT) are not very successful in promoting the sustainable governance of the bike-sharing industry. However, using the bootstrapping simulation approach, we find that the role of modulators such as satisfaction and sustainable management factors are statistically significant. The modulating effect of a user's satisfaction on the intention of continuous use based on all four inputs of PRV (0.304), PEV (0.298), PR (−0.156), and EXT (0.263), as well as the other indirect variables of sustainable management, such as environmental factors (0.284), is shown to be statistically significant. Based on these modulating effects, we conclude that the sharing economy, represented by the bike-sharing industry, could be one of the most important business cases for the future of China, but only if it is strongly supported by the public. Therefore, to help the industry get out of its current slump, we propose that the bike-sharing companies put in more diverse efforts to employ multi-use types of innovation with practical benefits such as coupons for the nearest shops, and social functions that enhance the quality of life such as mileage contribution from bike sharing for disabled people. Evidently, the Chinese government should eliminate "the over-supply issues" through appropriate market governance and increase its efforts toward a better public–private partnership (PPP), as the sharing economy should be based on the harmonization of all interest groups to eventually create value.

Keywords: bike-sharing industry; sharing economy; continuous use intention; structural equation model (SEM)

1. Introduction

Based on the new paradigm of the fourth industrial revolution, the sharing economy has been prosperous worldwide, with the expectation of a rapid growth [1]. Owing to the successful inauguration of star ventures such as Airbnb and Uber, numerous new businesses have successfully entered into the market, and many new start-up companies with sales volumes of more than 1 billion dollars have been established based on the principles of sharing business, serving as a new growth engine for the global economy [2]. The sharing economy is fundamentally different from the traditional competition-based consumer economy, since sharing the value from collaborative networking among all partners, such as consumers and workers, enhances sustainable performance [2]. Under the new norm of sustainable

management, the sharing economy could strengthen corporate social responsibility (CSR) and be a source of creating shared value for all partners. If the sharing economy can create social trust as the reputational capital of society, then all the partners in the sharing economy can create value based on cooperative networking performance [3].

China has participated in this trend, beginning with the bike-sharing system that was introduced in 2014 by the first commercial bike-sharing web company, OFFO, which perfectly met the enormous demand, especially in the downtown areas of major Chinese cities, resulting in a booming new market in a short time. There have been diverse trials of bike-sharing services around the world before their successful inauguration in China. However, most of these bike-sharing services were part of public goods provided by the local governments, resulting in failure due to the tragedy of commons [4], expressed as, for example, stealing or destroying public bikes. After these trial and error experiences, many European countries introduced more updated bike-sharing systems, still as public goods. However, in China, initiated by a private web-based company, OFFO, with smart mobility based on a one-stop service from payment to consumption, many private bike-sharing companies entered the transportation service market in metropolitan areas with great success in a short period [5]. This one-stop service based on smartphones showed extraordinary success in the initial phase of the bike-sharing industry in China. A user has to download a bike-sharing application (App) on his/her smartphone and register to pay through a payment application such as Alipay or WeChat, a very popular smart payment system in China. Then, the user can trace the closest location of a sharing bike on the App and check the quick response (QR) code of the bike with their smartphone. Thus, they are ready to share a bike. After the user rides this sharing bike, he/she gets off the bike and locks it; then, automatically, the service fees shall be transferred to the bike-sharing company based on the duration the bike was used. Through its App, the bike-sharing company can monitor and trace all the sharing bikes in the city in real time.

According to Verified Market Research (2019), the global market size of the sharing bike industry was 1.5 billion US dollars in year 2018 and will have grown at a 22.4% annual growth rate by 2026 [6]. The growth rate is especially higher in Asian countries due to rapidly accelerating urbanization. Based on the successful inauguration of the first private bike-sharing business in 2014, the Chinese government highlighted the sharing economy as one of five core national paradigms (i.e., innovation, cooperation, green [environment], openness, and sharing economy) of the 13th five-year development plan from 2016 to 2020. Led by the bike-sharing industry, the Chinese government predicted at least a 40% annual growth rate of the sharing economy during this five-year plan, up to 10% of the national GDP in 2020. Based on this strong, proactive support by the Chinese government, many sharing businesses have become gigantic leading companies through mergers and acquisitions (M&A) with other sharing companies, with no doubt about the future of this explosive trend in the sharing economy, especially in the bike-sharing industry [7].

From the Chinese government perspective, a much more important mission of the successful bike-sharing industry could be its consideration as an ideal business model for a communist society. Thus, it is strongly supported by diverse incentives, deregulation of the industry, and much more investment by the government. There are several reasons for the success of the sharing economy in China. First, Chinese consumers are ready to use cashless payment systems by phone, and this smart mobility has offered users easy and convenient access to the sharing economy industries. Second, Chinese consumers are early adapters of the sharing economy due to the high penetration rate of smartphone payment systems. More than 51.5% of consumers have already used sharing services to enhance their quality of life [8]. Third, the strong support by the Chinese government means it is very likely for the sharing economy businesses to receive more investment in the future. Fourth, the young generation in China is more accustomed to this new type of sharing businesses due to its convenience and easy access at a very reasonable cost.

However, the bubble of the sharing economy could burst, if the too high expectations from it are not met, with many serious environmental, social, and industrial legacy system problems. Garrett

(1968) argued there is a conflict between individual interests and shared resources, known as the tragedy of commons [4], which comes from the lack of partnership among all the participants of the sharing economy. Owing to the lack of voluntary participation by the users to maintain this sharing economy, at present, thousands of malfunctioning bicycles are collected every morning nationwide in China by trucks, implying that there some missing links for the sustainable management of this type of sharing economy. As shown in Figure 1, 46.8% of Chinese consumers are experiencing convenience in their life through the sharing economy, while 29.8% are benefiting through savings (economy) in consumption [9]. Nonetheless, 27.7% of consumers complained about the accidents due to the low morality of other consumers, and 25.5% are worried about the privacy and security issues of the sharing economy. In particular, 17% of consumers pointed out the importance of appropriate legal measures by the government, and another 14.4% asked for enhanced control and monitoring by the government, implying that 'the tragedy of commons' phenomena occurs in the sharing economy of China, and consequently, a strong, appropriate 'participation' by the government should be accompanied with an ideal public-private partnership (PPP) in the sharing economy.
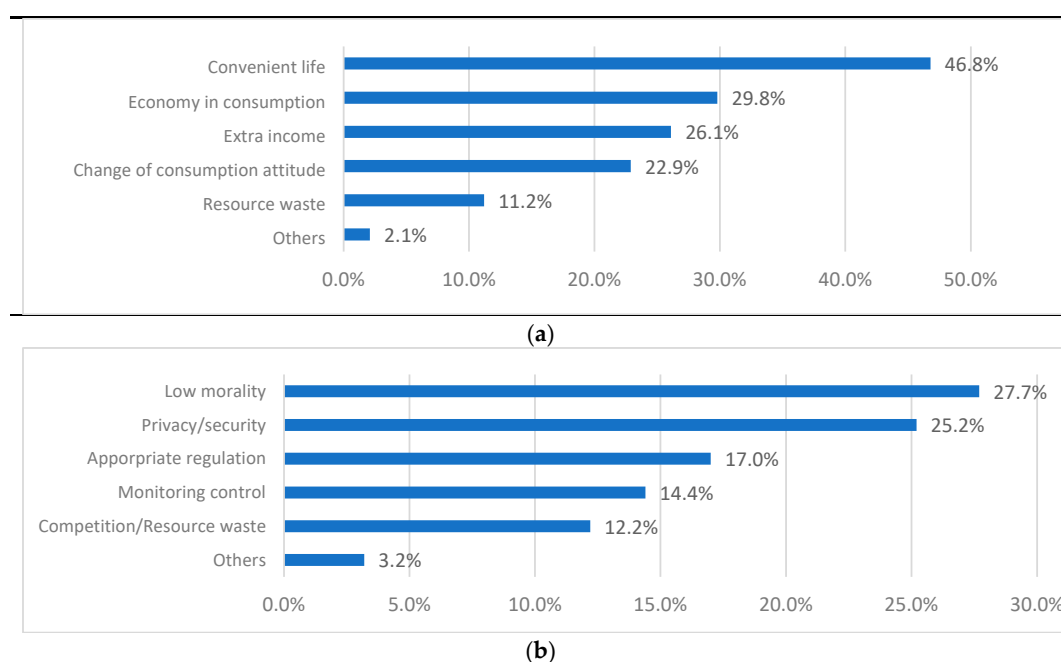

Figure 1. Effect of the sharing economy on the Chinese Consumer (**a**), and Future challenges in 2019 (**b**). Source: ii Media Research (2019) [9].

Therefore, a smooth and soft transition management path toward the sustainable sharing economy has become one of the critical challenges facing the Chinese government, as it could be one of the symbols used to lead the global economy by an ideal communist economy. Similar to Didi chuxing, a car-sharing company, the bike-sharing industry has been one of the hotspots in the Chinese economy. However, owing to the lack of social trust in the bike-sharing industry, there exists serious doubt about the sustainable governance of this industry. Here, we define governance as the workable mechanism of sustainable performance. From the governance perspective, is this type of sharing economy really feasible in a sustainable manner? The objective of this paper is to find out an appropriate answer for this research question. Thus, this paper evaluates the bike-sharing industry in terms of sustainable governance in the future and identifies the sustainable governance factors. For this research purpose, we examine the participating users of shared bicycles in terms of the causal relationship between the perceived values and risks and the willingness for continuous use of the bike-sharing services.

This paper contributes to the literature as follows. First, our research integrates all the marketing theories on customer satisfaction, especially from sustainable management perspectives,

thus identifying more systematic, integrated determinants of the sharing economy in the bike-sharing industry. Since the sustainable management factors of the sharing economy are barely examined in the previous studies, our study offers illuminating insights into the bike-sharing services, the corporations, and the cooperating partners establishing good governance for sustainable management in the sharing economy networks. Second, our research data are based on diverse nationwide major cities by internet respondents who are much more familiar with using sharing systems through information technology (IT) applications. Since they are in general early adapters of new technologies and/or business services, our paper identifies the future challenges facing the sharing economy in China. Third, our paper emphasizes the role of the Chinese government because the sharing economy could be one of the best strategies for China to lead the global economy under its different social and economic system. China has already begun its differentiated strategies on the global economy by focusing on ecological civilization as the national goal of the 21st century. When the United States (US) decided to withdraw from the Paris agreement on climate change, the Chinese government held its strong position to promote an environment-friendly green growth strategy. The sharing economy could be another ideal national strategy that helps China lead the global economy. Therefore, our paper evaluates the future of the Chinese economy during its transition toward the sharing economy, which is strongly supported by the Chinese government, in terms of feasibility of the bike-sharing industry.

The remainder of this paper is structured as follows. Section 2 reviews the related literature with respect to the sharing economy, focusing on the bike-sharing industry in China. Section 3 develops the variables and hypotheses. Section 4 presents the research method and data. Section 5 demonstrates the empirical results. Section 5 summarizes the conclusions and offers insightful policy suggestions.

2. Literature Review

2.1. Conceptual Characteristics of the Sharing Economy

The sharing economy or the collaborative consumption is defined as a peer-to-peer-based activity of acquiring, providing, or sharing access to goods and services that is often facilitated by a community-based on-line platform [1]. The sharing economy allows individuals and groups to create value from underused assets, such as parked cars and unused bedrooms. Thereby, physical assets are shared as services. This type of internalization of externalities is the core of sustainable management, and thus, its most important character could be open connectivity to create value based on collaborative network management [10]. The sharing economy should be based on the sharing of the value created by this collaborative network, resulting in a positive-sum game. If one of the partners just uses the others as a tool for maximizing his or her own benefit, it cannot be sustainable, and thus, Gold et al. defines the sharing economy as the platform economy for 'warm economy' toward value-sharing between all partners in the network, contrary to the traditional cold economy based on the competitive maximization of an individual's economic benefits [11].

As the platform business for collaborative consumption, the most important governance factor of the sharing economy is the role or function of the platform in cooperation and its resulting service quality. Most of previous studies on the sharing economy, therefore, are based on the perceived quality of services from the users' perspectives [12–18]. As shown in the Table 1, most of these studies are based on structural equation modeling (SEM) because the resulting benefits from the sharing economy could and should be measured by the perceived satisfaction as a modulating variable. Notably, most studies used satisfaction as a modulating variable for sustainable management because the invisible value of the sharing economy should come from the satisfaction of all participants in the collaborative consumption network [12,14]. Moreover, the emotional values such as community belonging [12], reputation [13], social benefits [14], social relationship [15], and social value [11] are used as input for collaborative consumption, and thus, we use them as proxy variables in our questionnaires. Additionally, the invisible values of emotional sharing are much more important than the visible profits in the sharing economy. Based on the comparison shown in Table 1, not only the practical benefits of

using shared bikes, but also the emotionally perceived values could be crucial for the user's intention. Moreover, the perceived risk factors such as private information of payment could be considered. Evidently, the bike-sharing industry is not an exception by focusing on the invisible governance factors. We further discuss this causal relation of the bike-sharing industry in the following section.

Table 1. Observable variables and methodologies of the sharing business studies with SEM.

Authors	Subject of Research	Inputs	Outputs	Modulating Variable
Mareike Möhlmann (2015) [12]	Collaborative consumption using a sharing economy option (B2C/C2C)	Community Belonging Cost savings Environmental impact Familiarity, Service Quality Internet capability Smartphone capability Trend Affinity, Trust, Utility	Likelihood of choosing a sharing option again	Satisfaction
Juho H. et al. (2015) [13]	Sharing Economy in Collaborative Consumption	Sustainability, Enjoyment, Reputation, Economic Benefits	Behavioral Intention	Attitude
Lis P. Tussyadia (2016) [14]	Factors of Satisfaction and Intention to Use Peer-to-Peer Accommodation	Social Benefits, Enjoyment Economic Benefits, Sustainability, Amenities Locational Benefits	Future Intention	Satisfaction
Sung, et al. (2018) [15]	Sharing Economy on Accommodation: A Sustainability Perspective	Economic Benefit, Sustainability, Enjoyment, Social Relationship, Perceived Network Effect	Behavior Intention	Attitude
Zahng C. et al. (2018) [16]	Value co-creation in a sharing economy	Emotional value, Functional value, Social value	Willingness to pay premium price	Results by group stage: Pre-consumption During consumption Post-consumption
Martina Toni et al. (2018) [17]	Link between collaborative economy and sustainable behavior	Attitude, Subjective Norms, Perceived Behavioral Control	Sustainable Behavior	Intention
Wang et al. (2019) [18]	Consumption behaviors in sharing economy: A socio-economic approach based on social exchange theory	Antecedents of social exchange factors (Social/Economic Factor)	Sales Performance	Boundaries of social exchange factors (Symbolic/Functional) Reciprocal Behaviors

2.2. Researches on the Sharing Bike Industry

A bike-sharing system could be considered as the basis for the sharing economy because it is reasonably easy to use with a convenient access at an almost negligible price from the user's perspective. Thus, the successful operation of the bike-sharing system may result in a social platform of mutual trust for the user to explore more diverse sharing businesses. In particular, the bike-sharing industry could be considered the barometer for the Chinese economy to enhance ecological civilization and provide a healthier quality of life under the socialist paradigm. Most studies on the bike-sharing industry focused on the perceived attitude of early adapters based on the technology acceptance model (TAM). As shown in Table 2, the studies on the bike-sharing industry are not much different from the general marketing theories of re-use intention based on the perceived satisfaction. Liang et al. (2018) examine the sustainable factors that result in the subjective happiness of users [19], and find that the perceived value comes from the social impact of sharing bikes as well as the economic service values such as the perceived ease of use and usefulness.

As shown in the Table 2, most previous studies on the bike-sharing industry evaluate the causal inputs such as values, risk, and externalities, with the impact on satisfaction and trust as modulating factors, resulting in an increased sustainable re-use intention [19–23]. In particular, the reliability or trust in the platform of the service is crucial for the perceived values of the bike-sharing system. Based on these arguments, our research uses SEM to evaluate the feasibility of the sustainable management of bike-sharing systems. To analyze the feasibility of the bike-sharing systems, the following section defines the variables and develops the hypotheses of our model.

<div align="center">**Table 2.** Comparison of the studies on the sharing-bike industry.</div>

Authors	Subject of Research	Inputs	Outputs	Modulating Variable
Liang et al. (2018) [19]	Bike sharing and users' subjective well-being: An empirical study in China	Perceived Value (Utilitarian/Hedonic/Social) Social Influence Characteristics of the Bike System (Perceived Ease of Use/Usefulness) Personal Accomplishment, Control Variable (Personal Income/Frequency of Shared Bike Use)	Subjective Well-Being	Trust Attitude
Cheng et al. (2019) [20]	Evaluation of bike sharing use over time	Perceived: (Risk/Usefulness/Ease of Use)	Continuous Intention	Satisfaction, Attitude
Leonardo Caggiani et al. (2017) [21]	A user satisfaction-based model for resource allocation in bike-sharing systems	Clustering rush hour/location, Management of the supplier, Efficiency of the deployment.	User-satisfaction-oriented optimum	-
Qiu et al. (2018) [22]	Bike Sharing and the Economy, Environment, and Health-Related Externalities	Energy use condition (energy consumption/GHG emission)	Effect on the public health (death rate/in-patient rate)	-
Yuge Ma et al. (2018) [23]	Challenges of collaborative governance in the sharing economy: The case of free-floating bike sharing case in Shanghai	Governance factors (Convenience, usefulness, economic benefits, etc.)	Level of Public Private Partnership (PPP)	-

3. Operational Definitions of the Variables and Hypotheses

3.1. Perceived Rational and Emotional Values

In general, the perceived value implies the personal belief and attitude from it, and exerts an unconscious effect on the decisions and activities of the human [24]. Zeithaml (1988) defines the perceived quality of value as a global assessment of a consumer's subjective judgment about the superiority or excellence of a product. She concludes, after reviewing a set of articles, that the perceived value is at a higher level of abstraction than a specific attribute of a product [25]. A theoretical framework of perceived value developed by Sheth, Newman, and Gross (1991) suggests that emotional, social, economic values and quality need to be examined to determine the perceived value of the service/product experience, since, in combination, they perform better compared to a single value item such as the economic benefit [26]. Elster (1998) argues that the perceived value should be evaluated based on the rational and emotional benefits coming from the consumption of the service [27]. All these common arguments can be used as proxy variables of emotional [24,25,27] and rational values [19,26,27]. Since the paradigm of the sustainable management is defined as the value creation based on the network management coming from satisfaction, we propose the following hypotheses.

Hypotheses 1-1 (H1-1): *Perceived rational value has a positive effect on the sustainable economic factor.*

Hypotheses 1-2 (H1-2): *Perceived emotional value has a positive effect on the sustainable economic factor.*

Hypotheses 2-1 (H2-1): *Perceived rational value has a positive effect on the sustainable environmental factor.*

Hypotheses 2-2 (H2-2): *Perceived emotional value has a positive effect on the sustainable environmental factor.*

Hypotheses 3-1 (H3-1): *Perceived rational value has a positive effect on the consumer's satisfaction.*

Hypotheses 3-2 (H3-2): *Perceived emotional value has a positive effect on the consumer's satisfaction.*

3.2. Perceived Risk

Perceived risk is defined as the defensive feeling to secure the current status from changes in the surrounding conditions. It could result from the uncertainty about the future, and the perceived loss coming from this uncertainty [28]. If there is any negative information on the bike-sharing service, then a user will be reluctant to reuse it. This perceived risk may come from not only the user's experience in

its first use, but also from the viral information from others as well as the public opinion such as the news [29]. As shown in Figure 1, many Chinese people began to feel uncomfortable with perceived risks from the bike-sharing industry such as a disqualified service (malfunctioning bikes), exposure of their private information, and the dissatisfaction from the service level of the company, resulting in a threat for the sustainable performance of the service. Based on Tables 1 and 3, the proxy variable of perceived risk can be defined [20,28,29], and the following hypotheses can be derived from the aforementioned argument.

Hypotheses 1-3 (H1-3): *Perceived risk has a negative effect on the sustainable economic factor.*

Hypotheses 2-3 (H2-3): *Perceived risk has a negative effect on the sustainable environmental factor.*

Hypotheses 3-3 (H3-3): *Perceived risk has a negative effect on the consumer's satisfaction.*

Table 3. Descriptive statistics.

Characteristics	Items	Percentage
Gender	Male	42.9%
	Female	57.1%
Brand preference	Mobike	39.0%
	Hellobike	24.9%
	Offo	23.7%
	QuingJu	4.9%
	Others	7.5%
Weekly used frequency	Less than 5 times	87.6%
	6~10	9.8%
	11~15	1.2%
	More than 15 times	1.4%
Used hour each time	Less than 10 min.	36.7%
	11~30 min.	54.3%
	31~60 min.	7.8%
	Over 1 h	1.2%

3.3. Positive Externality

An externality occurs when the activity of one person positively or negatively affects another person through market mechanisms. Externalities may generally be traced to the absence of property rights. Similar to public goods, such as public parks, the sharing economy is based on the positive externalities coming from the network externality. Public parks may reduce the environmental pollution in the community due to the trees in the park. In a similar vein, sharing bikes may result in less environmental pollution due to the reduced individual transportation. In particular, since bikes do not need extra energy, it is more beneficial for both the bike user and the wider community. During the period of uptake, when some users are positive toward their experience of bike sharing while some are not, it is difficult to trust the bike-sharing service. However, when the critical mass of users for the network to be useful is reached, then all the network participants are assured that the sharing economy is beneficial for all, resulting in the sustainable performance of the bike-sharing service [15,18,19]. This positive network externality may come from the following reasons. First, as a bandwagon effect, the more users participate in a network, the better they feel. Second, as the users are consuming more, the image and resulting trust in the bike-sharing company will be higher. Third, the benefit versus its service cost is much higher compared to the traditional products. Fourth, social pressure, such as environmental campaigns, attracts more users with additional externalities. Based on these arguments, we put forward the following hypotheses.

Hypotheses 1-4 (H1-4): *Externality has a negative effect on the sustainable economic factor.*

Hypotheses 2-4 (H2-4): *Externality has a negative effect on the sustainable environmental factor.*

Hypotheses 3-4 (H3-4): *Externality has a negative effect on the consumer's satisfaction.*

3.4. Sustainable Economic and Environmental Factors

Sustainable management implies not only providing products and services that satisfy the customer in more economic ways, but also operating in a socially responsible manner (Three Bottom Line: TBL) [27]. Therefore, the sharing economy entities should harmonize all related business activities from these three perspectives. To achieve economic efficiency and social equitability, the bike-sharing industry should provide transparent business management, a productivity-oriented marketing strategy, and innovative measures to promote the sharing economy in terms of the sustainable economic factors [9]. Similarly, the bike-sharing industry should provide environmental-friendly businesses, energy-efficient management systems, and recycling-oriented resources-saving efforts in terms of the sustainable environmental factors [30]. Based on the aforementioned arguments, we derive the proxy variables of sustainable management factors [9,14,15,18,27]. Therefore, we propose the following hypotheses.

Hypotheses 4 (H4): *Sustainable economic factors have a positive effect on the consumer's satisfaction.*

Hypotheses 5 (H5): *Sustainable economic factors have a positive effect on the sustainable environmental factor.*

Hypotheses 6 (H6): *Sustainable environmental factors have a positive effect on the consumer's satisfaction factors.*

3.5. Satisfaction

As one of the core variables that predict the consumer's decision, satisfaction is measured in general by the gap between the expected and perceived values of a product or service [31]. Möhlmann (2015) [12] find that there is a strong positive relationship between satisfaction and continuous use intention [12]. According to Möhlmann, satisfaction may consist of joyfulness from the service consumption, satisfaction with quality and Apps, overall good feeling, and the positive awareness of the service use. Based on his argument, we can derive the following hypotheses.

Hypotheses 7 (H7): *Satisfaction by a consumer has a positive effect on the continuous use intention.*

Hypotheses 8 (H8): *Sustainable economic factors have a positive effect on the continuous use intention.*

Hypotheses 9 (H9): *Sustainable environmental factors have a positive effect on the continuous use intention.*

3.6. Continuous Use Intention

According to Engel (1995), the continuous use intention is defined as the planned or predicted future action based on the subjective satisfaction with the product consumption [32]. The continuous use intention is used as the final decision by the consumer regarding a specific product or service to confirm the quality of performance. Thus, it could be measured as our final output of the performance of the bike-sharing industry according to the subjective intention level to reuse, the intention level of recommendation to others, willingness to use in daily life, etc. Based on the aforementioned arguments, we can derive hypotheses of the research model as shown in the Figure 2.
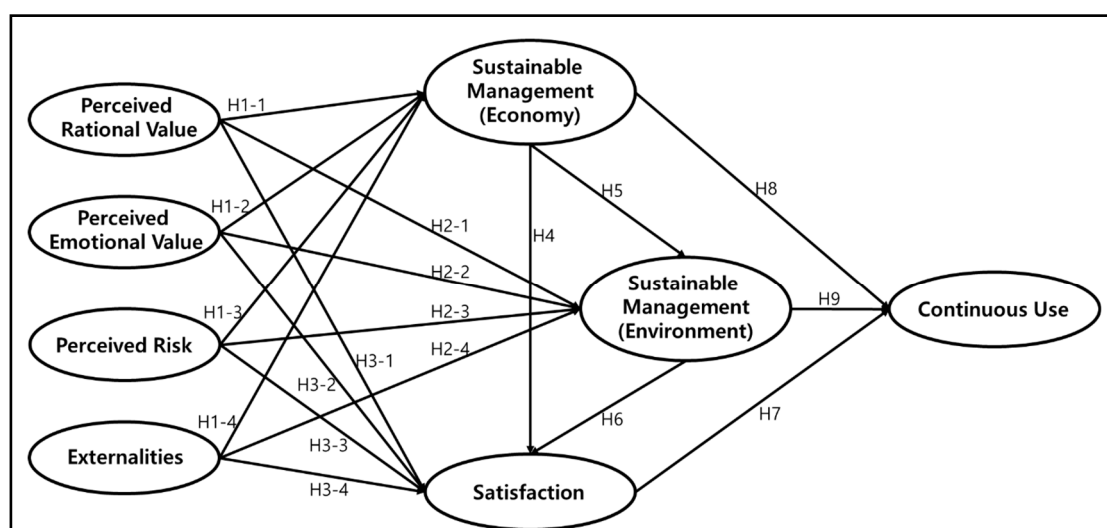
Figure 2. The research model and hypotheses.

4. Methods and Data

4.1. Data Collection and Descriptive Statistics of the Data

For the reliable questionnaires, we have a pilot test, in Beijing, consisting of the proxy variables of all the hypothesized issues introduced in Section 3. Based on the interview results with professionals and experienced citizens in Beijing, we modify the questionnaires in a more clear and accurate manner. Then, we obtain the survey data from all over China using professional research websites as well as off-line interviews in larger cities such as Beijing and Shanghai using 7-point Likert scales during the experiment period from April the 15th to May the 20th, 2019. From the 367 questionnaires, we only select 317 ones due to the missing values in the other questionnaires. For the reliability test, the SPSS 26.0 software is used; while for the path analysis, AMOS 26.0 is used.

Males account for 42.9% of respondents, while females account for about 58.0%. Respondents with an annual income RMB 5000 or less are 58.7%, with 46.8% of respondents being students. As shown in Table 3, Mobike, Hellobike, OFFO, QuingJu, and other local brands are preferred by 39%, 24.9%, 23.7%, 4.9%, 7.5% of respondents, respectively. Moreover, 87.6% of respondents use shared bikes less than five times per week, with the average duration of riding bikes being 16.43 minutes each time.

4.2. Reliability Test, Convergent and Discriminant Validity Test

In SEM, the indicator of a latent hypothetical relationship is denoted as the measurement model. For these construct items, the factor loading and reliability test are important to represent the proxy variables with different but consistent questions. Since the traditional Cronbach's alpha α test tends to underestimate the reliability of latent variables, a more appropriate measure, the Composite reliability (CR) test, is applied. When the composite reliability values of all constructs are higher than the cut-off value of 0.5 as a critical requirement, the constructs are reliable and acceptable [33]. As shown in Table 4, all questions for the variables are accepted according to these criteria.

Table 4. The reliability test results.

Construct	Measurement Items	Factor Loading/Coefficient (*t*-Value) (>0.5)	Composite Reliability (>0.7)	AVE (>0.5)
Perceived rational value (PRV)	PRV1	0.83 ***	0.80	0.51
	PRV2	0.82 ***		
	PRV3	0.80 ***		
	PRV4	0.74 ***		
Perceived emotional value (PEV)	PEV1	0.91 ***	0.83	0.55
	PEV2	0.87 ***		
	PEV3	0.75 ***		
	PEV4	0.82 ***		
Perceived risk (PR)	PR1	0.83 ***	0.79	0.56
	PR2	0.95 ***		
	PR3	0.82 ***		
Externalities (EX)	EX1	0.90 ***	0.82	0.53
	EX2	0.85 ***		
	EX3	0.79 ***		
	EX4	0.78 ***		
Sustainable Economy (ECON)	ECON1	0.94 ***	0.87	0.68
	ECON2	0.93 ***		
	ECON3	0.94 ***		
Sustainable Environment (Envi)	Envi1	0.91 ***	0.84	0.64
	Envi2	0.96 ***		
	Envi3	0.90 ***		
Satisfaction (SAT)	SAT1	0.86 ***	0.87	0.63
	SAT2	0.92 ***		
	SAT3	0.86 ***		
	SAT4	0.89 ***		
Continuous Use Intention (CUI)	CUI1	0.86 ***	0.88	0.65
	CUI2	0.92 ***		
	CUI3	0.94 ***		
	CUI4	0.95 ***		

Note: *** *p*-value < 0.001.

To ensure the construct validity, the convergent validity and discriminant validity tests are performed. The constructs display convergent validity if the factor loads are greater than 0.5, the reliability value is greater than 0.7, and the average variance extracted (AVE) is greater than 0.5. As shown in Table 4, all of the constructs satisfy these criteria, exhibiting favorable convergent validity.

Discriminant validity is used to examine the cross loading differences among different constructs. According to Engel (1995), construct validity tests the extent to which data provides discriminant validity [32]. Discriminant validity is adequate once the correlation of one construct with its indicators exceeds the correlation of that construct with other variables [33]. Table 5 shows us the result of the correlation matrix, indicating whether the square root of AVE is greater than the correlation coefficients of the constructs. All cross loadings are over 0.6, with both Tables 4 and 5 showing that the constructs achieve discriminant validity.

The goodness-of-fit test examines how well it fits a set of variables as a whole model. The goodness-of-fit is measured by the difference between the observed and expected values in a survey. A model fits the data better if the discrepancy between the observed and predicted values is small and unbiased. In this model, the absolute fit index (AFI) is 1.977, and the standard root mean residual (SRMR) is 0.047, thus satisfying all criteria. For the explanatory power of the model as a whole,

the goodness-of-fit index (GFI) is 0.902 and the adjusted GFI is 0.855, indicating, overall, that the variables fit reasonably well to the model.

Table 5. The correlation matrix.

	PRV	PEV	PR	EX	ECON	Envi	SAT	CUI
PRV	1							
PEV	0.455 **	1						
PR	0.033	−0.037	1					
EX	0.337 **	0.439 **	0.277 **	1				
ECON	0.311 **	0.379 **	0.172 **	0.571 **	1			
Envi	0.273 **	0.476 **	0.063	0.465 **	0.566 **	1		
SAT	0.531 **	0.580 **	−0.082	0.447 **	0.386 **	0.516 **	1	
CUI	0.513 **	0.524 **	−0.064	0.454 **	0.418 **	0.463 **	0.668 **	1

Note: All the numbers off the diagonal are significant with *p*-value < 0.01. ** *p*-value < 0.05.

5. Empirical Results

5.1. Structural Model Result and its Implication

The result of the path analysis based on the SEM in Figure 2 is shown in Figure 3, with the perceived rational and emotional values, perceived risk and externalities being used as four independent variables, while the sustainable management economic and environmental variables and the resulting satisfaction variables used as the modulating variables for the final output variable of continuous use intention. Based on the 95% level of statistical significance, all the lines show the accepted causal relationships, while the dotted lines show the rejected variables. First, for the sustainable management economic factors, only the externality variable is accepted, with all other three hypotheses on the perceived rational and emotional values, and perceived risk rejected.
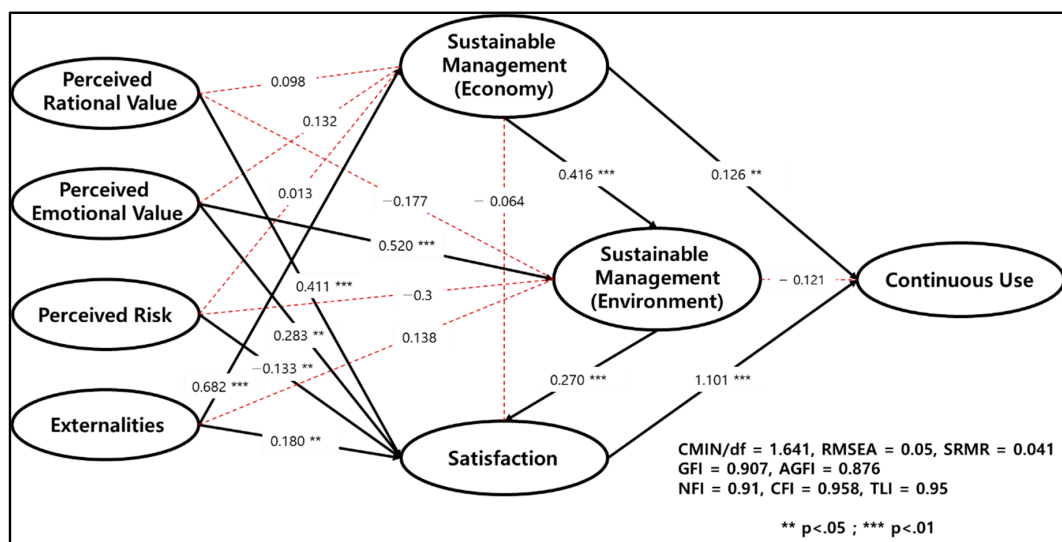

Figure 3. Results of the path analysis.

Second, only the perceived emotional values are found to have a statistically significant and positive effect on the sustainable management environmental factors, while all other three characteristics of the bike-sharing service are rejected. Third, all four hypotheses (H3-1~3) on the service characteristics of bike sharing are accepted, implying that externalities, perceived rational and emotional values are positively related with the user's satisfaction, while the perceived risk is negatively associated with the satisfaction of the user. In particular, the perceived rational values showed the largest coefficients, implying that the

economic and convenient reasons have the greatest impact on satisfaction. The estimated coefficient of the perceived risk is also −3.064, much larger compared to the other coefficients, implying that the users are very sensitive to the safety of the bike-sharing service and the privacy of the user's information.

Fourth, H4 is rejected, indicating a strong relationship between sustainable management economic factors and user's satisfaction. It is critical that the users may not be concerned about the sustainable management economic activities of the service-providing companies, and/or that the bike-sharing companies have failed in transferring their efforts to emphasize the sustainable management activities. Since the bike-sharing service is based on the premises of being environment-friendly, providing healthy exercises for all community, the rejection of H4 implies that the bike-sharing companies should put in more efforts to make the users more sensitive to sustainable management activities. For example, if the bike-sharing companies offer incentives or value sharing to the users, they will promote sustainable management economic activities and result in a much better performance in terms of higher satisfaction of the users. Additionally, H5 is accepted, implying that there is a strong, positive relationship between sustainable management economic and environmental activities. This result supports the implications of H4 that all users understand the bike-sharing system is environmentally friendly, leading to a strong viability of sustainable management. Moreover, H6 is accepted, implying that sustainable management environmental activities of bike-sharing companies result in a better satisfaction of the users. Recently, most bike-sharing companies have begun to promote much diverse environment-friendly activities to bring about more participation by the community members. By verifying H6, we confirm the effectiveness of this new trend of environment-friendly campaigns by the Chinese bike-sharing companies in the sustainable governance of the sharing economy.

Fifth, among the three modulating hypotheses, sustainable management economic values (H8) and user's satisfaction (H7) are shown to have statistically significant and positive relationship with the continuous use intention, while the hypothesis that sustainable management environmental values have a positive effect on continuous use intention (H9) is rejected. It implies that the traditional approach to the continuous use intention by the user's satisfaction as well as the sustainable management values is supported, while the current sustainable management of environmental activities is not significantly perceived by the users, resulting in the rejection of H9. As mentioned above, the bike-sharing companies should put in more consistent efforts to make the users more sensitive to their decisions on the continuous use intention (H9).

5.2. Modulating Effects and Its Implication

To evaluate the statistical significance of the modulating effect, the AMOS bootstrapping simulation method is used. Using 5000 times of iteration of the bootstrapping method, we obtain reliable statistical results as shown in Table 6. First, the modulating effect of the user's satisfaction on the continuous use intention by all the four inputs of PRV (0.304), PEV (0.298), PR (−0.156) and EXT (0.263) as well as the other indirect variable of sustainable management environmental factors (0.284) is shown to be statistically significant. Second, the modulating effect of the sustainable management economic factors on sustainable management environmental factors (0.252) is shown to be statistically significant. Moreover, the modulating effect of the sustainable management environmental factors on the user's satisfaction by PEV (0.126) and ECON (0.134) is shown to be statistically significant as well. All these indirect effects by the modulators indicate that our selected modulators of sustainable management (ECON, Envi) and user's satisfaction (SAT) have statistically significant effects on the continuous use intention. It implies that the new norm of environment-friendly activities promoted by the sustainable management of the bike-sharing companies has contributed significantly to the impact of sustainable governance on the continuous user's intention [10,31].

In addition, perceived risk is found to be significant only with the modulator of user's satisfaction, implying that even if the users are sensitive to sustainable management with respect to the safe and consistent conditions to use bikes, most bikes are not suitable to be reused, resulting in the distrust of the service management with the lack of governance as a perceived risk. Thus, it is very crucial for

the Chinese government to regulate the bike-sharing industry by imposing appropriate measures for users to safely participate in the sharing economy. The bike-sharing service, at present, in China is a dockless free style of management, resulting in the reckless and irresponsible deployment of bikes after its use. Some of those end up in private territories and/or untraceable areas such as riversides or mountain areas. When a user wants to use a shared bike, it might not be easy to find one due to the reckless return of the bikes by other users, resulting in the distrust of the sharing economy. Therefore, the bike-sharing companies as well as the Chinese government should put in more efforts to promote the voluntary participation of users to improve the service without any perceived risks.

Table 6. The indirect effect with bootstrapping approach.

Indirect Path					Modulating Effect (p)	95% Confidence Interval (Bias-Corrected Bootstrap)	
						Lower	Upper
1	PRV	→	SAT	→	CUI	0.304 (0.006 **)	0.130	0.452
2	PEV	→	Envi	→	SAT	0.126 (***)	0.050	0.260
3	PEV	→	SAT	→	CUI	0.298 (***)	0.156	0.442
4	PR	→	SAT	→	CUI	−0.156 (0.014 *)	−0.261	−0.047
5	EXT	→	SE	→	Envi	0.252 (***)	0.146	0.408
6	EXT	→	SAT	→	CUI	0.263 (0.006 **)	0.124	0.411
7	ECON	→	Envi	→	SAT	0.134 (***)	0.064	0.247
8	Envi	→	SAT	→	CUI	0.284 (***)	0.143	0.446

* p-value < 0.01; ** p-value < 0.05; *** p-value < 0.001.

6. Conclusions and Policy Implications

Socialist countries, such as China, have emphasized the importance of an equitable society where citizens work together, and thus, the basic paradigm of sharing economy might be one of the best directions for the Chinese government. In 2016, Xi Jinping, the leader of China, announced a new paradigm of "Ecological Civilization" for China, indicating that the Chinese dream of being the leader of the global economy should begin with the economic transformation, as a trendsetter, to sustainable development, harmonizing all the interests of the Chinese people for achieving a better quality of life. Evidently, the sharing economy, represented by the bike-sharing industry, could be one of the exemplary business cases for this Chinese dream.

After the initial stage of bursting bubbles in the bike-sharing industry in 2016, the Chinese government allowed M&A across other industries of the sharing economy. Owing to these appropriate measures, many bike-sharing companies have been integrated for achieving a better performance. Moreover, some bike-sharing companies began to emphasize innovation in the sharing economy using more user-friendly approaches. For example, the Mobike company began to provide new services such as reports on CO_2 abatement volumes by each shared bike and the number of burned calories from the bike-sharing exercise. Many innovations ware introduced by newspapers and netizen groups to promote the bike-sharing systems, including mileage programs based on reused hours and frequencies and coupons that can to be used in neighboring shops.

All these efforts by the companies and government facilitated the transition from the trial and error phase for the bike-sharing industry. As shown in the empirical results of our study, there is an important role of the modulators in promoting the bike-sharing industry. We can summarize our findings as follows.

First, the role of perceived rational values such as the easiness to use and the saving of the moving time could promote the bike-sharing industry at best [21,24]. Thus, an appropriate deployment of the shared bikes in the congested metropolitan areas should be well managed in a smart way. In particular, the rational values are strongly interrelated with the sustainable management factors, and thus, the bike-sharing companies should put in more diverse efforts to develop one-source multi-use types of innovation for the sharing service. They may provide other practical benefits such as coupons for the nearest shops, social benefits such as the reports on CO2 emission abatement volumes for each

round of bike sharing, and the functions that enhances the quality of life such as mileage contribution from bike sharing for disabled persons.

Second, transparent business management is required for accountability in the user community [22,23]. At the initial stage, there were numerous deposits from the new users of the bike-sharing service, and many companies did not know how to use it, resulting in a huge loss coming from the moral hazard regarding the deposits of members. Even if the Chinese government did not allow this type of initiation cost any more, a company should ensure more efficient, transparent business management because, in the sharing economy, all revenues from the users should be used for all interest groups, not just the stockholders.

Third, in a socialist country such as China, the Chinese government should eliminate "the over-supply issues". All the idle bikes should be redistributed, and appropriate competition structure should be maintained based on the licensing system, regulations, and promoting policies. From the empirical results, even if the rational values are critical to the continuous use intention, the emotional values and other externalities have a much stronger effect on sustainable management, implying that the partnership with users is a cornerstone for future sustainable governance. Therefore, the Chinese government should work with private bike-sharing companies to build a better public-private partnership (PPP), since the sharing economy should be based on the harmonization of all interest groups to create value.

Since there are many rejected variables, this paper could have some limitations with respect to the deterministic evaluation of the governance factors. Thus, it may need more precise articulation of the variables and hypotheses with the participation of more respondents to the survey.

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