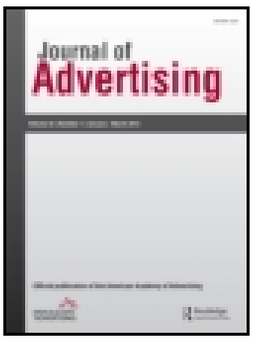

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The Impact of Competitors' Store Flyer Advertisements on EDLP/ High-Low Chain Performance in a Highly Competitive Retail Market: GPS Information and POS Data Approach in Japan

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The Japanese retail market has a high degree of competition among many small stores that use promotional (high-low) pricing strategies. Because store advertisement flyers are effective tools for such retailers, they play a very important role in Japan. However, despite the large impact made by flyers of competitive retail chains in various trade areas, the effects of advertising flyers has not been investigated in Japan, nor has this advertising strategy been investigated in Western countries. In this study, we obtained store traffic information using global positioning system (GPS) data from shoppers' smartphones, with flyer information from 80 retail chain stores located in different trading areas. We found that while own-store flyers had a positive effect on that store's performance, competitors' flyers had negative effects on performance; indeed, these negative effects were of a magnitude that should not be ignored. Store-specific factors and trading area demographics also affect the effectiveness of store flyers. Furthermore, we found that high-low shoppers are more sensitive to competitors' flyers than are customers who purchase at everyday low prices (EDLP). The results can help EDLP chains stop the practice of designating a loss leader brand.

To communicate with consumers about the availability and the price of featured products, printed advertisements, especially store flyers, are often used by retailers (Mulhern and Leone 1990). Although today's retailers are likely to utilize online media promotions, store flyer advertisements still account for more than 60% of the average communications budget for retailers in the United States and Europe (Ieva et al. 2018). Store flyers are also important communications tools for reaching the consumer segment that does not engage online. Furthermore, Ieva et al. (2018) revealed that print promotional communications have equivalent effects to online advertising in regard to consumers' purchase behaviors and memories. Because of the importance of store flyers as printed advertisements, several studies on advertising have discussed their properties and effectiveness (e.g., Schmidt and Bjerre 2003; Leonard and Ashley 2012; Okazaki, Li, and Hirose 2012; Ieva et al. 2018).

In addition, because store flyers can advertise a large number of products—compared to other print feature promotions, such as newspapers and magazines—they are significant tools for retailers to attract customers. In fact, the use of store flyers can increase the sales and profits of featured products and have a positive impact on store traffic. At the same time, price promotions in store flyers can adversely influence store traffic and sales volumes of competing stores (Dawes 2004). Retailers with promotional pricing (high-low) spend a lot of money on promotions, including on store flyers; as a result, discounts and promotions contribute to about one-quarter of their sales (Gauri et al. 2017). As store flyers appeal to the deal-prone customer segment (price-sensitive switchers) and contribute to a low-price image of the store (Hoch, Dreze, and Purk 1994), they play a strategic role for retailers with high-low policy (Luceri et al. 2014).

Managers of high-low stores are eager to attract deal-prone customers through price promotions. Although there are concerns in the trade literature that using a loss leader strategy attracts too many cherry pickers and has negative effects on margins (McWilliams 2004; Gauri, Sudhir, and

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Talukdar 2008; McAlister, George, and Chien 2009; Talukdar, Gauri, and Grewal 2010), high-low strategy retailers use some brand categories as loss leaders to attract customers, and these products are featured in their flyers.

Stores that use an everyday low price (EDLP) strategy tend to keep their prices relatively low for long periods (Pechtl 2004), which is done in an effort to generate customer loyalty. However, surprisingly, some EDLP retailers sell some of their products for very low prices (Lal and Rao 1997) because they are concerned that their customers could be diverted by competing high-low promotions. In fact, Walmart instituted a rollback program in the late 2000s that regularly puts many products on sale.

Our data set is not an exception. The EDLP retailer used in our analysis sells Coca-Cola (0.4 gal. [1,500 mL]) at 127 Japanese yen (JPY; equivalent to about 1.2 USD), while the manufacturer's recommended price is 320 JPY (2.9 USD). Furthermore, data used in our analysis show that about 31% of drink products at an EDLP chain display lower prices than the corresponding product's price during a sale, as featured on a high-low competitor's flyer. These facts show how a specific brand or category may be sold at an abnormally lower price at EDLP retailers. Regarding store flyers, they are utilized not only by high-low retailers but also by EDLP retailers (see Table 1), even though one of the important tactics of EDLP retailers is to offer products at consistently low prices by keeping their operating costs low.

This study aims to investigate the effects of use of store flyers on high-low and EDLP retailers. We especially focus on the effects of flyers distributed by competing retailers within a trade area. Store traffic and store sales are often used to measure store performance (Gijsbrechts, Campo, and Goossens 2003; Luceri et al. 2014; Gauri et al. 2017), and the positive effects of flyers on store sales and traffic have been reported by many studies. Because a store flyer appeals to customers looking for deals or discounted prices, use of flyers should first affect store traffic. We treat store traffic as an outcome in the main analysis. In addition, store sales also seem to be strongly related to store flyers because shoppers not only purchase promoted items but also spend additional money on nonpromoted products (Mulhern and Padgett 1995). Following this motivation, we also use store sales as a store performance metric in the additional analysis section.

Conversely, knowledge is available about consumer differences or product characteristics, and the different effects on consumers and retailers caused by pricing strategy policy (high-low/EDLP). For example, customers of EDLP and high-low retailers differ in income, age, and household size (Bailey 2008; Bell, Ho, and Tang 1998; Bell and Lattin 1998; Ellickson and Misra 2008; Gauri, Sudhir, and Talukdar 2008; Ortmeyer, Quelch, and Salmon 1991; Pechtl 2004; Tang, Bell, and Ho 2001). Therefore, flyer effects may differ by pricing strategy. However, the interaction of flyer effects caused by these pricing strategy differences—that is, whether store traffic or sales of EDLP retailers are affected due to the competing high-low or EDLP chains' strategies and vice versa—is unknown. The purpose of this study is to fill these gaps. To study consumer behaviors associated with store flyers, we obtained store traffic data and flyer data from 80 retailers in 10 trade areas. The flyer data cover all categories sold by each retailer. The traffic data are sourced from global positioning system (GPS) information from customer smartphones, which was recently made available in Japan. Thus, we can know about all shoppers' visits to these retailers and can investigate the effects of competing retailers' flyers in a trade area.

Some existing studies on flyers and promotions do not find positive effects on some store performance measures, such as store traffic and sales (e.g., Walters and MacKenzie 1988; Burton, Lichtenstein, and Netemeyer 1999). However, as Gijsbrechts, Campo, and Goossens (2003) point out, this may be attributed to data limitations, such as using the flyer information of only some items in the product category or restricting analyzed stores to one retailer or one supermarket chain. In particular, the heterogeneity of a trade area can cause incorrect estimations of flyer effects (e.g., see Bell, Ho, and Tang 1998; Cooper et al. 1999). For example, Bell, Ho, and Tang (1998) showed that differences in household income affects price sensitivity, and higher-income areas are less responsive to the promotion. Hence, using wider-category flyers and considering different trade areas is important not only for investigating flyer effects of competitors but also for arriving at correct estimations of the relationship between flyers and store traffic (and sales).

To the best of our knowledge, there exists no research that has surveyed flyer effects, including of competitors' flyers, on such a large scale with multiple trade areas and various retail chains. Gauri et al. (2017) investigated flyer effects using sales and traffic information from 24 stores. However, their analysis is restricted to one specific retail chain that uses a high-low strategy. Dawes (2004) investigated the effects of price reduction of one brand by one retailer on two competing brands and three retailers. He observed a negative impact on category sales of one competing retailer, but not for the two other retailers, caused by the price reduction of a brand. However, the research restricted the product analysis to one low-price food category. Moreover, the main promotion regarding price reduction was conducted only once. Therefore, generalization of these results is difficult due to the limited product category and limited number of times promotions were conducted. Of course, our interest is in flyer effects,

so the subject of our research is different from that of Dawes (2004). Dawes (2004) and Gauri et al. (2017) are important studies on promotions and would be helpful to use in constructing our framework, but EDLP stores are beyond the scope of their research; indeed, existing research on flyer effects in general is scant. This is because obtaining sales and traffic data from multiple retail chains in various trade areas is generally difficult. Thus, because investigation of cross store-type (EDLP versus high-low) flyer effects was beyond the scope of prior research, the results obtained from our research are unique.

Our results may be important for deciding the promotion strategy of retailers that have competing stores nearby; in addition, it extends the literature on store flyers and advertising. For example, if customers of an EDLP chain are unaffected by the price promotions of a competing store and do not switch stores even after looking at the flyers of competing retailers, the EDLP chain need not make excessive price reductions and will be better off staying with their strategy of offering generally low prices. Manufacturers can also avoid low profits and damage to brand value caused by intermittent sales at a discounted price (DelVecchio, Henard, and Freling 2006). If customers of high-low chains are responsive to price promotions of competing retailers, the loss-leading products will still be beneficial to the high-low chains. Therefore, our results provide information not only about flyer effects but also about promotion strategy depending on retailers' pricing strategy.

THE RETAIL LANDSCAPE IN JAPAN

Japan has two main unique features compared with Western countries. First, Japan has many smaller retail stores (e.g., mom-and-pop stores) in neighborhoods due to laws and Japan's traditional culture and customs. In fact, while there are 2.9 retail stores in the United States and 3.8 stores in Germany per 1,000 people, Japan has 7.4 retail stores per 1,000 people. In addition, 26% of retail shops are mom-and-pop stores in Japan, while such stores make up 17% of retail in the United States and 16% in Germany. Average floor area of Japanese retailers is 3,630 square feet (340 square meters), which is about one-third the size of U.S. retail stores and half the size of German retail stores (Euromonitor International 2009).

Second, in Japan, the majority of pricing strategies involve high-low pricing. Although several stores have started using the EDLP strategy, the number is much smaller than those using high-low pricing. According to Ellickson and Misra (2008), retail stores of the top 15 U.S. supermarkets (in volume) choose EDLP strategy 1.43 times more than high-low strategy. In contrast, among the top 15 supermarkets in Japan, only DAISO (the 14th largest supermarket in Japan as of 2012) employs the EDLP strategy. Aeon Co., Ltd., which is the largest supermarket in Japan and 11th largest in the world, and Seven & I Holdings Co., Ltd., which is the second largest supermarket in Japan and 13th largest in the world, employ the high-low strategy.

The retail landscape in Japan suggest that flyers have been a significant tool for attracting customers. Because promotions with store flyers can target a specific geographic area, and flyers are a comparatively low-cost advertising medium, flyers are usually the first tool used for promoting small, family-operated stores. For those customers who make frequent shopping trips to various neighborhood stores, flyers have also been a good tool for comparing prices. A more detailed description of the Japanese retail market is provided in the Online Supplemental Material.

BACKGROUND AND HYPOTHESES

Research on flyer effects is significant due to the importance of flyer in retail price promotions. Many existing studies have investigated whether store promotions have positive or negative effects on store traffic and store sales (e.g., Walters and MacKenzie 1988; Mulhern and Leone 1990; Mulhern and Padgett 1995; Volle 2001; Freo 2005), including the effects of store flyers (Burton, Lichtenstein, and Netemeyer 1999; Gijsbrechts, Campo, and Goossens 2003; Ailawadi et al. 2006; Luceri et al. 2014; Gauri et al. 2017). With regard to the empirical research, the characteristics of flyers that affect store sales and traffic have been investigated. For example, Gijsbrechts, Campo, and Goossens (2003) investigated the characteristics of flyers that affect store sales and traffic, such as flyer volume, magnitude of discounts, and allocation of space to product types. Luceri et al. (2014) focused on flyer effects based on flyer sale dates and variety of featured purchasing options. Table 1 summarizes the related empirical studies on promotions including store flyers.

The use of store flyers is one of the most important pricing strategies for retailers, and much research has focused on pricing strategy (e.g., Bell and Lattin 1998). As noted, pricing strategy can be divided into EDLP and high-low (promotional) pricing (Bailey 2008; Lal and Rao 1997; Pechtl 2004). Prior research showed that customer segments that look for EDLP versus high-low retailers differ in characteristics. Bell, Ho, and Tang (1998) found that families with lower incomes prefer EDLP stores. On the contrary, Bell, Ho, and Tang (1998) and Bailey (2008) indicated that higher-income families prefer high-low retailers. Bell, Ho, and Tang (1998) and Ortmeyer,

TABLE 1
Prior Empirical Research on Promotion and Store Flyers

Reference	Dependent Variable (⋆ Store Performance)	Independent Variables of Main Interest (⋆ Flyer Characteristics)	Other Control Variables (or Methods of Controlling for Confounders)	Sample (Stores, Pricing Strategy, Data Duration, and Country, if Indicated)	Main Results
Walters and MacKenzie (1988)	Store sales, traffic, profit	Loss leader indicator by week for eight products	In-store price deal for seven products	Two stores of the same supermarket chain with high-low strategy, 131 weeks, eight loss leader products, United States	Loss leader products increase store traffic rather than sales of promoted items. Most loss leader items do not affect store profit.
Mulhern and Leone (1990)	Store sales, traffic	Changes in promotion strategy (from many items at small discount to small items at deep discount)	Intervention model to avoid autocorrelation of store performance	One grocery chain, two years	Promotions by a few products at deeper discounts increase store sales more than those by many products at smaller discounts. However, this is not the case for store traffic.
Mulhern and Padgett (1995)	Promotional purchase and regular purchase	Shoppers indicating promotions as a reason for store visit	No other factors are controlled (chi-square test)	Survey data from two stores of the same home improvement products chain, three weeks	There is positive correlation between regular price purchasing and promotion purchasing. About 75% of shoppers who visit store for the reason of the promotion purchase one or more regular price items.
⋆ Burton, Lichtenstein, and Netemeyer (1999)	Number of advertised products purchased	Whether a store flyer reached each consumer before shopping	Consumers attitudes (e.g., price sensitivity, coupon proneness) and demographics (e.g., age, sex, income)	Two grocery stores, five days, United States	Compared with the shoppers who were not exposed to store flyer, more than 100% increase in the number of featured products purchased by those who were exposed to the flyer.

Volle (2001)	Consumers' store choice probability	Number of products on promotion, radio advertising, outdoor advertising	Individual variables (e.g., store loyalty, involvement in shopping, search for promotional information)	Behavioral data of 964 households, six months, France	Weak and short promotional effects are found, but the main driver of store choice is individual store loyalty.
⋆ Gijsbrechts, Campo, and Goossens (2003)	Store sales, traffic	Flyer page, discount size, share of food promotions, share of private label promotions, specialties on cover page	Demographics of location (e.g., age, income level)	55 stores of the same supermarket chain with high-low strategy, 52 weeks, United States	Flyer size, discount size, share of food promotions, share of private label promotions, and specialties on cover page positively affect store traffic and sales.
Freo (2005)	Net store sales	Promotional sales of groceries, perishables, textiles, light household, and heavy household	No other factors are controlled (but employed structural vector autoregressive model)	One retail chain, 70 weeks, Italy	Sales promotions are effective in the short run. However, in perishables category, repeated promotions negatively affect store sales.
⋆ Ailawadi et al. (2006)	Store sales, profit	Discount size, placement of featured item in flyers, presence of BOGO	Category characteristics (e.g., penetration, frequency, storability) and store characteristics (e.g., location, competition)	3,803 stores of the same drugstore chain with high-low strategy, one year	Promotions bring positive revenue but simultaneously reduce net profit, especially for consumer-pull brand.
⋆ Luceri et al. (2014)	Store sales, traffic	Number of pages, number of products featured, number of categories featured, duration, share of leader brand, share of private label, share of products with selling price	No other factors are controlled	Two stores of the same retail grocery chain with high-low strategy, 52 weeks	Better store flyer configurations improve store performance. Response to flyer varies by store format (supermarket or hypermarket) with customer segments.

(*Continued*)

TABLE 1
(*Continued*).

Reference	Dependent Variable (⋆ Store Performance)	Independent Variables of Main Interest (⋆ Flyer Characteristics)	Other Control Variables (or Methods of Controlling for Confounders)	Sample (Stores, Pricing Strategy, Data Duration, and Country, if Indicated)	Main Results
⋆ Gauri et al. (2017)	Store sales, traffic, profit	Discount size, proportion of items in a category that are discounted	Penetration and frequency, average transaction size, impulse buying scale, stockpiling scale, for each category	24 stores of one grocery chain in one area with high-low strategy, 49 weeks, United States	Store flyers are effective for store traffic when categories featured are high penetration and high frequency. Discounting on more items results in lower profits.
⋆ This study	Store sales, traffic	Number of flyer pages, competitors' flyers	Store fixed effect, day fixed effect, demographics of location (such as age, income, gender, retail competitiveness)	80 stores in 37 different retail chains in different trade areas with EDLP and high-low strategy, 92 days, Japan	Flyer has positive effect on store performance and negative effect on competitors' store performance, but effects are asymmetric depending on price strategy (EDLP or high-low).

Note. EDLP = every day low pricing; BOGO = buy one, get one. Relevant empirical studies on store promotion, including store flyer, are summarized. Studies especially focusing on store flyer effect are marked with "⋆" at authors' names.

Quelch, and Salmon (1991) stated that younger customers prefer EDLP. Interestingly, Ellickson and Misra (2008), by using strategic models, revealed that retail stores choose their price strategy based on the demographics of their trade area.

These findings suggest that characteristics of the trade area and the customer segment vary by pricing strategy. Therefore, flyer effects on customers may also differ depending on the pricing strategy. However, the relationship is not clear. Is it important to understand whether traffic and sales of EDLP retailers are affected by competing high-low chains, and vice versa. This study focuses on the effects of competitors' strategies on customer purchasing behavior.

The scope of existing studies on flyers is entirely restricted to high-low retailer chains. The sensitivity of EDLP customers to price promotions, including promotion by competing stores, is not investigated (see Table 1). The hypotheses specified in this article are mainly extrapolated from traditional surveys of deal proneness and price proneness of high-low and EDLP consumers.

The Effects of Store Flyers on Own-Store Traffic

Although one of the novelties of our study is in investigating the effects of competing stores' flyers, we also confirm the traditional theory on flyers' potential to change store traffic. This may help improve existing theories, which state that own-store flyers have a positive impact on store traffic, because we employ 10 heterogeneous trade areas with 80 retail stores that include flyers covering all product categories. This wide coverage reduces selection bias, which can lead to a more accurate understanding of store flyer effects.

Many existing studies reveal that store promotions, including flyers, have short-term positive effects on store traffic and sales (e.g., Mulhern and Padgett 1995; Burton, Lichtenstein, and Netemeyer 1999; Luceri et al. 2014). On the other hand, some studies indicate there are no positive effects of store promotions and flyers on a store's performance (e.g., Walters and MacKenzie 1988; Burton, Lichtenstein, and Netemeyer 1999). However, these results may be attributed to data limitations, as discussed previously. This study covers a wide range of trade areas and retail chains with featured product categories, which should reduce such data limitations. The former argument is adapted, and hypothesis 1 is formulated as follows:

> **H1:** The number of self-store flyers has a positive effect on self-store traffic.

We also hypothesize about the countereffect of store flyers—that is, the effect of competitors' flyers on store traffic. Because consumers are exposed to store flyers from several competitors and likely choose one store from many stores around them, it is natural to conceive that competitors' flyers have a negative effect on self-store traffic. Thus, hypothesis 2 is offered:

> **H2:** The number of competitors' flyers has a negative effect on self-store traffic.

Next, we move on to our main hypotheses. Boatwright, Dhar, and Rossi (2004) showed that EDLP customers are less price sensitive than high-low customers. Therefore, it is expected that EDLP customers are less likely to visit a competing store when travel costs are incurred, even if the store promotes some brands through flyers. Hoch, Dreze, and Purk (1994) also stated that EDLP customers are less likely to be responsive to price changes of individual items because EDLP retailers assure the lower prices of their goods. On the contrary, Shankar and Krishnamurthi (1996) argued that considering the cost of seeking a cheaper product at another store, even if some products in high-low stores are cheaper than in the EDLP stores, effective prices are lower for the EDLP store. This indicates that EDLP customers are more price sensitive.

Although the findings of Hoch, Dreze, and Purk (1994) and Boatwright, Dhar, and Rossi (2004) seems to be contradictory to those of Shankar and Krishnamurthi (1996), Boatwright, Dhar, and Rossi (2004) also added that these results are consistent. Shankar and Krishnamurthi (1996) investigated long-run price sensitivities, that is, the elasticity to the variation in "regular price." On the contrary, Hoch, Dreze, and Purk (1994) and Boatwright, Dhar, and Rossi (2004) described short-term promotional price responses at individual brand levels and found that EDLP customers are less likely to respond to deals.

As our research focuses on store flyers, previous discussions on price and deal sensitivity should be also considered, along with store flyer properties. In summary, Hoch, Dreze, and Purk (1994), Shankar and Krishnamurthi (1996), and Boatwright, Dhar, and Rossi (2004) imply that high-low customers are price sensitive at the "item level" and EDLP customers are price sensitive at the "store level," as high-low shoppers are responsive to short-run promotional prices (deals) and EDLP shoppers are responsive to longer-run price sensitivities when considering the cost of seeking a cheaper product at another store. Store flyers' appeal lies in the lower price image of featured stores, but this is accomplished by promoting selected items in flyers. Moreover, compared with other promotions, such as newspapers or television advertising, store flyers focus more on individual brand promotions than on retailer promotions. Therefore, if high-low

shoppers are price sensitive at item level, store flyers should be more appealing to them. Because store flyers attract deal-prone shoppers and sometimes cherry pickers (Gijsbrechts, Campo, and Goossens 2003; Miranda and Kónya 2007), high-low customers are more likely to respond to competitors' flyers. Conversely, this mechanism is less appealing to EDLP shoppers, as they are price sensitive at the store level. Taken together, store flyers asymmetrically draw high-low and EDLP customers; specifically, they are more attractive to high-low customers.

Other indirect discussions are also beneficial to construct our hypotheses. From the retailer's standpoint, previous findings support the less/more responsive EDLP/high-low customers to competitors' flyers. Lal and Rao (1997) asserted that because time-constrained shoppers feel it is costly to visit multiple stores, they tend to visit an EDLP retailer. Therefore, time-constrained EDLP shoppers have a lower chance of going to another store based on promotions through flyers. Suri, Manchanda, and Kohli (2000, 2002) surveyed the relationship between pricing strategy and perception of quality, which showed that perceived quality and value are higher for products with a fixed price, such as at Walmart, than for products with a discounted price. Following their argument, EDLP shoppers may prefer EDLP products and may not respond to promotional (discounted) pricing at competing stores. Thus, we offer the following hypotheses:

H3: The number of own-store flyers has a positive effect on self-store traffic more for high-low retailers than for EDLP retailers.

H4: The number of competitors' flyers has a negative effect on self-store traffic more for high-low retailers than for EDLP retailers.

The findings obtained from many prior studies on flyer effects show very similar results when store traffic and store sales are employed as store performance metrics, but some works do not show consistent results (Mulhern and Leone 1990; Gijsbrechts, Campo, and Goossens 2003; Srinivasan et al. 2004). We offer hypotheses 5 and 6 in a modified form, corresponding to our main hypotheses 3 and 4:

H5: The number of own-store flyers has a more positive effect on store sales for high-low retailers than for EDLP retailers.

H6: The number of competitors' flyers has a more negative effect on self-store sales for high-low retailers than for EDLP retailers.

The results on hypotheses 5 and 6 are provided in the additional analysis. In the Online Supplemental Material, we also conducted analyses on category sales and specific brand sales.

DATA AND METHODOLOGY

Data

We collected the data of 80 stores from 37 retail chains with traffic information and flyer history for empirical analysis. We first selected EDLP chain "E" from the Kyushu region in Japan. Kyushu is in western Japan, which has medium-sized metropolitan areas as well as rural areas. We set definitions of trade areas and, as a result, large metropolitan areas such as Tokyo and Osaka were not included in our sample, because shops in those regions are too crowded to clearly define trade areas. EDLP chain "E" covers a wide area in the Kyushu region and had 86 stores there as of 2018. We chose 10 of the 86 stores so that those selected were located in various-sized cities and had various characteristics. We then defined retail competitors as those located within radius of 3.1 miles (5 km) from EDLP chain "E." As a result, we obtained 10 trade areas with 80 retailers. Convenience stores were excluded from the analysis.

As described in the introductory section, the Japanese retail market has many smaller mom-and-pop retail stores. If several retail companies dominate the market, as in the United States, using scanner panel data is a good choice to collect store traffic and store sales. However, this method is inappropriate in Japan because such panel data do not cover smaller retailers in general, which still dominate the Japanese retail market. Therefore, we decided to obtain store traffic using GPS data, because it can easily cover the traffic data of smaller stores by setting enclosures, as described in the next section.

Data from GPS, flyers, and purchase history described in this article were collected for three months, from August 1 to October 31, 2017.

GPS Data

Traffic information for each retailer was obtained from GPS data. GPS information was sourced from the smartphones of shoppers. We set enclosure lines on all 80 stores. If a shopper entered the enclosure, meaning that he or she visited the store, the visit duration and a unique shopper identification (ID) were recorded. An example of a GPS data enclosure is described in the Online Supplemental Material.

GPS data enclosures are capable of being displayed in a combined straight line (not a circular or a square shape), enabling us to precisely define the store locations.

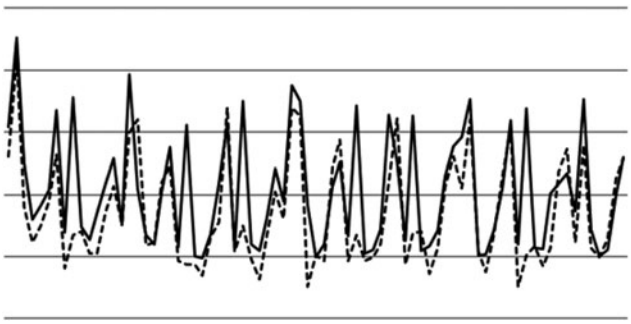

FIG. 1. Store traffic of store H2. The solid line indicates the daily store traffic based on receipt data (ID-POS). The dotted line indicates the daily store traffic based on global positioning system (GPS) data. The scales of receipt data and GPS data are different.

We obtained 1,153,198 observations (total number of visits to 80 stores) from the GPS data.

Flyer Data

Flyer data from the 80 targeted retailers were sourced from Chirashi Report Co., Ltd, which collects flyer information from supermarkets, hardware stores, drugstores, and liquor stores. The data provided the start and end dates of the flyers in use. The flyer data covered all the product categories of the retailers.

ID-POS Data

We also obtained purchase data for each customer (hereafter, ID-POS) from EDLP chain "E" (stores E1 through E10) and one high-low retail chain store, "H," located in Trade Area 2. Both sets of ID-POS data contained the total purchase history of the shoppers.

Figure 1 describes the comparison of daily store traffic based on receipt (ID-POS) data and GPS data from store H2. The scales of the store traffic obtained from GPS and ID-POS are concealed due to commercial confidentiality. Figure 1 shows that the GPS information seems to accurately estimate store traffic, indicating the validity of using GPS information to represent the number of customers who visited the 80 stores.

Trade Area Demographics Data

We also obtained the demographics data of local trade areas from the National Census in Japan. The National Census is a complete survey of individuals and households undertaken every five years (in 2015, 2000, 1995, and so on) concerning individuals and households. It publishes statistics such as age and income for every region in Japan. We used a 0.38 square mile (1 square kilometer) area mesh demographics data from National Census data of Japan for 2015.

Definition of EDLP and High-Low Stores

We needed to select EDLP and high-low stores from the sample of 80 stores; however, there exists no such research or article in Japan that classifies retailers as either EDLP or high-low. Pechtl (2004) classified his samples as EDLP or high-low based on their advertising slogans. For example, they regarded shops with advertisement slogans such as "Low Prices Every Day" as EDLP stores. In accordance with Pechtl (2004), we chose those stores located in multiple trade areas and clearly identifiable as following either an EDLP or high-low pricing strategy according to the slogans that appeared on their official website or annual report. As described previously, chain "E" is an EDLP retail chain that covers all 10 trading areas. Chain "F" and chain "G" are also EDLP chains with locations across multiple trade areas. Chains "E," "F," and "G" clearly declare themselves to be EDLP retailers on their official websites and in their annual reports, with slogans like "Low Prices Every Day." Business magazines also regard these three chains as EDLP retailers and report their strategies.

We selected six high-low chains (chains "H," "I," "J," "K," "L," and "M") in accordance with the following criteria: (1) chains that have at least two stores in the 10 trade areas and (2) chains that clearly state they use a promotional pricing strategy on their official websites or official annual reports. In addition, they also frequently use terms like "bargain" or "on sale" on their official websites and on flyers. In fact, flyers from these six chains account for approximately 49% of all flyers in our data.

We define 19 stores of three chains as EDLP and 20 stores of six chains as high-low. These 39 stores account for approximately 60% of all store traffic in our data.

Flyer Measure

One of the most frequently used variables accounting for flyer characteristics is the number of the flyer pages (Luceri et al. 2014). As Gijsbrechts, Campo, and Goossens (2003) stated, customers are more likely to notice store flyers that have many pages. A larger number of flyer pages also implies that the flyer has more promoted items, which is more attractive to consumers when visiting a store. Therefore, we employ number of pages of the store flyer as our flyer measure.

We calculate this measure for own store flyer (denoted as $SelfFly_{tj}$) and competitors' flyers (denoted as $CompFly_{tj}$) for day t and store j. Studies on flyer effects often use weekly indicators for t (e.g., Gijsbrechts,

Campo, and Goossens 2003; Freo 2005); however, we consider daily flyer effect because retailers in Japan distribute flyers for a variety of periods. These periods are not restricted to one week or one day, so considering weekly effect seems to be inappropriate for the Japanese retail market.

In detail, $SelfFly_{tj}$ denotes the number of flyer pages that are valid on day t that store j distributed. Assume that one flyer of store j has a start date of August 3 and end date of August 5, with one page. Also assume that store j offers another flyer that is valid on August 5 only, with two pages. (In Japan, it is typical for a store to simultaneously offer more than one active flyer with different promotions.) In this case, $SelfFly_{tj}$ equals 1 for August 3 and 4, and equals 3 for August 5.

$CompFly_{tj}$ denotes the total number of store j's competitors' flyer pages which are valid on day t within the defined trade area where store j is located. $CompFly_{tj}$ is also calculated in the same way for competitors, but this is a summed value of all the competitors of store j which are located in the same trade area. Assume that store j has two competing stores within the same trading area, denoted as store j' and j''. If store j' offers a store flyer with one page that is valid on August 3 and 4, and store j'' also offers flyers with two pages which are valid on August 4 and 5, then $CompFly_{tj}$ takes the values of 1, 3, and 2 on August 3, 4, and 5, respectively.

Methodology

To test our hypothesis, we used the multiple regression approach similar to that adopted by Gijsbrechts, Campo, and Goossens (2003), which regresses the traffic of store j at time t on flyer effects at time t with random coefficients explained by demographics of each store's location. Although advertisements generally have a carryover effect (Naik, Mantrala, and Sawyer 1998; Bass et al. 2007), as shown by Freo (2005), flyers are effective in the short run but not in the long run. Therefore, we do not consider the long-term or carryover effects of the flyers. To test hypotheses 1 through 4, we define offer Equation (1),[1]

$$Traffic_{tj} = \alpha_0 + \alpha_{1,j} SelfFly_{tj} + \alpha_{2,j} CompFly_{tj} + \sum\nolimits_t \alpha_{3,t} D_t + \sum\nolimits_j \alpha_{4,j} S_j + \sum\nolimits_{j,u} \alpha_{5,ju} S_j W_u + e_{tj} \quad (1)$$

where t (= 1, 2, …, 92), j (= 1, 2, …), and u denote day, store, and day of week (u = 1, 2, …, 8; Sunday, Monday, …, Saturday, and public holiday) indicators, respectively. Table 2 summarizes the definition of variables.

In Equation (1), the outcome is store traffic ($Traffic_{tj}$) and the independent variables of main interest are $SelfFly_{tj}$ and $CompFly_{tj}$. D_t is a day fixed effect, S_j is a store fixed effect, and e_{tj} is a random error term. To control for time-varying store price level, we considered store × day of the week-fixed effect ($S_j W_u$).[2]

To consider the store characteristics effects where the retail stores are located, we used a random effect model in which the coefficients for flyer effects vary with demographics. For each store flyer variable coefficient, a linear model is specified, where the dependent variables are the slope of self-flyer effect (1a) and competitors' flyer effect (1b), and independent variables are store characteristics and trade area characteristics for each retail store j:

$$\alpha_{1,j} = \omega_{10} + \omega_{11} Share_j + \omega_{12} FreqFly_j + \omega_{13} Age_j + \omega_{14} Single_j + \omega_{15} Income_j + \omega_{16} MF_j + \omega_{17} Comp_j \quad (1a)$$

$$\alpha_{2,j} = \omega_{20} + \omega_{21} Share_j + \omega_{22} FreqFly_j + \omega_{23} Age_j + \omega_{24} Single_j + \omega_{25} Income_j + \omega_{26} MF_j + \omega_{27} Comp_j \quad (1b)$$

We do not consider moderation effect for intercept α_0 as store baseline difference is already considered in store fixed effect S_j. In Equations (1a) and (1b), we included seven demographic variables: store characteristics ($Share_j$, $FreqFly_j$), the sociodemographics of the local population (Age_j, $Single_j$, $Income_j$, MF_j) and degree of competition in the trade area ($Comp_j$). Campo et al. (2000) and Gijsbrechts, Campo, and Goossens (2003) found that these three factors affect store performance as search cost and transaction cost varies by these factors.

As a store characteristics variable, we employed $Share_j$. As Gijsbrechts, Campo, and Goossens (2003) discussed, smaller stores, which are associated with a smaller share of visitors, entail lower transaction cost because customers finish shopping more quickly due to shorter trip distance and waiting lines. The lower degree of congestion for stores with a lower share of visitors may also reduce transaction cost. Hence, we expect that the coefficient for $Share_j$, (ω_{11} and ω_{21}) will be negative. In addition, the frequency of flyer distribution may also affect the effectiveness of the store flyer. Various previous works on the effects of promotions considered the dynamic effects of advertising. For example, Bass et al. (2007) showed that too many promotions reduce responsiveness in customers and result in lower promotional effectiveness. Therefore, we predict that the coefficient of $FreqFly_j$ (ω_{12} and ω_{22}) will be negative.

Regarding sociodemographic characteristics of the local population, we included age and income information for the city in which each retail store j is located. As pointed out by Gijsbrechts, Campo, and Goossens (2003), transaction cost is higher for younger and higher-income customers because older shoppers have less competing

TABLE 2
Definition of Variables

Variable	Definition
Store performance	
$Traffic_{tj}$	Daily number of visitors to store j on day t divided by the maximum number of visitors to store j during analysis period
$Sales_{tj}$	Natural logarithm of daily whole sales of store j on day t
$SalesD_{tj}$	Natural logarithm of daily drink category sales of store j on day t
Store flyer variable	
$SelfFly_{tj}$	Number of store j's flyer pages that are valid on day t
$CompFly_{tj}$	Total number of flyer pages of store j's competitors that are valid on day t
$SelfFlyD_{tj}$	Number of store j's flyer pages on drink category that are valid on day t
$CompFlyD_{tj}$	Total number of flyer pages on drink category of store j's competitors that are valid on day t
$NP\_SelfFlyD_{tj}$	Number of drink category products featured on store j's flyer that are valid on day t
$NP\_CompFlyD_{tj}$	Total number of drink category products featured on store j's competitors' flyer that are valid on day t
Local demographics	
$Share_j$	Store average share of visitors within trade area where store j is located
$FreqFly_j$	Daily average number of pages of store flyers distributed by store j
Age_j	Fraction of people older than 65 in 0.38 square mile (1 square kilometer) mesh area where store j is located
$Single_j$	Fraction of single-person households in 0.38 square mile (1 square kilometer) mesh area where store j is located
$Income_j$	Average annual income of the city where store j is located (in million yen)
MF_j	Male to female ratio in 0.38 square mile (1 square kilometer) mesh area where store j is located
$Comp_j$	Number of retail stores within the trade area where store j is located divided by the daily total number of visitors to retail stores in the trade area where store j is located
AVG_price_{tj}	Average price of the top 500 sales products for store j on day t
Fixed effect	
D_t	Day fixed effect on day t ($t = 1, 2, \ldots, 92$)
S_j	Store fixed effect for store j
W_u	Day-of-week fixed effect ($u = 1, 2, \ldots, 8$; Sunday, Monday, …, Saturday, and public holiday)

demands on their time and higher-income shoppers recognize their time as having higher value and are less willing to spend it shopping (Bawa and Ghosh 1999). On the other hand, single-person households have lower search and transaction costs than larger families. Therefore, we employed local variables on age (Age_j), single-person households ($Single_j$), and average annual income ($Income_j$). We expect the coefficients for Age_j (ω_{13}, ω_{23}), for $Single_j$ (ω_{14}, ω_{24}) to be positive and for $Incomej$ (ω_{15}, ω_{25}) to be negative. Gender might be a significant moderating variable in Japan, as employment rates are still higher for men, and women may have a lower search cost—although Gijsbrechts, Campo, and Goossens (2003) did not consider this factor. Therefore, we included MF_j. Because women are still the main shoppers in Japan and traditionally visit several stores in one shopping trip, as described in the introduction, we expect the coefficients of MF_j (ω_{16}, ω_{26}) to be negative.

To measure the degree of competition in the trade area, we measured $Comp_j$. We expect that ω_{17} and ω_{27} will be positive because the areas with more competition may have more accessibility and entail lower search costs for customers.

We also estimated the regression model represented by Equation (1) with (1a) and (1b) for subsamples divided by their pricing strategy: high-low and EDLP. Consequently, to test hypotheses 3 and 4, 20 high-low stores and 19 EDLP stores were employed as the sample.

TABLE 3
Summary Description of Trade Area and Local Demographic Variables

	Number of Retail Stores	Traffic Scale	*Share* (*M*)	*FreqFly* (*M*)	*Age* (*M*)	*Single* (*M*)	*Income* (*M*)	*MF* (*M*)
Whole sample	80	—	0.130	0.754	0.249	0.187	278	0.922
Trade area 1	8	1.000	0.125	0.835	0.287	0.272	305	0.989
Trade area 2	12	0.950	0.091	0.762	0.309	0.158	264	0.862
Trade area 3	7	0.370	0.143	0.748	0.287	0.128	263	0.871
Trade area 4	8	2.310	0.125	0.855	0.245	0.305	305	0.965
Trade area 5	7	0.589	0.143	0.553	0.202	0.137	281	0.916
Trade area 6	7	0.345	0.143	0.776	0.227	0.117	269	0.911
Trade area 7	7	0.448	0.143	0.845	0.227	0.203	286	0.964
Trade area 8	6	0.272	0.167	0.612	0.325	0.152	266	0.828
Trade area 9	5	0.170	0.200	0.900	0.187	0.147	243	0.906
Trade area 10	13	2.003	0.083	0.697	0.196	0.214	298	0.979

Note. Traffic scale denotes the ratio of average store traffic of all stores within the corresponding trade area when that of Trade Area 1 is set to 1. (Store traffic numbers for each store are concealed due to commercial confidentiality.)

RESULTS

Description of Independent Variables

Retail stores of our sample use 0.71 page flyers per day, and each household is exposed to 6.14 flyer pages per day on average. We should note that the average value of $SelfFly_{tj}$ of EDLP is 0.18, which is significantly lower than the high-low subsample average 0.75 and the overall sample average. This indicates that EDLP stores in Japan rarely distribute flyers. The detailed descriptive statistics, including information by each trade area, is shown in the Online Supplemental Material.

Table 3 presents a summary description of the 10 trade areas and variables of local demographics. The table shows that the demographics vary by trade area. Trade Area 10 has the largest number of retail stores, but the traffic is the largest for Trade Area 4.

Main Results

Table 4 summarizes the estimated results of the regression model described in Equations (1), (1a), and (1b). The regressions were run for the whole (pooled) sample with and without $CompFly_{tj}$, the high-low subsample, and the EDLP subsample. If regression Model 1 is estimated without local moderation effects, the adjusted R^2 indices are 0.962 (pooled sample), 0.961 (high-low subsample), and 0.897 (EDLP subsample), respectively. Thus, the explanatory power of Model 1 with flyer variables and day, store, and week of the day × store fixed effects seems to be sufficient.

Although the detailed estimators for these fixed effects are not shown in Table 4, they are significant. If these fixed effects are excluded from the regression analysis, the adjusted R^2 results are reduced to about 0.15 for the whole sample, and a positive coefficient estimate of $CompFly_{tj}$ is shown when fixed effects are not considered.[3]

Next, we confirm the detailed estimation result. The leftmost part of Table 5 describes the results for pooled samples. The sample size is $N = 7{,}078$. Because each store has some days when it is closed, the sample size does not equal 7,360 (i.e., 80 stores × 92 days).

Average flyer effects across individual stores are shown in the "main effect" row in Table 5. Wolf (1986), Rosenthal (1991), and Gijsbrechts, Campo, and Goossens (2003) suggested obtaining mean effects across stores by the weighted average of effect sizes for each store, where the weight is calculated from the inverse estimated effect size variance of each store. We followed their suggestion.

The results show that the coefficient of $SelfFly_{tj}$ is positively significant ($p < .01$), suggesting that store flyers attract customers. The results support the theory that flyers contribute to positive store performance (Luceri et al. 2014; Gauri et al. 2017), and hypothesis 1 is supported. As noted in the Background and Hypotheses section, some prior studies did not detect significant flyer effects on store performance due to their limited data. Because we employ many stores with a variety of pricing strategies in different trade areas, our results strongly support the evidence of flyer effectiveness. On the other hand, the coefficient of $CompFly_{tj}$ is negatively significant ($p < .01$), suggesting that competitors' flyers decrease own-store traffic, and hypothesis 2 is supported.

The estimate of $SelfFly_{tj}$ indicates that increasing $SelfFly_{tj}$ by one unit increases the store traffic by 1.4% on average, whereas increasing $CompFly_{tj}$ by one unit decreases the store traffic by 0.5%, on average. For

TABLE 4
Summary of Store Flyer Effects on Store Traffic

	Pooled Sample		Pooled Sample		High-low Sample		EDLP Sample	
Independent Variable	Estimate	*t* Value	Estimate	*t* Value	Estimate	*t* Value	Estimate	*t* Value
Intercept	0.423	7.84***	0.442	10.99***	0.455	10.01***	0.519	12.84***
Main effects								
SelfFly	0.014	2.89***	0.020	2.96***	0.007	1.36	0.011	1.53
CompFly	−0.005	−2.76***		—	−0.016	−2.50**	−0.001	−0.14
Moderator effects for *SelfFly*								
Share	0.122	1.43	0.137	2.14**	0.432	1.96**	0.160	0.66
FreqFly	−0.046	−2.19**	−0.024	−1.43	−0.131	−2.00**	−0.002	0.16
Age	0.106	2.11**	0.222	1.68*	0.458	1.68*	0.016	0.69
Single	0.050	0.87	0.046	0.36	0.336	2.33**	0.112	0.74
MF	0.022	0.90	0.017	0.34	0.155	0.56	−0.020	−0.11
Income	−0.014	−0.20	−0.010	−0.05	−0.009	1.11	−0.018	−1.58
Comp	0.471	1.88*	0.353	0.35	0.241	1.14	0.313	1.65*
Moderator effects for *CompFly*								
Share	0.124	3.33***		—		1.79*	0.031	0.56
FreqFly	0.011	−1.79*		—		−1.90*	0.019	−1.47
Age	0.054	1.66*		—		0.19	−0.025	−0.46
Single	0.094	3.33***		—		2.90***	0.087	1.29
MF	0.057	1.20		—		0.24	0.049	0.83
Income	−0.005	−1.89*		—		−0.24	0.002	−0.24
Comp	−0.162	−0.50		—		0.15	0.328	0.42
Fixed effects								
Day_FE	Included		Included		Included		Included	
Store_FE	Included		Included		Included		Included	
Store × *DW_FE*	Included		Included		Included		Included	
AIC	−5991.2		−5881.4		−1237.7		−1255.1	
N	7,078		7,078		1,656		1,748	

Note. Traffic is the dependent variable in this table. The estimate for SelfFly and CompFly show mean effect across stores by the weighted average of effect sizes for each store, where the weight is calculated from the inverse estimated effect size variance of each store, as suggested by Wolf (1986), Rosenthal (1991), and Gijsbrechts, Campo, and Goossens (2003).
*$p < .1$; **$p < .05$; ***$p < .01$.

example, if a retailer doubles its number of flyers from one to two, the average increase in store traffic is 1.4%. At the same time, if competing retailers increase their flyers by four pages, for example, from three to seven pages (a reasonable increase; see Table 3), the average decrease in store traffic is 2.0%. Therefore, retailers and researchers should not neglect the impact of competitors' flyers.

If we estimate the model without the $CompFly_{tj}$ term, which is shown in the second leftmost part in Table 4, the estimated coefficient of $SelfFly_{tj}$ becomes 0.020. This result shows that if we ignore the effects of competitors' flyers, the effects of own-store flyers are overestimated by 43% (i.e., $1 - [0.020/0.014]$).

The third leftmost part shows the regression result of the high-low subsample and the results. First, the $SelfFly_{tj}$ effect is positive but statistically insignificant. The coefficients are larger, but the variance is also large; this can be caused by small sample size. If we calculate the sensitivity, increasing $SelfFly_{tj}$ by one unit increases store traffic by 0.7% on average. We discuss the result from the perspective of store sales in the following section.

The coefficient of $CompFly_{tj}$ shows a negative and statistically significant result ($p < .05$), meaning that the number of flyers from competitors has a negative effect on store traffic of high-low retailers. If we look at sensitivity, an increase in $CompFly_{tj}$ by one unit decreases store traffic by 1.6% on average, indicating high-low retailers are particularly sensitive to competitors' flyers. High-low retailers are often employed as test objects when investigating the effects of price promotions

TABLE 5
Summary of Store Flyer Effects on Store Sales

	High-Low Sample		EDLP Sample without Moderator		EDLP Sample with Moderator	
Independent Variable	Estimate	*t* Value	Estimate	*t* Value	Estimate	*t* Value
Intercept	12.91	57.21***	100.12	12.90***	12.89	30.48***
Main effects						
SelfFly	0.026	2.22**	0.118	14.51***	0.094	4.80***
CompFly	−0.012	−1.50	0.002	0.74	−0.003	−0.21
Moderator effects for *SelfFly*						
Share	—		—		0.619	2.19**
FreqFly	—		—		−0.101	−0.67
Age	—		—		0.010	0.23
Single	—		—		0.125	0.94
MF	—		—		0.048	0.10
Income	—		—		−0.005	−1.78*
Comp	—		—		0.289	1.55
Moderator effects for *CompFly*						
Share	—		—		0.213	2.10**
FreqFly	—		—		−0.044	−0.74
Age	—		—		0.014	0.99
Single	—		—		0.075	0.99
MF	—		—		0.043	0.04
Income	—		—		0.016	−1.34
Comp	—		—		1.942	0.87
AV_price	−0.001	−0.32	—		—	
Fixed effects						
Day_FE	—		Included		Included	
Store_FE	—		Included		Included	
DW_FE	Included		—		—	
Store × *DW_FE*	—		Included		Included	
Adj. R^2	0.812		0.842		—	
AIC	4.4		−1000.9		−1031.4	
N	92		920		920	

Note. Sales is the dependent variable in this table. The estimate for SelfFly and CompFly for the every day low price (EDLP) subsample shows mean effect across stores by the weighted average of effect sizes for each store, where the weight is calculated from the inverse estimated effect size variance of each store, as suggested by Wolf (1986), Rosenthal (1991), and Gijsbrechts, Campo, and Goossens (2003).
*$p < .1$; **$p < .05$; ***$p < .01$.

(including of store flyers) on store performance, but it is again important that researchers should not neglect the existence of competitors, especially for high-low policy chains.

The rightmost part of Table 4 displays the regression results of the EDLP subsample. The $SelfFly_{tj}$ effect is positive but not statistically significant, meaning that store flyers do not significantly increase own-store traffic. We again discuss the result from the perspective of store sales in the following section.

On the contrary, the coefficient of $CompFly_{tj}$ indicates a statistically insignificant result.

To test hypotheses 3 and 4, we conducted the *z* test for the equality of two regression coefficients (Paternoster et al. 1998). Hypothesis 3 appeared to not be supported, as the regression coefficient of *SelfFly* is larger for the EDLP sample than for the high-low sample. However, contrary to our expectation, EDLP customers also respond to EDLP store flyers. This finding may be attributed to the rare use of EDLP store flyers. It is known that overuse of advertising reduces its effectiveness (Bass et al. 2007). The analysis results for local moderation effect as described in the next section also show that the frequency of flyers negatively impacts flyer performance

in increasing store traffic. Because use of EDLP store flyers is about one-quarter the rate of high-low retailers, customers still think the EDLP flyers are attractive.

On the other hand, hypothesis 4 is supported, as the z value for the equality of *CompFly* coefficients for the high-low and the EDLP subsample is 2.08 $(= (-0.001 + 0.016)/\sqrt{(0.006)^2 + (0.004)^2}$, where 0.006 and 0.004 are the standard errors for two coefficients) and there exists a positively significant difference between the two regression coefficients at the 5% level. The results indicate that the number of competitors' flyers has less effect on the store traffic of EDLP retailers than on high-low retailers. In the next section, the results are discussed from the perspective of store sales.

Local Moderation Results

Estimated local moderation effects are described for *SelfFly* and *Compfly*, respectively, in Table 4. The pooled sample analysis shows that flyers distributed by stores with a higher average share of visitors within the trade area do not elicit a less strong reaction. These results are contrary to our expectation. This may be because Japanese retail stores are smaller than those in the United States or other Western countries and, as discussed in the Japanese landscape section, the floor area effect seems to be very limited. Moreover, customers of stores with a larger share of visitors are more responsive to the effects of competitors' flyers. This can be attributed the fact that such stores tend to be high-low retailers in our sample, and the customers may be less loyal to those stores than to EDLP stores. (As discussed, EDLP retailers aim to generate customer loyalty by keeping their prices consistently lower for long periods.) Therefore, the less loyal customers of high-low stores may be sensitive to competitors' flyers.

The expected moderating effects of flyer frequency are confirmed by the whole sample. As expected, flyers of stores that frequently use them as a promotional tool are less attractive to shoppers ($p < .05$ for *SelfFly*, $p < .1$ for *CompFly*). However, this relationship does not hold in the case of the EDLP sample. In our data set, EDLP stores rarely use flyers; hence, customers seem not to be oversaturated by, and thus unresponsive to, the flyers.

For the age variable, older customers react more to own-store flyers and competitors' store flyers for the pooled sample. This is consistent with expectations. Factors specific to Japan may enhance the result. In Japan, younger people tend to be less likely to subscribe to newspapers, and store flyers are usually enclosed in newspapers. Therefore, the elderly tend to be exposed to flyers, and react to them, more often.

Single-person households are more sensitive to competitors' flyers, which is consistent with expected results. Especially for the high-low subsample, the *Single* variable is statistically significant for *SelfFly* and *CompFly*.

The male to female ratio (*MF*) is not significant throughout the analysis. The search and travel costs for shopping were equivalent for women and men.

For the income variable, customers with lower incomes are more sensitive to competitors' store flyers in the pooled sample ($p < .10$), but this effect is not significant for *SelfFly*. This result could be ascribed to the fact that deal-prone customers and cherry pickers tend to be from lower-income households, as indicated by previous research (Ratchford 1982; Urbany, Dickson, and Kalapurakal 1996).

The degree of the competition in trade area also causes heterogeneous flyer effects. The results for the whole sample and the EDLP sample indicate that flyers are more effective in more competitive trade areas. As previously mentioned, Japan's high density of retail stores allows better accessibility to shoppers than in Western countries. Even in such a situation, higher store accessibility may enhance store flyer effects.

ADDITIONAL ANALYSIS

We conducted some additional analyses, focusing on the flyer effects on sales performance. As described in the Data and Methodology section, we obtained ID-POS data from EDLP chain "E" and store H2 of chain "H" so we could calculate the store sales of these 11 stores. We conducted the same analysis as in the main study, but the sample consists of one chain for EDLP (sample size: 920 = 92 days × 10 stores) and one store for high-low (sample size: 92 = 92 days × 1 store).

Overall Store Sales

To test the effect of own-store flyers and competitors' flyers on store sales of EDLP stores, we formulated the multiple regression model as follows with heterogeneous local effect:

$$Sales_{tj} = \beta_0 + \beta_{1,j} SelfFly_{tj} + \beta_{2,j} CompFly_{tj} + \sum\nolimits_t \beta_{3,t} D_t + \sum\nolimits_j \beta_{4,j} S_j + \sum\nolimits_{j,u} \beta_{5,ju} S_j W_u + e_{tj} \quad (2)$$

$$\beta_{1,j} = \kappa_{10} + \kappa_{11} Share_j + \kappa_{12} FreqFly_j + \kappa_{13} Age_j + \kappa_{14} Income_j + \kappa_{15} Comp_j \quad (2a)$$

$$\beta_{2,j} = \kappa_{20} + \kappa_{21} Share_j + \kappa_{22} FreqFly_j + \kappa_{23} Age_j + \kappa_{24} Income_j + \kappa_{25} Comp_j \quad (2b)$$

This model is compatible with Equations (1), (1a) and (1b).

For the analysis on high-low retailers, we use the following regression model:

$$Sales_{tj} = \gamma_0 + \gamma_1 SelfFly_{tj} + \gamma_2 CompFly_{tj} + \gamma_3 AVG\_price_{tj} + \sum_u \gamma_{4,u} W_u + e_{tj} \quad (3)$$

where W_u is a day-of-week fixed effect ($u = 1, 2, .., 8$; Sunday, Monday, … , Saturday, and public holiday).[4] To consider the daily store price level, we included AVG_price_{tj} calculated by the average price of the top 500 sales products for store j on day t. We also considered the inclusion of AVG_price_{tj} in EDLP analysis, but the value does not change during the analysis period (as is consistent with EDLP pricing policy) and the coefficient is not estimable. Thus, AVG_price_{tj} is not included in the analysis on EDLP sales. Heterogenous demographic effects cannot be considered for high-low analysis because store sales analysis of the high-low sample is limited to one retail store.

The outcome of Equations (2) and (3), store sales, is carried out using logarithmic transformation to approximately normalize its marginal distribution (Gijsbrechts, Campo, and Goossens 2003). Other variables have the same definition as in Equations (1) and (2).

The results are described in Table 5. For comparison, Table 5 also reports the results without local moderation effects for the EDLP sample. The adjusted R^2 values are 75.5% and 85.1% for the high-low subsample and the EDLP subsample without demographic moderator effects, respectively. The sample sizes are 92 (= 1 store × 92 days) for the high-low subsample and 920 (= 10 stores × 92 days) for the EDLP subsample.

As can be seen from Table 5, the coefficient of $SelfFly_{tj}$ of the EDLP subsample is positively significant ($p < .01$) both with and without heterogeneous coefficient, indicating that self-store flyers increase the sales of EDLP stores. As logarithmic conversion is carried out to the outcome, the estimate of the $SelfFly_{tj}$ coefficient shows that the increase in store flyers by one unit increases store sales by about 10%. As EDLP stores rarely distribute flyers, flyer use seems to be very effective. On the other hand, the coefficients of $CompFly_{tj}$ are not significant.

Heterogenous coefficients analysis results are similar to the main analysis results. In summary, store flyers of the shops with higher shares of customers in the trade area are more effective, and lower-income people are more sensitive to store flyers. *FreqFly* is negative, but is not statistically significant for the *SelfFly* coefficient, as the EDLP store does not use flyers frequently.

For the high-low subsample, the $SelfFly_{tj}$ coefficient is positive and $CompFly_{tj}$ is negative. However, the coefficient is statistically significant only for $SelfFly_{tj}$ at the 5% level. (An increase in the number of store flyers by one unit increases the overall store sales by 2.6%.) This result might be attributed to low sample size. If we follow the argument that store flyers increase own-store sales, and we refer to the estimation result of Equation (1) (Table 4), flyers have a stronger positive effect on own-store sales than on own-store traffic. The coefficient for AVG_price_{tj} is not significant, which implies that daily store price level is sufficiently controlled by fixed effects.

The results from store sales analysis imply that own-store flyers are more effective on EDLP customers (t test for the equality of two regression coefficients shows a significant result at 1% level with t value = 2.98). In addition, EDLP customers are less sensitive to competitors' store flyers (but coefficient *CompFly* is also not significant). Therefore, hypothesis 5 is not supported.

DISCUSSION

Theoretical Implications

We obtained several theoretical implications. First, we should consider the effects of competitors' flyers as well as own-store flyers. The heterogeneity in characteristics of the trade area significantly affects the effectiveness of the flyer. Because we also obtained store traffic data and flyer information for all 80 stores, we were able to study competitors' flyers effects.

Second, flyer sensitivity of EDLP customers is revealed; they are less sensitive to competitors' flyers than are high-low customers. The sample of retail chains and stores of existing empirical studies is generally limited to high-low stores, because flyers as a store promotion is more important for high-low retailers. However, EDLP customers are in fact exposed to both competing high-low store flyers and EDLP store flyers. Because EDLP retailers are also anxious about their customers switching stores, the potential effect of flyers on EDLP customers should be described.

Third, previously, no flyer research had investigated the Japanese retail market, which has unique consumer cultures and retailer characteristics. Although Japan has one of the largest retail markets, existing research mainly focuses on Western countries. Therefore, our research may provide insight into this otherwise-unexamined retail market.

Finally, our data acquisition method using GPS is novel and applicable to other researchers. As Shugan (2004) predicted 15 years ago, the cost of GPS devices has declined, and GPS data are now easily applied to academic research. The method for obtaining store traffic can also be applied to other retail markets where large numbers of smaller stores dominate. For example, Korea seems to have a similar retail market, as it has 10.4 retail stores per 1,000 people. (As previously noted, Japan has 7.4 stores and the United States has 2.9 stores per 1,000 people.) In addition, in developing countries in Asia, such

as Indonesia, Malaysia, and Thailand, multinational chains are emerging. According to Reardon, Timmer, and Minten (2012), there are combinations of small supermarkets with modest market shares, but the number is growing rapidly. Our method may be appropriately applicable to investigate such emerging markets in Asia with the evolution of its supermarkets.

Managerial Implications

High-Low Retailers

From the analysis, high-low customers are shown to be sensitive to competitors' promotions. To protect own-store customers from competitors' promotions, other marketing strategies may be useful, such as a loyalty program. At the same time, store flyers might be more effective for increasing store sales than for increasing store traffic. Therefore, retailers should properly plan flyer distribution considering the sales, cost, and status of the reference price of featured products. Various works on the effects of promotions exist that consider the dynamic effects of advertising, such as wearout or forgetting effects (e.g., Bass et al. 2007). This knowledge may be beneficial to high-low retailers. These studies showed that excessive investment in a specific advertising channel negatively impacts its effectiveness; thus, optimal spending and scheduling should be decided.

EDLP Retailers

From the analysis, we find that own-store flyers are very effective for increasing store sales but not traffic. Because EDLP customers are seldom exposed to flyers, they may be attracted to the featured product without feeling oversaturated by advertising. The reference prices of the featured products are not as low as similar loss-leading products at high-low stores. Therefore, any contribution of frequent EDLP flyers to higher revenue is not certain simply because they are shown to be effective for store sales. Frequent promotions might cause too much reduction in reference price, leading to reduced effectiveness of flyers and lower margins. It is also shown that EDLP shoppers are not sensitive to competitors' flyers. Hence, even if an EDLP store is worried that its customers may be diverted by competing high-low (and sometimes EDLP) retailers, it might be unnecessary to reduce prices of some brands as loss leaders.

Limitations and Future Research

There are limitations that should be considered as future research topics. First, we have considered the flyer effects based only on the number of flyer pages. Many prior studies investigated flyer characteristics that affect store performances, such as the number of the featured products or discount magnitude (Gijsbrechts, Campo, and Goossens 2003). Whereas prior empirical works on store flyers use one store or one retail chain as their sample, and flyer information is available from the source, we use 80 stores with 37 chains as a sample to consider the competitors' flyer effects, and obtaining detailed flyer information for all 80 stores is extremely challenging.

Second, we can improve the identification or the definition of pricing strategy (EDLP/high-low store). One aspect to be considered is the number of classifications in pricing strategy. We and many prior researchers view pricing strategy as dichotomous (e.g., Bailey 2008; Lal and Rao 1997; Pechtl 2004). However, some researches indicate the options of pricing strategy are more than two (e.g., Ortmeyer, Quelch, and Salmon 1991; Bolton and Shankar 2003). Adopting these other frameworks might be helpful in investigating competitors' flyer effects.

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SUPPLEMENTAL MATERIAL

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NOTES

1. We also considered employing the multiplicative (double-log) regression model as used by Gijsbrechts, Campo, and Goossens (2003). However, the multiplicative model fit worse than in Equation (1).
2. Japanese retailers tend to lower the price level on weekends. In fact, average price levels of the top 500 sales products of store H2 by day of week are 1.00 (Monday), 0.99 (Tuesday), 0.98 (Wednesday), 0.97 (Thursday), 0.96 (Friday), 0.88 (Saturday), and 0.87 (Sunday) when the average price of the top 500 sales

products on Monday is set to be 1. A Japanese survey on consumer price index also supports that trend.

3. A positive coefficient of $CompFly_{tj}$ be attributed to a spurious correlation caused by day effects. For example, store traffic increases on weekends; simultaneously, retailers also increase their flyers. In fact, compared with weekdays, the flyers increase by about 25.0% and store traffic increases by about 19.4% on weekends. Therefore, day fixed effects are necessary for the analysis.
4. Day and store fixed effects in Equations (1) and (2) are replaced by day-of-week fixed effect in Equation (3), as day and store fixed effects cannot be estimated due to small sample size.

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