Available online at www.sciencedirect.com

ScienceDirect

Transportation Research Procedia 00 (2018) 000–000

Transportation Research Procedia

www.elsevier.com/locate/procedia

World Conference on Transport Research—WCTR 2019 Mumbai 26–31 May 2019

The effect of local foods competition to the number of visitors

Kenya Arita[a], Shintaro Terabe[b], Hideki Yaginuma[b], Tanaka Kousuke[b], Kang Nan[b]

[a] *Tokyo University of Science, Graduate School of Science and Technology, Department of Civil Engineering, Yamazaki 2641, Noda, Chiba 278-8501, Japan*

[b] *Tokyo University of Science, Faculty of Science and Engineering, Department of Civil Engineering Yamazaki 2641, Noda, Chiba 278-8501, Japan*

Abstract

In recent years, local cities have experience problems with declining economic power due to suburbanization and a reduction of urban functions. One approach to revitalizing local cities, local foods as tourism attractions, has recently attracted much attention. Using the causal model method, this research aimed to analyze the connection between a local foods event, the B-1 Grand Prix, and attracting tourists. We found that the local foods theme has the potential to positively influence and increase the number of visitors. In particular, the results suggested that improvements in publicity, such as newspaper coverage, online evaluations, and announcements by stores offering local foods, contribute to an increase in the number of visitors.

Peer-review under responsibility of WORLD CONFERENCE ON TRANSPORT RESEARCH SOCIETY.

Key Words: Local food, gourmet, causal effect, causal model , tourism resources

1. Background and purpose of research

In recent years, social problems such as a declining birthrate, an aging population, and a decreasing population have become important issues in Japan. Especially in rural areas, many local cities stand have experienced the withdrawal of companies and a decline in the number of local shops. In addition, local cities have been affected by a diminution of capital, as funds that should stay in the area flow instead to larger urban areas and investment money that could build for the future, such as social infrastructure and medical services, dwindles. These losses have, in turn, led to a decline in employment and concerns that young people seeking jobs will be move away from the district to the larger metropolitan areas, exacerbating the decline of the smaller cities. One response to this problem has been the government's "regional revitalization" efforts, including urging young people to settle in rural areas to stem the flow of youth flight to major metropolitan areas. Regional economic development has become an indispensable element for economic development in Japan.

To counter the decline of local cities, there have been increasing efforts to identify unique values and characteristics of the areas that can excite existing industries and companies and attract new ones. Moreover, while

Peer-review under responsibility of WORLD CONFERENCE ON TRANSPORT RESEARCH SOCIETY

recognizing the importance of Japanese culture and tradition, it is also necessary to look for original methods, creative ideas, and receptive attitudes to find solutions. Smaller cities in danger of decline need to determine what tools they have and how to make use of them to maintain and revitalize their urban functions. It is not surprising, then, that local governments that lack the benefit of special geographic or historic tourism resources are trying to attract visitors by focusing on more commonplace resources. One such resource that has gained momentum is "local foods as a tourism magnet"—promoting locally sourced foods as a tourist attraction. Anecdotal information suggests that this can work. However, it is not yet clear how these activities have influenced the numbers of tourists and the revitalization of tourism in these areas.

Therefore, this research sought empirical evidence of the connection between a local foods event and tourism. Specifically, it focused on a peripatetic event known as the B-1 Grand Prix (b-1grandprix.com), the largest "local gourmet" event in Japan, held in a different location each year. The study aimed to quantitatively analyze and clarify the event's influence on attracting visitors.

2. Past research and significance of this research

2.1 Past research

There is some existing research that should be referred to as background for this study. For example, Kagaya (2011) focused on shrines and temples, which are tourism resources. To express the resources' locational relationship, Kagaya used attractiveness, degree of tourism resource integration, and recognition degree of tourism resource name as quantitative indicators. By conducting multiple regression analyses using these indicators, the study found a city is activated as tourism resources accumulate.

Masaki, Kagaya, Terabe, and Kasai (2014) define local foods restaurants as those worth visiting as sightseeing spots for the purpose of food tourism and those serving foods that can be eaten only in the area as "local gourmets." By calculating the index of Kagaya's "degree of tourism resource integration" (2011) to the local gourmets, the relationship between the location of the local gourmet purveyors and tourism activities can be clarified by multiple regression analysis. As a result, Masaki et al. found that the number of tourists increases with higher concentrations of local gourmet vendors.

2.2 Significance of this research

Studies on the revitalization of cities have been made from various perspectives, such as examining measures to use regional resources. However, the following problems exist in the past research: (a) although there are many case studies of narrow areas, few have analyzed the whole country; (b) few studies have analyzed the relationship between tourism resources and attracting tourists; and (c) no research exists that shows the influence of gourmet events and local gourmets on attracting tourists. Therefore, in this research, we focused on the B-1 Grand Prix, a national event and the largest gourmet event in Japan, with the aim of quantitatively analyzing the causal effect of gourmet events on attracting tourists.

3. Explanation of a method by causality reasoning for inferring causal effects

3.1 Terms used in causality reasoning

The cause variable is called the *treatment variable* (independent variable). The resulting variable is called the *result variable* (dependent variable). A variable that affects both treatment variables and result variables is called a *covariate* or confounding factor. A variable interposed between the treatment variable and the result variable, affected by the treatment variable, and affecting the result variable is called an *intermediate variable*. Causal effects include not only direct effects from treatment variables on result variables but also indirect effects from treatment variables taking covariates into account. Finally, in randomized experimental studies, groups given special treatment are referred to as *treatment groups*. A group not given special treatment is called a *control group*.

3.2 Definition of causal effect

For the treatment group and the control group, let y_1 be the "value of the result variable obtained when assigned to the treatment group" and let y_0 be the "value of the result variable obtained when assigned to the control group." Also, we define the difference between two potential outcome variables for each subject i, y_{1i} - y_{1i} , as a causal effect for subject i. Theoretically, for the same subject, this can be seen as a pure causal effect, which we determine by calculating the difference between the result for the treatment group and the result for the control group, as the effect of factors other than the assignment condition are removed.

However, the same subject cannot simultaneously experience the treatment. In other words, since one result variable cannot be observed at any given time, the estimator cannot actually be calculated from the observed data. This is a fundamental problem in causality reasoning. As a means to solving this problem, we need a method of finding the causal effect from the difference between expected values of two pure result variables by fixing or eliminating confounding factors that affect the result variables in each subject. For example, the randomized controlled trial corresponds to that concept. Assuming that the confounding factors of the extraction subject of each group are virtually constant, we can know the causal effect by calculating the difference between the result for the treatment group and the result for the control group.

3.3 Propensity score and inverse probability weighting (IPW) estimator

Ideally, such a study would have random assignment of subjects to the treatment group and the control group. To obtain pure causal effects on or by the two groups in surveillance research in which random assignment cannot be performed, the influence of various variables affecting the result variable must be removed, as explained above. The method for eliminating the effect of the covariate is the *propensity score*. The propensity score (1) is an analytical method for constructing a model from which the effect of covariates is eliminated by one dimension, and a plurality of covariates (confounding factors) are made one dimensional. The propensity score is defined by the probability $e_i = (z_i = 1 \mid x_i)$ that is assigned to group 1 when x_i is the covariate vector of the i^{th} subject and z_i is the value of the treatment variable (discrete amount). However, since it is not possible to confirm the true value of the propensity score of each subject, it is necessary to estimate from the data. Therefore, for a model estimation explaining assignment using covariates, this calculation is often performed using such methods as *logistic regression analysis* or *nonparametric regression*.

In this study, each covariate was made one dimensional through logistic regression analysis. We followed this procedure for using the method described here. When calculating the causal effects of the treatment group and the control group, to infer the pure causal effect between the variables, a covariate affecting both sides is set. Then, using the covariate as an explanatory variable and the treatment variable as a target variable, we used logistic regression analysis to calculate the propensity score by unifying each covariate. (For further explanation of the propensity score, see Hoshino and Okada (2006).) In addition, in this study, by calculating the difference of the *inverse probability weighting* (IPW) estimator, we obtained the causal effect of "result for the treatment group" and "result for the control group." The IPW estimator (2) is a weighted average of the result variable Y with the inverse of the propensity score.

$$e_i = \frac{1}{1 + exp(-\beta_k x_{k,i})} \tag{1}$$

$$E[Y_1] = \frac{\sum_{i=1}^{N} \frac{Z_i * y_i}{e_i}}{\sum_{i=1}^{N} \frac{Z_i}{e_i}} \qquad E[Y_0] = \frac{\sum_{i=1}^{N} \frac{(1 - Z_i) * y_i}{e_i}}{\sum_{i=1}^{N} \frac{(1 - Z_i)}{e_i}} \tag{2}$$

About each variable

$x_{k,i}$	:	The k th explanatory variable held by the i th sample
β_k	:	Parameter of k th explanatory variable calculated by logistic regression analysis
e_i	:	Probability score calculated when each i-th covariate is made one-dimensional
$E[Y_1]$	:	IPW estimator of treated group
$E[Y_0]$	:	IPW estimator of the group without treatment
N	:	Total number of samples
Z_i	:	Presence or absence of treatment of ith sample (Yes = 1, No = 0)
y_i	:	Sample ith result variable

3.4 Strongly ignorable assignment condition

To make it possible to estimate a causal effect by adjustment of the propensity score, we need to establish a *strongly negligible allocation condition*. This is the hypothesis that the "assignment (treatment variable) depends on covariates and not on result variables." To show that this precondition holds, we must know the missing value that cannot be observed. However, it is impossible to confirm this directly. Therefore, there is a method of confirming this condition indirectly by confirming whether the fitness of the model (pseudo decision coefficient, C statistic, etc.) is good when calculating the propensity score. If the fitness of the model is good, it can be said that there is no influence of other covariates that have not been observed, so the conditions are confirmed indirectly.

For the selection of covariates in many studies, we introduce variables that should be adjusted from the theoretical or previous findings and verify the fitness of the model for the sake of confirmation. This confirmation is important. However, there is also a tendency to point out the problem of selecting covariates by themselves. Therefore, by sticking to seeking a complete covariate set that satisfies the above conditions, we make adjustments using covariates that are available and theoretically considerable in the current data. As Hoshino and Okada (2006) stated, there is significance to conducting covariate adjustment, and research in this field advances forward.

In this study, in the logistic regression analysis, the p value for each explanatory variable (covariate) was the "probability score–organized model, without considering the significance of the significance level" and the "organizes model with only variables meeting the significance level." The tendency score was analyzed using both.

4. Data

4.1 Outline of variable used

In this research, the results (first to third) relate to the gourmets that participated in the B-1 Grand Prix during the 10 years between 2006 and 2015 and the number of tourists visiting the area where the gourmet was exhibiting in the event.

In this section, we first define the phrases *tourism resources*, *food as tourism resources*, and *class B local gourmet*, for the purpose described in the previous section. Next, we indicate the target area, target gourmet, and past achievement in B-1 Grand Prix, and then organize each data used in the research. Finally, we organize the data of each covariate used for inferring causal effects with the causal model.

4.2 Definition of each term concerning tourism

"Sightseeing" is the act of visiting an area for the purpose of enjoyment from viewing or learning about a place or object of interest in a particular location. The premise of the act seems to include inducing action. Therefore, in this research, we defined *tourism resources* as "elements of the area that can attract people planning a sightseeing trip. We defined *food as a tourism resource* as "a gourmet worth visiting on a trip aimed at enjoying food produced in an area." Also, our definition of a *local gourmet* is any prepared-food vendor who meets any of the following qualifications: (a) is posted on a website listing local gourmets or is promoted as a local attraction; (b) has exhibited

at the B-1 Grand Prix; or (c) is listed on the National B-class Gourmet information website. Finally, we define *Class B local gourmet* as a "prepared-food vendor of cheap and delicious local specialties loved by locals."

4.3 Selection of area and gourmet for this research

The target areas in this research included region where local gourmets have exhibited at the B-1 Grand Prix; regions where data on the number of tourist is available; and regions that have local gourmets. The 21 regions and gourmets that satisfied all these conditions were set as our *target area* and *target gourmets* for this research. In addition to them, past results of the event are shown in Table 4-1.

Table 4-1
B-1 Grand Prix Results by Target Area and Gourmet

Prefectures	City	Meal name	Participation times									
			1	2	3	4	5	6	7	8	9	10
Hokkaido	Muroran	室蘭やきとり	●	●	×							
	Furano	富良野オムカレー	●	●	●	●	●	●	●	×		
	Otaru	小樽あんかけ焼そば								–	●	●
Aomori	Hatinohe	八戸せんべい汁	●	●	●	●	●	●	●	○	○	○
	Towada	十和田バラ焼き				–	●	●	●	●	●	○
	Aomori	青森生姜味噌おでん	●	●	●	●	●	●	–	–	–	×
Iwate	Itinoseki	いちのせきハラミ焼								–	●	●
Akita	Yokote	横手焼きそば	●	●	●	●	○	○	○	○	○	○
	Senboku	あいがけ神代カレー	–	–	●	●	●	●	–	×		
Ibaraki	Kasama	笠間いなり寿司						–	●	●	●	●
	Hitatinaka	那珂湊焼きそば									–	●
Gunnma	Ohta	上州太田焼きそば	–	●	●	●	●	●	●	●	●	●
Kanagawa	Atsugi	厚木シロコロ・ホルモン	–	●	●	●	○	○	×			
	Miura	三浦まぐろラーメン				–	●	●	●	●	●	●
Niigata	Minamiuonuma	南魚沼きりざい丼								●	●	●
Shizuoka	Fujinomiya	富士宮やきそば	●	●	●	●	○	○	○	○	○	○
	Fuji	富士つけナポリタン						●	●	●	●	●
	Furano	すその水ギョーザ	–	●	●	●	●	●	●	–	×	
	Fukuroi	袋井宿たまごふわふわ	–	●	●	●	●	●	●	●	–	–
Mie	Tsu	津ぎょうざ						●	●	●	●	●
	Matuzaka	松阪鶏焼き肉								●	●	●

※) ●:Participation ○:Not eligible for voting ×:Withdrawal ■:1st ■:2nd ■:3rd

4.4 Selection of target area and target gourmet

4.4.1 B-1 Grand Prix

In this research, we focused on the B-1 Grand Prix, the largest gourmet event in Japan; it is national and the event location varies annually. Below are three points to keep in mind as rules set by the B-1 Grand Prix.

- Voting is done with the chopsticks used by visitors, with two votes per serving. It is possible to vote for up to two gourmets per visitor. After the weight of chopsticks allocated is measured, the gourmet with the largest total weight becomes winner of the B-1 Grand Prix.
- Visitors vote on both the deliciousness and the attractiveness/presentation of the gourmet offering.
- After the fifth B-1 Grand Prix, a rules was added stating that gourmets who had won the B-1 Grand Prix in the past are not eligible to vote.

This research treated gourmets entering the Hall of Fame during the year as winning groups.

4.4.2 Variables

We focused on gourmets in each region who participated in the B-1 Grand Prix and set treatment variables. Information we considered important was when and which gourmet participated in the event and whether or not it

was possible to win a first to third place in the event. With regard to each gourmet, we considered whether or not a prize is given out in the B-1 Grand Prix of a certain year; as the treatment variable, a gourmet who won a prize at the B-1 Grand Prix was assigned a 1, and a gourmet who did not win a prize was assigned a 0.

4.4.3 Result variables

For this study, a result variable represents an increase (or decrease) in the number of sightseeing visitors one year before and after a local gourmet won a prize at the B-1 Grand Prix. To determine which tourists are visiting an area due to the influence of the gourmet event, the tourism agency considers whether the number of tourists investigated by each municipality is in accordance with the common standards stipulated in Tourist Survey Statistics. The number of sightseeing visitors collected on a monthly basis is divided into one year before and after the month of the event (for example, when the event was held in November 2008, October 2007 to November 2008 is the relevant period before the event, and December 2008 to November 2009 is the relevant period after the event). The value calculated from the difference between the before and after tourism data for each year represents the amount of the increase (or decrease) in the number of sightseeing visitors, and we used this value as a result variable.

4.4.4 Covariates

Covariates are considered to affect both the treatment variable and the result variable. We employed several publicity-related efforts as covariates: newspaper coverage, average of reviews by website, number of reviews by website, number of local gourmet stores, number of cumulative winnings, and number of cumulative appearances. Since it was difficult to obtain data by month when preparing indicators concerning local gourmets, we collected data on the average review by websites collected in July 2017. An explanation of each covariate is described below.

Newspaper coverage. To measure the degree of spread of information about the local gourmets exhibiting at the event, we focused on the number of newspaper reports published after the event. The newspaper companies from which we extracted data totaled 44 companies, with 4 national newspapers and 40 local newspapers. The target period was specified as January 2005 to December 2016, the year before the first-ever B-1 Grand Prix (2006); the number of newspaper reports was extracted by month and the data sorted out. The amount of coverage from January 2005 to the month of gourmet event was weighted by the size of the circulation for each newspaper company and the calculated value was used as an indicator of the amount of newspaper coverage.

Average review by websites. In data gathering on local gourmets, we focused on vendors in the target area and collected data using gourmet guide websites. The evaluation score for each Class-B gourmet was gathered from the websites for each area and summed up; the total value divided by the total number of vendors was used as an index of the average review.

Number of reviews by websites. The total number of reviews of each Class-B gourmet vendor was gathered from the websites, divided by the total number of vendors, and used as an index of the number of reviews.

Number of local gourmets. The total number of locations considered to be Class-B local gourmets in each area as noted on the relevant website was used as an index of the number of local gourmets.

Number of cumulative winnings. This is the total of the number of times a gourmet won a prize at the B-1 Grand Prix.

Number of cumulative appearances. This is the total of the number of times a gourmet participated in the B-1 Grand Prix.

4.5 Summary of each variable

The basic statistics of each variable are shown in Table 4-2 and Table 4-3 below. Standardization of each variable was not done.

Table 4-2
Basis Aggregation of Treatment Variables and Result Variables

Treatment variable	Unit	Winning	No prize	The number of samples	
Winning result	[-]	26	70	96	
Result variable	Unit	Average	PRC	Min	Max
Number of tourists	[people]	3.16	0.12	3.00	3.48

Table 4-3
Basic Calculation of Covariates

Variable name	Unit	Average	PRC	Min	Max
Newspaper coverage	[Times]	26.92	44.02	0.00	209.36
Tabelog evaluation	[point/Store]	3.16	0.12	3.00	3.48
Tabelog reviews	[point/Store]	16.28	8.40	2.00	33.93
Number of stores	[Store]	40.67	38.11	4.00	115.00
Number of winnings	[Times]	0.64	1.22	0.00	5.00
Appearance frequency	[Times]	3.07	2.49	0.00	9.00

5. Causal reasoning

5.1 Result

In this section, we show the results of the logistic regression analysis and the difference between the IPW estimators in the treatment group and the control group. In the logistic regression analysis, we obtained the propensity score (Hoshino & Okada, 2006), and did not to stick to whether the significance level of each covariate was effective or not and includes all the variables in the model. In the present study, we performed our analysis using both the propensity score organized without considering the significance of the significance level and the propensity score organized only with variables satisfying the significance level. By obtaining the IPW estimate of each gourmet (treatment group) who won at the B-1 Grand Prix and the gourmets not winning (control group) and calculating the difference, we arrived at a statistical indicator of the causal effect that the gourmet event has on the attraction of tourists. Table 5-1 shows the results.

Table 5-1
Analysis Results of Causal Reasoning

Variable	PRC	P Value	PRC	P Value
Newspaper coverage	2.700	＜0.01***	3.647	＜0.01***
Tabelog evaluation	0.619	0.189	0.712	0.027**
Tabelog reviews	-0.645	0.140	-	-
Number of stores	1.049	0.022**	0.853	0.021**
Number of winnings	0.342	0.719	-	-
Appearance frequency	0.766	0.134	-	-
			*10%	**5% ***1%
Consideration of significance level (Yes,No)	IPW Estimate	No	IPW Estimate	Yes
		155819.4		135249.9

5.2 Discussion

When calculating the propensity score from the logistic regression analysis, we considered two cases: (1) taking into consideration the significance level of the partial regression coefficient obtained in the analysis result, and (2) not including the significance level. The analysis showed that the number of visitors to the area where the vent was most recently held increased by 13 to 15 thousand people during the year after the event, compared to the other

areas where gourmets had won at the B-1 Grand Prix. Table 5-1 reveals about a 10% difference between the two results. However, both show an increasing trend, and consideration of the significance level in the selection of covariates cannot be considered a significant difference in the direction of the research results. It will consider the parameters of each covariate. Table 5-1 also shows that, to win a prize at the B-1 Grand Prix, in particular, newspaper coverage was a big influence, likely because an increase in newspaper coverage improved the public's perception of the local gourmets and the possibility that they might win in the B-1 Grand Prix. However, the number of newspaper reports depends on such regional influences as the topicality of the Class-B gourmets, the promotional resources in the area, and the circumstances of the newspaper companies. Table 5-1 also shows that the number of vendors/shops that featured local gourmets and the evaluations of those shops affected the gourmets' chances of winning at the B-1 Grand Prix. These results suggest that increasing the number of shops/vendors that develop local gourmets and obtaining a greater number of good evaluations from customers would improve gourmets' chances of winning at the B-1 Gran Prix. Based on this and tourism-related research, we concluded that steady efforts in each region devoted to winning a prize at the B-1 Grand Prix will eventually lead to an increase in the number of tourists.

6. Conclusion

6.1 Conclusion of this research

We studied the effect of local foods competition on the number of sightseeing visitors in an area and found that there is an increase (or decrease) in the number of sightseeing visitors in one year before and after announcements of the winners at the B-1 Grand Prix. Our inference is that local foods or specialized local gourmets are an important tourism resource. We summarized the data necessary for this research and carried out basic tabulation for each variable. Then, we explained the causal model used in this research and note important points in calculating the causal effects. We defined the treatment variable (the presence or absence of a winning gourmet at the B-1 Grand Prix in each target area in a certain year) and the result variable (the sightseeing tourism increment/decrement), as well as the covariates affecting both, which including such factors as newspaper coverage and the number and ranking of gourmets' reviews online.

From the consideration of the parameters of each covariate, we found that the number of media coverage was a major factor in increasing gourmets' chances of winning a prize at the B-1 Grand Prix. As a result of our analysis based on the causal model, compared to areas not awarded a prize at the B-1 Grand Prix, the number of sightseeing visitors increased by 130,000 to 150,000 in the year after the event. This suggests that food as a tourism resources is an effective means of regional revitalization. In addition, food tourism provides a way for local residents to voluntarily work to revitalize their own areas by increase the number of vendors/shops that develop local gourmets, by offer delicious gourmet foods, and by posting positive customer evaluation of their favorite local gourmets.

This study concluded that sustainment of steady efforts in each region in support of local gourmets can lead to winning a prize at the national B-1 Grand Prix, eventually leading to an increase in the number of tourists in the area and helping to counter local decline.

6.2 Future research

We focused on and analyzed the B-1 Grand Prix, a national competition and the largest gourmet event in Japan it. However, there are many smaller regional gourmet events dealing with local gourmets and food. Research than expands this analysis to these events might help identify additional or more specific factors relating to food and increased tourism. In addition, this research focused on the magnitude of the causal effect, but to clarify the influence of each factor concerning gourmets' effect on the attraction of tourists, there is also room for additional analysis on causality.

Acknowledgments

We would like to thank Editage (www.editage.jp) for English language editing.

References

B-1 Grand Prix, http://www.b-1grandprix.com/

Cabinet Office. “Regional revitalization.” http://www.kantei.go.jp/jp/singi/sousei/

Hoshino, T., & Okada, K. (2006). Estimation of causal effect using propensity score methods in clinical medicine, epidemiology, pharmacoepidemiology and public health. *Journal of the National Institute of Public Health, 55*(3), 230–243.

Kagaya D. (2011). *Possibility of revitalizing the central urban area by urban tourism* (master’s thesis). Tokyo University of Science, Tokyo. In Japanese.

Masaki, M., Kagaya, D., Terabe, S., & Kasai, M. (2014). Relation between the number of tourists and accumulation of shops of local foods, “gourmet gtochi.” *Journal of Civil Engineering, D3 (Infrastructure Planning), 70*(5), I-315–I-321. In Japanese.