The Impact of an Augmented Reality Game on Local Businesses: A Study of Pokemon Go on Restaurants

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Abstract

Upon release, Pokemon Go, an augmented reality technology based game garnered tremendous interest in the public, with an average of 20 million daily active users. The game combines geo-spatial elements along with gamification practices to incentivize it's users movement in the physical world. Such incentives can have potential externalities to businesses associated with them. Using online reviews of restaurants as a proxy for sales and quality, we study the impact of Pokemon Go on local restaurants. We treat the release of Pokemon Go as a natural experiment and study the post-release impact for the associated restaurants. We find that restaurants that are located near PokeStops indeed observe a higher number of customers compared to restaurants that do not have PokeStops nearby. However, there is no significant difference in terms of the perception of customers between restaurants that have PokeStops nearby and those that do not. In addition, the average menu price of the restaurants play an important role in moderating the effect of PokeStops on the foot traffic. Interestingly, restaurants with higher average menu price enjoy a higher increase in the number of customers who visit the restaurant after Pokemon Go was released. Being the first research to study economic implications of augmented reality applications, the research lays theoretical foundations of how the augmented-reality games affect the consumer economics behavior. It also helps to build insights into potential value of such associations for business owners as well as policy makers.

1 Introduction

Virtual/Augmented reality applications have seen a tremendous increase of late, both in terms of the popularity and the value. In 2016, the industry made $1 billion in revenue (Lee and Stewart, 2016). Previous literature has also shown that these application can significantly affect user behavior (Billinghurst, 2002). In this light, it becomes important for business research to study the implications of such applications and platforms on the real-world user preferences, actions and incentives.

One of the mobile application that utilizes the virtual/augmented reality technology and catches public attention in recent years is Pokemon Go. It is a mobile game that incorporates the GPS capability to locate, capture, battle, and train virtual creatures called Pokemon. Since the release of its application on Android and Apple smartphone in July 2016, it has become a worldwide phenomenon (Fitzpatrick, 2016). The app brought in more than $440 million in revenue from App store and Google Play Store in less than two months (Nelson, 2016) and has become the biggest mobile game in the U.S. history with more than 20 million active daily users (Lovelace Jr, 2016). Prior literature, specifically medical research, has studied how Pokemon Go affects its users in terms of the change in user behavior. Several works have found that Pokemon Go has a positive impact on its users physical activities which, in turn, enhance their well-being (e.g., Althoff et al., 2016; Howe et al., 2016). Meanwhile, the application can also be a source of distraction and may harm the users as well (e.g., Ayers et al., 2016; Joseph and Armstrong, 2016). Although the impact of Pokemon Go on its users appears to be prevalent, little research has been done thus far to extend the frontier of the effect to broader contexts such as economic implications, particularly in terms of the business value of the application and its partnership with local businesses. This issue is crucially relevant and important to business research for the following reasons. First, Niantic, which is the owner of Pokemon Go, has started to develop a sponsored partnership with large retail businesses around the globe including McDonalds in Japan (Olson, 2016) and Starbucks in the United States (Liptak, 2016). This type of sponsored partnership

will potentially be extended to local businesses in the near future. Yet, with an emerging technology such as augmented reality and limited insights from prior literature regarding its economic value, managers are left in the dark about how to properly evaluate the value of this partnership and how to develop appropriate policies surrounding it. In addition, from the policymaker point of view, the partnership may need to be properly fostered to stipulate the growth of the local businesses, or even to be regulated to ensure that local businesses are not taken advantage of. To fill this gap in knowledge, the primary objective of this research project is to provide novel empirical insights into the effect that Pokemon Go has on the performance of the businesses that are associated with it and the nature of the effect with respect to the characteristics of the business. Formally, our research questions are: 1) Does Pokemon Go affect the performance of the businesses that are associated with it? and 2) Does the characteristics of the business moderate such an effect, if the effect exists?

To address the aforementioned research questions, we leverage the practice that Niantic employs to initially determine the locations of an in-game artifact called PokeStop. Essentially, Niantic uses a historical foot traffic data to establish PokeStops at several non-commercial based locations (such as monuments, churches, and libraries) which had a history of high foot traffic. With this practice, some restaurants happen to be located inside the radius of a PokeStop while other restaurants are not. Since Pokemon Go users are required to frequently visit PokeStop to refill in-game items, restaurants located inside the radius of a PokeStop would possess an advantage over other restaurants as their customers can collect in-game items from that PokeStop during the visit. We treat this arrangement as a natural experiment and aim to study how the presence of a PokeStop affects the performance of nearby restaurants. We operationalize our research agenda by collecting locations of PokeStops in the city of Houston, Texas. In addition, we collect restaurant reviews data from one of the major restaurant reviews platform in the United States. Here, we use the number of reviews as a proxy to measure the number of customers who eat at the restaurant and the average star ratings to measure the satisfaction of the customers. We also collect

other restaurant characteristics such as average menu price to examine the heterogeneous treatment effect of the PokeStop as well.

Our study has a strong potential to make the following contributions to the literature. First, it will be the first to investigate the economic implications of Pokemon Go and an augmented reality technology in. Generally speaking, our work provides insights into the business value of this emerging technology and how to adopt it or create a partnership with it. Second, this work will establish theoretical foundations of how the augmented-reality games affect the consumer economics behavior and confirm the theoretical connection between consumer behavior and economic impacts. Third, this paper will also inform business managers and policymakers regarding the potential value of establishing a partnership with an application that utilizes virtual/augmented reality technology so the appropriate policies can be derived and a regulation can be developed if necessary.

2 Literature Review

In this section, we review previous literature related to our study. We begin by reviewing recent works that study the impact of Pokemon Go on its users. Following that, we survey the literature that examines the impact of the location-based technology. Lastly, we examine prior studies that investigate the connection between the augmented reality technology and consumer behavior and the link between consumer behavior and economic impacts.

2.1 The Impact of Pokemon Go on Its Users

Pokemon Go application has formed a convenient natural experiment framework for researchers. Evidently, it has been a medium for research, especially in the medical research, since its release in July 2016. So far, most of the research that specifically studies Pokemon Go has focused on the impact on its players wellbeing. For example, Howe et al. (2016) use online survey data to show that Pokemon Go players walk 25% more on average after they

install the game, although such an increase gradually weakens and eventually disappears after five weeks. On the other hand, several studies have reported potential negative consequences of playing Pokemon Go, including Serino et al. (2016), which highlight the fact that the location-based gameplay of the app can drive players into inappropriate areas and increase the risk of abduction or trespassing, and Joseph and Armstrong (2016), which argue that the augmented reality feature of the game can cause a distraction and increase the risk that the player may suffer from an injury.

2.2 The Implications of the Location-based Technology

Previous literature has studied the implications of the location-based technology in several contexts. For instance, Cho et al. (2011) examined the movement of users in a location based social network and showed the dependency of periodicity and social relationships on human movement. Also, Frith (2013) explored the gaming elements of a location based social network and argued that the playful layers of these gaming elements can affect individual behavior in terms of their mobility decision and their experience of the surrounding components. Other works have also confirmed the effect of location-based feature applications on users mobility choice (Humphreys, 2007, 2010; Licoppe and Inada, 2010). With such a strong effect on user mobility, Hjorth (2011) proposed that the location-based feature and a mobile game would be a great combination to create a new avenue to experience different places. Gazzard (2011) reinforced this concept by arguing that the location-based mobile game can be supplemented with the augmented reality technology, which was implemented and has become the core element of Pokemon Go, to enhance user experience in involving and understanding the surroundings. However, the number of prior works that study the implication of such an augmented reality technology is limited. For instance, Kaufmann and Schmalstieg (2003) proposed an augmented reality application that could enhance students learning experience of mathematics and geometry. Additionally, Antonioli et al. (2014) explored options to utilize an augmented reality technology in education. Furthermore, Han

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et al. (2013) interviewed tourists in Dublin and concluded that the use of augmented reality in tourism can generate fruitful results if it is implemented properly.

2.3 The Economic Impact of Advance Technology

Although the proposed research seeks to identify the impact of Pokemon Go on the performance of the businesses that are associated with the app, it is important to highlight two relevant theoretical connections that will establish a conceptual framework for this research. The first connection is between the augmented reality technology and consumer behavior. As proposed by Gazzard (2011), augmented reality has a unique property that usually enhances the experience of its users on their surroundings. This concept is supported by several empirical and anecdotal evidence in several contexts. Therefore, we draw a conceptual connection between augmented reality technology and consumer behavior in our study as the first link.

Secondly, there is a well-established theoretical connection between consumer behavior and economic impact (Chevalier and Mayzlin, 2006). The literature has shown that as the consumer behavior changes, the change usually shapes the economic outcomes eventually. Therefore, when an external shock such as a change in policy, technology, or nature shapes consumer behavior in a certain aspect, it is reasonable to expect to observe economic implications of such a shock, which represents the second link of our study. In the context of our research, we choose restaurants as a proxy for markets. As discussed in Luca (2016), the availability of large volumes of public data makes it easier to calibrate the effect in the context of restaurants. Moreover, food is a necessary good and there has been a large market for restaurants. They established that increase sales and the number of reviews on yelp are associated with each other. Hence, we use online reviews can also be extrapolated as a proxy for online sales. The literature therefore encourages us to explore virtual/augmented reality applications through the impact observed on online reviews.

3   Hypotheses Development

In this section, we formally formulate the hypotheses that will be tested in the paper. We wish to highlight two specific details regarding our hypothesis formulation. First, note that the dataset in our study covers the period up to 4 months after the release date of Pokemon Go. Therefore, our hypotheses here are primarily developed based on the potential *short-term* effect that Pokemon Go may have on the performance of nearby restaurants. Second, our intention is to develop the hypotheses such that they are measures-agnostic. We will explain later regarding the measures that are employed to test our hypotheses.

Our first hypothesis is regarding how the presence of PokeStops impacts the foot traffic that the restaurant attains (i.e, the number of customers who visit the restaurant). This variable is particularly important because of the following reasons. First, foot traffic is a common performance indicator of restaurants in the literature (e.g., Dock et al., 2015). Second, the number of customers that visit the restaurant typically has a strong correlation with a short-term sales (Richter and Street, 2017). Third, the owner of Pokemon Go already developed a sponsorship program that allows large retailers (such as McDonalds and Starbucks) to have PokeStops at their retail locations. It is likely that the program will be extended to smaller retailers in the near future. Therefore, it is crucial for business managers to understand the economic value of having a PokeStop at the location so that they can compare the benefit to the potential cost of participating in the aforementioned sponsorship program. Fourth, it is virtually not possible for businesses located in the radius of a PokeStop to opt-out. Hence, even though many businesses may choose not to participate in the sponsorship program to have a PokeStop located at their store, it is still important for them to understand the consequence of having a PokeStop nearby as a PokeStop can be established near their location by chance or by somebody elses request. In this regard, prior research has shown that users of augmented reality technologies tend to explore the surroundings more (Gazzard, 2011). In addition, research works have empirically confirmed that Pokemon Go users walk more after they start using the app (Althoff et al., 2016; Howe

et al., 2016). Therefore, as we discuss earlier that Pokemon Go players are required to visit PokeStops to collect in-game items, we hypothesize that restaurants located inside the radius of a PokeStop would see the more customers after the release date of Pokemon Go. Hence, our first hypothesis is:

Hypothesis 1 *Restaurants located near a PokeStop should attain higher number of customers compared to restaurants that are not after Pokemon Go was released.*

The second hypothesis is regarding how the presence of PokeStops influences the perception that the customers have on the restaurant. This variable reflects the overall sentiment of the customers on the restaurant. It is as important as (if not more than) the number of customers the restaurants attain (i.e., the variable in our first hypothesis) as it can affect the restaurant in both short and long term. In addition, previous literature has shown that the average customer perception has a significant effect on restaurant sales (Luca, 2016). Furthermore, with the help of online reviews platforms and social media, the public opinion of restaurants can be easily observed by average customers but not easy for restaurants to improve once it becomes negative and reaches the critical mass. Lastly, the change in the number of customers due to an external shock is not necessarily correlated with the change in the customer perception. Recall that we only hypothesize the short-term effect of PokeStop, we assume that, on average, there is no significant fundamental or systematical change in terms of restaurant quality before/after Pokemon Go was released. Therefore, customers who play Pokemon Go would be happier if they can collect in-game items from the restaurants that are located near PokeStops. Meanwhile, there is virtually no short-term impact on customers of the restaurants who do not play Pokemon Go. Hence, we hypothesize that:

Hypothesis 2 *Customers would be more lenient toward restaurants located near a PokeStop compared to restaurants that are not after Pokemon Go was released.*

The last hypothesis in this study is regarding the moderation effect that restaurant characteristics may have on the potential effect of Pokemon Go on restaurant performance.

In that regard, we choose the average menu price of the restaurants as a moderator for our model because prior literature has found the price of the restaurant to be a strong moderator (e.g., Ryu and Han, 2010). However, it is important to note that the direction of such a moderation effect is not necessarily obvious from prior studies. Therefore, we treat our hypothesis regarding the moderation effect of the average menu price as an open empirical question by not imposing any directionality of such an effect on our hypothesis. Specifically, our third hypothesis is:

Hypothesis 3 *The average menu price of restaurants moderates the effect of the presence of the PokeStop on restaurant performance.*

4   Research Context and Data

In this section, we describe the research context and data that will be used in our study. Specifically, we describe our empirical setting, the proxy variables that will be employed in our study, and the characteristics of our dataset.

4.1   Empirical Setting

We first wish to highlight the characteristic of a PokeStop, which is the primary artifact of interest in this research. Essentially, PokeStop is an in-game location where Pokemon Go users can visit and collect in-game items. Users who are located within 40 meters of a PokeStop can collect in-game items from it once every 5 minutes. Hence, it is essential for the players to gather around the PokeStop to obtain items such as PokeBall, which can be used to capture Pokemons; or Potion, which can be used to heal Pokemons from a battle. When Pokemon Go was released, PokeStops were only placed at non-commercial based locations (such as monuments, churches, and libraries) that had a history of high foot traffic. As a result, some restaurants happen to be located inside the radius of a PokeStop, thereby allowing their customers to collect items from that PokeStop during the visit, while some

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restaurants are not. We treat this arrangement as a natural experiment and aim to study how the presence of a PokeStop affects the performance of nearby restaurants.

4.2 Proxy Variables

Since our main objective is to identify the impact of PokeStop location on restaurant performance, the ideal dependent variable of this study would be the sales volume of the restaurant before and after the introduction of Pokemon Go. However, obtaining restaurant sales can be proven to be challenging to researchers as the sales data are generally confidential and thus not publicly available. To overcome such a challenge, we operationalize our research agenda by employing restaurant reviews as a proxy to measure restaurant performance in our study. Particularly, we use the number of online reviews that each restaurant receives before and after the release date of Pokemon Go along with the average star ratings. Previous literature has extensively shown that the number of online reviews is strongly correlated with sales (e.g., Chevalier and Mayzlin, 2006; Sun, 2012; Zhu and Zhang, 2010). In the same way, the average star ratings is a common measure to capture restaurant valence (Chintagunta et al., 2010) and also as a significant impact on sales (Luca, 2016). The practice of using online reviews as a proxy for performance also offers the following benefits. First, when utilizing online reviews, we can measure both the volume (i.e., the number of posts) and the valence (the average star ratings) of the reviews, which provides an additional dimension comparing to measuring the sales or the foot traffic of the restaurant. Second, online reviews also have a long-term impact on the restaurant through the social factor. Therefore, studying the impact of PokeStop on online reviews can also help restaurant develop a policy that targets both short-term and long-term goals.

4.3 Data

We collected the data from one of the most popular online restaurant review platforms in the United States. In addition to providing online reviews, this platform also provides an

indication whether the restaurants are located inside the radius of any PokeStops or not, which facilitates our research agenda. As regards the geographical area, the scope of our data is at a city level (i.e., our dataset consists of reviews of restaurants and locations of PokeStops from one city). We chose Houston as the target city in our research for the following reasons. First, Houston is recognized as one of the most diverse city in the United States (Gates, 2012). Therefore, the results obtained from the dataset are less likely to be biased due to cultural or ethnicity background. In addition, as our data are from restaurant reviews, the multi-cultural cities typically offer various type of restaurants, thus minimize the issue of restaurant-type bias as well. Second, Houston is one of the most populous city in the United States. Recall that the initial placement of PokeStops was based on the historical foot traffic, we can see plenty of PokeStops throughout the city of Houston. The availability of PokeStops would facilitate us in identifying their effect on restaurants. We started to collect the data in December 2016 by utilizing an automated script. We began by acquiring a list of restaurants located in 30 neighborhoods, across the city. Following that, we then collected the details of each restaurant, including restaurant identification, restaurant name, average menu price, restaurant category, and the address of the restaurant (including zip code). Then, for each restaurant, we collected online reviews of that restaurant, including textual content of the review, issued star ratings, date, and reviewer identification. Details of collected restaurant characteristics and review elements are provided in Table 1 and Table 2. In total, the dataset consists of a 2,032 restaurants, out of which 348 have a PokeStop nearby. In terms of the time period, our dataset consists of restaurant reviews from March 2016 to October 2016 (i.e., 4 months before and after the release of Pokemon Go on July 2016). Lastly, we construct a dummy variable $PokeStopInfluence$, which indicates whether a restaurant is located near a PokeStop after the release of Pokemon Go or not. In other words, the value of this variable is 1 if the restaurant is located near a PokeStop and the time period is on or after July 2016, and 0 otherwise. Table 3 below presents the summary statistics of the variables related to online reviews elements we collected.

ID	Unique identifier of the restaurant
Name	The name of the restaurant
Category	The category of the restaurant (e.g., cafe, bakery, etc.)
Address	The address of the restaurant (including zip code)
Average Menu Price	The average menu price of the restaurant
NearPokeStop	An indicator if there is at least one PokeStop near the restaurant

Table 1: Restaurant data collected

User ID	The unique identifier of review writer
Review Content	Textual content of the review
Star rating	Rating (scale of 1 to 5) that review writer gave to the restaurant
Review date	The date the review was posted

Table 2: Review elements collected

Variable	Mean	Std. Dev.	Minimum	Maximum
Number of reviews	0.93	2.25	0	84
Average star ratings	3.53	1.30	1	5

Table 3: Summary Statistics of the variables of interest (Cross-sectional, per restaurant)

5 Methodology

We construct our data into a panel dataset such that each observation corresponds to a restaurant. Meanwhile, the unit of time is defined as semi-monthly. Hence, we have a total of 16 time periods, 8 periods before and 8 after the introduction of Pokemon Go. The primary dependent variables of our model are the number of reviews each restaurant receives in each month (which is a proxy to the traffic the restaurant attains) and the average star ratings of the reviews each restaurant receives in each month (which is a proxy to the perception of the restaurant in the eyes of its customer). We utilize the fixed-effect panel data model to estimate the impact that PokeStops have on the outcome variables of our interest. Fixed-effect panel data model is widely used when the main effect of the study is different across observations (e.g., the impact of PokeStop on restaurant would be different across restaurants) and time-varying (e.g., the impact of PokeStop on restaurant would be

different across time). Specifically, the main specification of our research takes the form:

$$DV_{it} = \alpha_i + \delta_t + \boldsymbol{\beta X_{it}} + \gamma PokeStopInfluence + \epsilon_{it}, \tag{1}$$

where subscript i denotes the restaurant and subscript t denotes the time period that each observation belongs to. Here, the fixed-effect model is useful in capturing the effect that varies across observations. In that regard, α_i captures the restaurant fixed effect, which varies across restaurants but remain constant across time, such as restaurant characteristics. Meanwhile, $delta_t$ captures the time fixed effect, which varies across time, such as the popularity of Pokemon Go in each time period and the time heterogeneity regarding consumer behavior in posting reviews. Lastly, $\boldsymbol{X_{i,t}}$ is the set of control variables that varies across both restaurant and time. Recall that $PokeStopInfluence$ is a dummy variable which indicates whether a restaurant is located near a PokeStop after the release of Pokemon Go or not. Essentially, this specification allows us to observe the average treatment effect that PokeStop has on the dependent variables of our interest.

In addition to the effect that PokeStop has on the nearby restaurant, we are also interested in the nature of such an effect (i.e., the heterogeneous treatment effect). Particularly, we would like to identify restaurant characteristic that moderates the effect. For that reason, we include another variable, AverageMenuPrice, which indicates the average price paid by consumers who dine at the restaurant (i.e., how expensive the restaurant is) to our specification. This variable has a potential to moderate the effect of the presence of PokeStop on restaurant performance because the prior literature has found the price of to be a strong moderator in the context of restaurant quality and consumer satisfactions (e.g., Ryu and Han 2010). Therefore, we include $AverageMenuPrice$ as an interaction term that moderates the

effect of *PokeStopInfluence*. As a result, out specification becomes:

$$
\begin{aligned}
DV_{it} \;=\;& \alpha_i + \delta_t + \boldsymbol{\beta X_{it}} + \gamma PokeStopInfluence + \theta AverageMenuPrice \\
+\;& \eta(PokeStopInfluence \times AverageMenuPrice) + \epsilon_{it},
\end{aligned}
\tag{2}
$$

Essentially, Equation 2 displayed above estimates the effect that the variable *PokeStopInfluence* and *AverageMenuPrice* have on the dependent variables and the moderation effect that *AverageMenuPrice* has on *PokeStopInfluence*.

6 Empirical Results

6.1 The Effect of PokeStop on Restaurants Performance

We first utilize the standard panel data model to analyze the data according to Equation 1. Note that the number of reviews per restaurant, which is one of our dependent variables, follows the power law distribution. Therefore, we apply natural logarithm transformation to it.[1] Table 4 below reports the regression results.

Table 4: The effect of PokeStops on nearby restaurants

	log(number of reviews)	average star ratings
Pokestop Influence	0.047*** (0.012)	0.035 (0.042)
Constant	0.401*** (0.008)	3.570*** (0.038)
Restaurant Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
N	37,376	14,433

Notes. Standard errors are reported in parentheses.
* $p < 0.1$; ** $p < 0.05$; and ***$p < 0.01$.

We find that after Pokemon Go was released, restaurants that are located in the radius of PokeStops indeed enjoy a significantly higher number of reviews. In other words, after Pokemon Go was released, restaurants located near PokeStops attain about 4.8% more number of reviews compared to restaurants that are not. This finding implies that PokeStops

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[1]Since the number of reviews per restaurant can be 0, we use log(1+number of reviews).

are an effective in attracting more customers to the restaurants. Hence, our Hypothesis 1 is statistically supported. In addition, we find that after the release date of Pokemon Go, restaurants nearby PokeStops also receive higher average star ratings compared to restaurants outside the radius of PokeStops. However, the increase is low and the variance is high, making it not statistically significant. Therefore, our Hypothesis 2 is not supported. Our results are particularly interesting. It turns out that PokeStops have a significantly impact in attracting customers to restaurants nearby. However, the presence of PokeStops does not significantly affect the perception of the restaurant customers. Note that we consider several alternative specification to ensure that our results are robust. We drop the observations 15 days before and after the release date of Pokemon Go to alleviate a concern that the observed effect is only an *immediate* effect. We also perform a dynamic panel data analysis using the ArellanoBond estimation to address an issue of serial correlation. All results are qualitatively similar. Next, we investigate whether these effects are moderated by restaurant characteristics, particularly the average menu price.

6.2   The Moderation Effect of Average Menu Price

To examine whether the average menu price moderates the effect that PokeStops have on restaurant performance, we employ the standard panel data model to analyze the data according to Equation 2. Note that we drop observations from restaurants that do not report the average menu price to the review platform. Table 5 below reports the regression results.

We find that the interaction term between $PokeStopInfluence$ and $AverageMenuPrice$ is positive an significant for the effect of PokeStops on the number of reviews. However, such an effect is not statistically significant for the effect of PokeStops on the average star ratings. Hence, the average menu price only moderates the effect that PokeStops have on nearby restaurants and the direction of such a moderation is positive. In other words, restaurants with higher average menu price enjoy a greater benefit of having PokeStops nearby in terms

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Table 5: The moderation effect of average menu price

	log(number of reviews)	average star ratings
Pokestop Influence	-0.027 (0.021)	0.090 (0.073)
Pokestop Influence x Average Menu Price	0.004*** (0.001)	-0.003 (0.003)
Constant	0.429*** (0.009)	3.569*** (0.038)
Restaurant Fixed Effect	Yes	Yes
Time Fixed Effect	Yes	Yes
N	34,448	14,176

Notes. Standard errors are reported in parentheses.

* $p < 0.1$; ** $p < 0.05$; and *** $p < 0.01$.

of the increase in number of customers that visit the restaurants after Pokemon Go was released. In this regard, our Hypothesis 3 is partially supported.

7   Discussions and Conclusions

After July 6, 2016, it is no longer uncommon to see a group of strangers standing together on the street, intensely staring at and interacting with their phone, and herding with each other. Such eccentric behavior that occurs world-wide stems from just one mobile phone application, Pokemon Go. This application has proven to be significantly effective in shaping user behavior in both positive and negative direction. However, with the recent partnership between the app and major restaurant chains such as McDonalds in Japan and Starbucks in the United States, it is crucially important for both academic researchers and business managers to understand the economic implications of Pokemon Go, which is the primary research question of this paper.

We collect our data from one of the most popular restaurant review websites in the United States. The review platform we chose provides both restaurant reviews and an indicator whether each restaurant has a PokeStop nearby. The data are collected by an automated script in December 2016. We then construct the data as a panel dataset, which allows us to empirically investigate the change in performance of the restaurants that are located near PokeStops. We operationalize our research agenda by using restaurant reviews

as a proxy to measure restaurant performance. Particularly, we use the number of reviews as a proxy to measure foot traffic that the restaurants attain and the average star ratings as a proxy to measure the perception the customers have on the restaurants. We also examine how the characteristics of the restaurant such as the average menu price of the restaurant moderates the effect that PokeStops have on the restaurants. We find that restaurants that are located near PokeStops indeed observe a higher number of customers compared to restaurants that do not have PokeStops nearby. However, there is no significant difference in terms of the perception of customers between restaurants that have PokeStops nearby and those that do not. In addition, the average menu price of the restaurants play an important role in moderating the effect of PokeStops on the foot traffic. Interestingly, restaurants with higher average menu price enjoy a higher increase in the number of customers who visit the restaurant after Pokemon Go was released.

In terms of contribution, this paper provides the first empirical evidence of the economic impact that Pokemon Go, or augmented-reality games in general, have on associated businesses. Unlike the past empirical studies that examine economic implications of location-based applications, mobile games, and gamification practices, Pokemon Go combines several technologies that are usually distinctive thus making it hard for academic researchers and practitioners to extrapolate the potential outcomes from the findings of the previous works in those areas. Second, from the theoretical standpoint, this research will also contribute to the field of economics of information systems by establishing the theoretical connections between the augmented-reality technology and consumer economics behavior. This theoretical foundation is critical as it represents the logical ground of the impact and can be adopted in future research that furthers the study of the augmented reality technology in the business context. Furthermore, this work will also employ the existing framework that connect the customer economic behavior and economic impacts. Therefore, our findings will help confirming the applicability of such a framework in the specific context of emerging technologies as well. Third, from a managerial perspective, this work will help business managers to

develop appropriate policies that govern the potential partnership between their businesses and Pokemon Go (or augmented reality games in general) by providing empirical insights on the economic implications of such partnership. The insights provided are crucial to the business since Pokemon Go is now adding more businesses to the partnership agreement and potentially looking to extend the agreement to local businesses. Also, such a partnership can be costly and the impact on the firms intrinsic value (e.g., consumer perception on the business) can affect business performance in the long run. In addition, from a public policy perspective, the results of this study can also be extrapolated to aid policymakers and government agents in urban development division to enhance their decision-making process as well. Particularly, the findings of this study can be derived to estimate the change of customer surplus and social welfare due to the introduction of Pokemon Go into the market. As a result, the insights could inform policymakers regarding how the partnership between Pokemon Go and local businesses affects the players in the market. Thus, policymakers are equipped with knowledge to develop public policies whether to engage Pokemon Go or other augmented reality game to stimulate the economy of the city or to regulate the partnership between the firms and the local businesses to protect the integrity of the partnership or to prevent any harms that may be inflicted to the local businesses instead.

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