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First-Mover Advantage through Distribution: A Decomposition Approach*

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Abstract

Whereas the extant literature on entry-order effects establishes that first entrants often earn higher market shares ("market-share advantage"), the literature on distribution suggests increased distribution has a positive effect on sales. Can distribution help us better understand entry-order effects on market shares? This paper examines how the first entrant in a geographical market achieves a market-share advantage through distribution. For this purpose, I propose a simple method of decomposing sales into physical distribution and sales performance. The data come from a manually collected panel on six major Japanese convenience-store chains from 47 geographical markets between 1991 and 2007. Using an instrumental variable approach to deal with the potential endogeneity of entry order, I find the market-share advantage for the first chain brand is positive. Specifically, the physical distribution, measured by the number of outlets in a market, drives most of the advantage. This paper further finds the density of own outlets is nonmonotonically related (inverted U) to sales performance per outlet, suggesting dynamic outlet expansion faces a trade-off between business-stealing effects within a chain ("cannibalization") and advertising effects through repetition.

Keywords: first-mover advantage; pioneering advantage; order of entry; market share; distribution; convenience store; chain; retailing; IV estimation

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1 Introduction

The extant literature on entry-order effects on performance, typically termed "first-mover advantage" or "pioneering advantage," establishes that first entrants often earn higher market shares ("market-share advantage;" see, e.g., Kalyanaram, Robinson, and Urban 1995; Lieberman and Montgomery 1988, 1998, 2012).[1] At the same time, the literature on the effects of marketing mix on performance provides empirical evidence that increased distribution has a positive effect on sales (see, e.g., Ataman, van Heerde, and Mela 2010; Kumar, Fan, Gulati, and Venkat 2009; Reibstein and Farris 1995). Of course, if a product or service is less accessible because of increased search costs or transportation costs, people might be less likely to purchase it. So, can distribution help us better understand entry-order effects on market shares?

This question is of concern to both academics and marketing practitioners. Consider, for example, chain retailers that aim to grow rapidly in size. Does entering a geographical market earlier than one's competitors lead to higher sales? If so, does this advantage come from increased physical distribution because entering early often leads to a higher number of outlets? Or does this advantage come from higher sales performance per outlet because consumers are more favorable toward earlier entrants' brands?

The purpose of this paper is to take a first step toward empirically assessing how a pioneering firm entering a geographical market might (or might not) achieve a market-share advantage through increased distribution and sales performance per distribution. To quantify the role of distribution separately from sales performance, I propose a simple decomposition of market shares, such that we only need aggregate information on distribution at the market level. Acknowledging that physical outlets in retailing and service industries characterize distribution, this paper decomposes sales into the number of outlets (i.e., stores) and average sales per outlet in a market, both of which are important measures of performance for marketing practitioners and scholars.[2][3] Because sales from

[1] Firms can develop a late-mover advantage, such as technology vintage effects (Bohlmann, Golder, and Mitra 2002). See Shankar and Carpenter (2012) for a broad review.

[2] This outlet share represents the fraction (or percentage) of outlets carrying a chain's brand in a market. Namely, I construct an outlet share for chain i in geographical market m as the number of chain i's outlets in market m divided by the total number of outlets from all chains in market m. Section 2.2 discusses how this measure corresponds to % physical distribution, one of the three major measures of distribution in the literature.

[3] For practitioners, outlet counts and sales per outlets are two meaningful measures for gauging performance across chains (Kosová, Lafontaine, and Zhao 2011). Indeed, marketers treat the magnitude of the per-outlet sales as one of the key yardsticks for measuring the relative performance of a chain compared with other chains in the same market. For scholars, the economic literature on retailing and service has treated the average sales per outlet/unit/establishment as one of the key performance measures for a chain (see, e.g., Caves and Murphy 1976; Martin 1988; Lafontaine 1992). Also, having two performance metrics would be helpful because the potential mechanisms through which early

a market are a product of the number of outlets and average sales per outlet, the decomposition resembles the literature on decomposition of market-share elasticities (Cooper and Nakanishi 1988) and decomposition of sales elasticities into elasticities of category purchase timing, brand choice, and purchase quantity (Gupta 1988; van Heerde, Gupta, and Wittink 2003).

This paper has two key substantive findings. First, using an extensive data set containing store counts and sales for 47 geographical markets for the Japanese convenience-store industry between 1991 and 2007, this paper finds the market-share advantage for first entrants is positive and 115.3%, after addressing the potential endogeneity of entry order by utilizing the distance from the largest shareholder company's headquarters as the instrumental variable. Specifically, the effects are driven by distribution, measured by the number of outlets in a market: of 115.3%, 101.7% comes directly from higher outlet shares ("outlet-share advantage") for first entrants, and the remaining 13.6% comes from better sales performance at the store level ("sales-per-outlet advantage") for first entrants. The significant outlet-share advantage for first entrants is qualitatively consistent with a strand of literature that argues a multistore incumbent may deter late entrants by credibly preempting a product space through product proliferation (e.g., Prescott and Visscher 1977; Schmalensee 1978; Eaton and Lipsey 1979) in geographical space. On the other hand, this paper finds the observed sales-per-outlet advantage does not exist with a set of controls for the density of own outlets. This finding is consistent with the repetition effect, and contrasts with the strand of literature that argues early entrants may permanently benefit from higher store-level sales performance through various mechanisms, such as prototypicality (e.g., Carpentar and Nakamoto 1989).

Second, this paper investigates the effect of distribution on sales performance, and finds density of own outlets is nonmonotonically related (inverted U) to average sales per store. The results suggest dynamic outlet expansion is associated not only with entry order, but also with a trade-off between business-stealing effects within a chain ("cannibalization") and the repetition effect. Two cross-sectional survey data sets on consumer perception of chain brands confirm this interpretation. To rule out alternative explanations, I use two cross-sectional data sets on outlet-level geographical location to verify whether multistore retailers entering earlier than competitors obtain prime locations.

This paper makes original contributions to the marketing literature in two ways. First, by

entrants achieve the market-share advantage are likely to act differently upon these two measures, thereby allowing us to further identify the source(s) of the market-share advantage. See Sections 4.2 and 4.3 for details.

proposing a market-share decomposition, this work quantifies the entry-order effects on market shares through distribution. Despite the extant empirical literature on the first-mover advantage (see, e.g., Table 1 in Lieberman and Montgomery 1998) and the literature on the relationship between market shares and distribution (e.g., Reibstein and Farris 1995; Bucklin, Siddarth, and Silva-Risso 2008; Kumar, Fan, Gulati, and Venkat 2009; Ataman, van Heerde, and Mela 2010), scant evidence assesses the relative importance of an outlet's sales performance and distribution as mechanisms for first-mover advantage. This paper contributes to the marketing literature by synthesizing the existing work on first-mover advantage and on the relationship between market shares and distribution through a simple decomposition of market shares. Accordingly, the decomposition yields two substantive findings on the sources of the entry-order effects on market shares that are unique in the literature of entry-order effects on performance, namely, (1) a strong role of distribution in market-share advantage and (2) a nonmonotonic relationship between sales performance at the store level and distribution. The first finding corresponds to evidence of the product proliferation for market pioneers (e.g., Robinson and Fornell 1985; Robinson 1988) in the context of geographical space. The managerial implications are potentially significant because practitioners should be aware of the magnitudes of the trade-off between rushing into a new market and increasing its outlet density in existing markets. By entering new markets earlier than its competitors, a firm may increase the total sales from the market via a higher number of outlets. Alternatively, a firm may want to develop its existing markets to have a higher density of outlets, which leads to a higher sales performance at the store level. The optimal decision hinges on how many outlets a chain has developed in existing markets because of a nonmonotonic (inverted-U) relationship between density of own outlets and sales per outlet.

Second, this work, by utilizing a unique panel data set, is a rare attempt to investigate the market-share advantage for early entrants in the retailing sector. Although the empirical work on the relationship between entry order and performance is thick, the established evidence, namely, a negative relationship between entry order and market shares, has been mostly on either consumer goods or industrial goods (Kalyanaram, Robinson, and Urban 1995). Given that retailing is growing in size in the economy in accordance with a decline in manufacturing sectors, the evidence on retailing firms is surprisingly scarce, and the literature has indeed recognized this topic as one of the key unresolved issues in empirical research. Kalyanaram, Robinson, and Urban (1995) conclude that "research is still needed on pioneer market share advantages for services, retailers, and in emerging markets," echoed by Lieberman and Montgomery (2012). The two closest papers in this regard are Denstadli, Lines, and Grønhaug (2005) and Michael (2003). Denstadli, Lines, and Grønhaug (2005) study entry-order effects on consumers' evaluations on prices and quality using survey data in the discount retail grocery industry. Michael (2003) explains the performance differences between restaurants by focusing on years since a firm adopted a franchising format. Unlike this study, both approaches lack the interplay between total sales and physical outlets, which characterize the distribution in retailing sectors.

The rest of the paper is organized as follows. The remainder of this section discusses related literature. Section 2 describes the empirical model of market shares and their decomposition, and presents several theoretical hypotheses that the empirical framework is able to test to examine the sources of market-share advantage (if any). Section 3 describes the data and the convenience-store industry. Section 4 provides empirical results on the first entrants' advantage in market shares, and decomposes this advantage into outlet-share and per-outlet-sales advantages. This section also identifies the potential mechanisms for higher per-outlet sales for the first entrant. Section 5 provides discussions of alternative explanations, explores the robustness analysis, and develops the managerial implications. Section 6 concludes.

1.1 Related Literature

This research is related to three strands of literature in marketing. First, this work builds on extensive research on the relationship between order of entry and performance, with a focus on geographic markets. The two closest papers in this regard are Brown and Lattin (1994) and Bronnenberg, Dhar, and Dubé (2009). The former provides empirical evidence of the effect of order of entry on market shares, employing cross-sectional data of two major brands in the pet food market. The latter uses historical entry-order information of 50 geographical markets and a panel data set of 39 months of market shares for the brands in 34 consumer packaged goods (CPG) industries. The authors statistically document entry orders and market shares through the distance from their first market of entry, where a "brand" is defined as all stock keeping units (SKUs) sold under a given brand name. By including an identity of retailers (i.e., groceries) as a regressor when regressing market shares on a first-entrant index, they find a retail account component explains 20% of the CPG brands' variation in market shares. This paper documents and investigates the mechanisms of market-share (dis-) advantages at the chain-brand level through decomposition of market shares into outlet shares and per-outlet sales.

Second, this work is related to the strand of literature on order of entry and product proliferation. Whereas existing empirical research has focused on how the first entrant benefits from its proliferation in product space (e.g., Robinson and Fornell 1985; Tellis and Golder 1996; Boulding and Christen 2009), this work looks at the first entrant's market-share advantage in the context of outlet proliferation in geographical space.

Finally, this paper is related to the literature on the effects of distribution on performance in sales. Previous empirical research has largely analyzed the performance of brands at the product level. Ataman, van Heerde, and Mela (2010) find the positive and significant effects of distribution breadth on sales for 70 brands at the SKU level. Bucklin, Siddarth, and Silva-Risso (2008) report the positive effect of distribution intensity on a consumer's choice of a new car from eight midsize premium sedan models. Kumar, Fan, Gulati, and Venkat (2009) find the distribution level has a positive influence on sales of P&G's 11 brands at the SKU level. By contrast, the empirical evidence of the effect of distribution on sales of brands at the aggregated level, such as the retailer chain, has received scant attention. This paper fills the gap by evaluating the effect of distribution on brands' market shares at the chain level.

2 Modeling Approach

2.1 Empirical Framework

Market share, outlet share, and sales-per-outlet share. This section begins by revisiting a market share, which is constructed by observed sales for a given chain, market, and time. In addition to sales, suppose we observe the number of outlets for each chain in market m at time t. Then we can back out the average sales per outlet in market m at time t by dividing sales by the number of outlets.

I formalize the model as follows. Consider a market share of a chain that enters a geographical market. By definition, the market share of chain i in geographical market m at time t is the sales of chain i in market m at time t divided by the total sales of all outlets in market m in year t. Namely,

$$\begin{aligned}\text{Market Share}_{i,m,t} &= \frac{\text{Sales}_{i,m,t}}{\text{Sales}_{m,t}} = s_{i,m,t} \\ &= \frac{\text{Number of Outlets}_{i,m,t} * \text{Per Outlet Sales}_{i,m,t}}{\text{Number of Outlets}_{m,t} * \text{Per Outlet Sales}_{m,t}} = n_{i,m,t} * v_{i,m,t},\end{aligned}$$

where $n_{i,m,t} = \frac{\text{Number of Outlets}_{i,m,t}}{\text{Number of Outlets}_{m,t}}$ and $v_{i,m,t} = \frac{\text{Per Outlet Sales}_{i,m,t}}{\text{Per Outlet Sales}_{m,t}}$ are an outlet share and a per-store-sales share, respectively. What do these variables mean? For example, consider a market in which two chains, A and B, exist and have 10 and 30 outlets, respectively. Then the outlet shares of chain A and B will be $n_{A,m,t} = 0.25(= \frac{10}{40})$ and $n_{B,m,t} = 0.75(= \frac{30}{40})$, respectively. This outlet share measures chain i's physical distribution in market m. One of the three main measures of distribution in the literature is % physical distribution, namely, percent of outlets carrying the product (Reibstein and Farris 1995). Because the product is a chain's brand in this paper, one may interpret an outlet share as % physical distribution. The per-outlet-sales share of chain i in market m at time t is defined as the sales per outlet of chain i in market m at time t divided by the sales per outlet of all outlets in market m in year t. This share represents relative store sales. For instance, if chain i's average per-outlet sales in a given market are $\$1.5M$ annually and the average per-outlet sales of all outlets in the market are $\$1M$ annually, $v_{i,m,t} = 1.5(= \frac{1.5}{1})$. This per-outlet-sales share $v_{i,m,t}$ represents chain i's individual store performance benchmarked against the market's average: how much an average outlet of chain i earns in sales relative to the average individual store sales of all chains in the market.

Entry-order-effect decompositions. Following the literature that measures the market-share advantage for the first entrant, such as Bronnenberg et al. 2009, the log market share of chain i in market m at time t is modeled as, in its simplest form,

$$\ln s_{i,m,t} = \beta^s_{first}\text{First Entrant}_{i,m} + \gamma^s \ln(\text{Year}_{i,m,t}) + \delta^s \text{X}_{i,m,t} + \varepsilon_{i,m,t}, \quad (1)$$

where First Entrant$_{i,m}$ is an indicator variable of 1 if chain i is the first entrant in market m, and 0 otherwise. Appendix A details the choice of a market-share model. The coefficient β^s_{first} captures how being the first entrant in market m affects that firm's market share permanently, all else being equal. If we alternatively are interested in order-of-entry effects, the first term becomes β^s_{order}Entry Order$_{i,m}$, which represents the historical order of entry of chain brand i in market m. The subscript for parameter β, $first$ and $order$, displays whether the specification employs the first-entrant indicator variable (First Entrant$_{i,m}$) or historical entry-order variable (Entry Order$_{i,m}$). Year$_{i,m,t}$ represents time in market, measured in years since entry into market m at time t for firm i. $\varepsilon_{i,m,t}$ is unobserved disturbance, such as a demand shock that affects the sales of the chain. γ^s captures the time-in-market effect, namely, how the absolute duration of firm i in market m affects its market share, regardless of the timing of entry relative to other competitors (e.g., Urban et al.

1986; Brown and Lattin 1994; Huff and Robinson 1994).[4] Lastly, $\mathrm{X}_{i,m,t}$ is a combination of other controls, such as chain-brand fixed effects, market fixed effects, and an intercept.

I construct regression equations of $\ln n_{i,m,t}$ and $\ln v_{i,m,t}$ on the same controls used in Equation (1). Namely,

$$\begin{aligned}
\ln n_{i,m,t} &= \beta^n_{first}\text{First Entrant}_{i,m} + \gamma^n \ln(\text{Year}_{i,m,t}) + \delta^n \mathrm{X}_{i,m,t} + \varepsilon^n_{i,m,t} \\
\ln v_{i,m,t} &= \beta^v_{first}\text{First Entrant}_{i,m} + \gamma^v \ln(\text{Year}_{i,m,t}) + \delta^v \mathrm{X}_{i,m,t} + \varepsilon^v_{i,m,t}.
\end{aligned} \tag{2}$$

Decomposition of Equation (1) similar to the sales-elasticity decomposition with respect to marketing mix (Cooper and Nakanishi 1988) reveals that in the population model, the sum of the parameters from these two separate equations is equal to the corresponding parameters of the market-share equation. Namely,

$$\beta^s_l = \beta^n_l + \beta^v_l, l \in \{first, order\} \tag{3}$$

and $\gamma^s = \gamma^n + \gamma^v$ and $\delta^s = \delta^n + \delta^v$ (see Appendix B-1, B-2, and B-3). This relationship enables a researcher to assess how much of a chain's higher market share over rival chains comes from the outstanding distribution, reflected in the number of outlets ("outlet-share advantage"), or from the superior sales at the individual store level relative to the market average ("sales-per-outlet advantage").

Per-outlet-sales regressions. The decomposition leads to an empirical question regarding whether the first entrants tend to earn higher performance at the store level, such as sales per outlet, which is unique in the literature of estimating entry-order effects on market shares. On one hand, Klemperer (1987) argues if consumers may incur substantial costs when they switch to buying other products from competitors, consumers show brand loyalty even when products are ex-ante functionally homogeneous. Early entrants may permanently enjoy higher performance than later entrants by deterring their entry. On the other hand, a strand of behavioral marketing research suggest the repetition of exposures, not entry order per se, affects consumers' purchase intention ("repetition effects"). We therefore include several controls regarding variables that relate

[4] Strictly speaking, this paper's $\text{Year}_{i,m,t}$, time in market, is different from that analyzed in Brown and Lattin (1994). In their paper, $\text{Year}_{i,m,t}$ is the lead time: (log) ratio of firm i's time in market m at time t to the first entrant's time in the market. This paper defines $\text{Year}_{i,m,t}$ as the absolute number of years since firm i's entry.

to the repetition of purchase– density of own-chain brand's and competitors' outlets. The regression equation is

$$
\begin{aligned}
\ln \text{Per Outlet Sales}_{i,m,t} \quad = \quad & \beta^{sales}_{first}\text{First Entrant}_{i,m} + \gamma^{sales}\ln(\text{Year}_{i,m,t}) + \delta^{sales}\text{X}_{i,m,t} \\
& + \lambda^{own}_1(\text{Outlet Density})_{i,m,t} + \lambda^{own}_2(\text{Outlet Density})^2_{i,m,t} \\
& + \lambda^{rival}(\text{Outlet Density})_{-i,m,t} + \varepsilon_{i,m,t}, \qquad (4)
\end{aligned}
$$

where $(\text{Outlet Density})_{i,m,t}$ is the outlet density of own chain, defined as the number of chain i's outlets at time t in market m divided by the population in that market, and $(\text{Outlet Density})_{-i,m,t}$ is the outlet density of competitor chains, defined as the number of chain i's competitor chains' outlets at time t in market m divided by the population in that market. To allow for the presence of a non-linear relationship between the density of own outlets and the sales per outlet, which I detail in Hypotheses 3 and 4 in the next theory subsection, the specification has a squared term.

I now turn to theoretical hypotheses that the empirical framework is able to test to assess the sources of market-share, outlet-share, and sales-per-outlet advantage (if any).

2.2 Theoretical Framework

This section develops five hypotheses to guide the empirical analysis. Specifically, based on the previous research that has proposed various mechanisms to explain the first entrant's higher (or lower) performance (Lieberman and Montgomery 1988), this section examines several models that may have different predictions on how entry order affects market shares and their components: outlet shares and sales per outlet.

Market-share advantage for the first entrant. The extant literature on entry-order effects has largely confirmed the market-share advantage in the long run for early entrants (e.g., Robinson and Fornell 1985; Urban et al. 1986), although some provided opposite evidence on the effects of order of entry on market shares (e.g., Golder and Tellis 1993). Schmalensee (1982) further suggests this first-entrant advantage is larger for convenience goods. I therefore formulate the following hypothesis.

Hypothesis 1 (H1): All else being equal, the first entrant tends to have a higher market share than that of non-first entrants ($\beta^s_{first} > 0$). Similarly, a negative relationship exists between entry order and market shares ($\beta^s_{order} < 0$).

Outlet-share advantage via outlet proliferation. How do theory models predict the entry-order effects on number of outlets? Two distinct predictions exist. First, a strand of theoretical literature argues an incumbent may deter late entrants by credibly preempting a product space through product proliferation, such as increasing the number of outlets in a geographical location. A model of sequential-move games predicts that in a subgame perfect equilibrium, the "leader," or the first entrant, produces a larger quantity and obtains a higher payoff than the followers (Stackelberg 1934). In the context of spatial competition, Prescott and Visscher (1977), Schmalensee (1978), Eaton and Lipsey (1979), and Bonanno (1987) echo this conclusion. For instance, a monopolist may deter entry through relocation of outlets or an increase in the number of outlets (Bonanno 1987). Overall, many variants of the leader-and-follower model in this direction, including Peng and Tabuchi (2007), predict the early entrant is likely to obtain a higher number of outlets than later entrants. A supply-side mechanism, such as economies of density– additional cost savings through logistics from having sufficient density in a market (see, e.g., Jia 2008; Holmes 2011; Nishida 2015)– may provide an alternative perspective on outlet-share advantage for early entrants.

By contrast, another strand of literature predicts the sequential move by players may not allow the incumbents to proliferate outlets. For instance, unless the incumbent's exit costs are not too high, entry deterrence against new entrants through product proliferation may not be credible for incumbents (Judd 1985). Moreover, if each firm increases the number of outlets over time at an approximately similar speed, even a simpler model with no strategic interactions would predict a spurious negative correlation emerges between order of entry and number of outlets. The order of entry would then not be associated with the outlet share, after controlling for the duration of firms in a given market. These two strands of literature lead to the testing of the following hypothesis.

Hypothesis 2 (H2): All else being equal, the first entrant tends to have a higher outlet share than those of non-first entrants ($\beta^n_{first} > 0$). Similarly, a negative relationship exists between entry order and outlet shares ($\beta^n_{order} < 0$).

Sales-per-outlet advantage via repetition effect, prototypicality, and prime location. How do theory models explain the entry-order effects on individual store performance, such as sales per outlet? Three major explanations– repetition effect, prototypicality, and prime location– are available, and I discuss them in order. First, the behavioral marketing research suggests two competing hypotheses for whether and why entry order may have a significant positive impact on consumers' preferences. On one hand, a strand of literature argues the repetition of exposures affects consumers' attitude and purchase intentions ("repetition effect"). A typical finding is that purchase intentions are nonmonotonically related (inverted U) to repetition (see, e.g., Batra and Ray 1986). This mechanism would predict the sales per store would be nonmonotonically related to the density of own outlets (i.e., number of own outlets per population) in the market, but not to the entry order. Namely, increased "visibility" of a chain brand through a higher density of own outlets initially increases the probability of consumers purchasing from the chain brand's outlets, but the marginal effect of this repetition effect starts to level off after a certain level of the density of outlets. On the other hand, another strand of literature argues an entry order permanently affects consumers' preferences. Carpenter and Nakamoto (1989) show in the laboratory setting that early entrants set the standard for the individual's preference for a set of particular items, thereby shifting the preferences to favor the product that an early entrant produces, and yielding a higher market share in the long run. This mechanism would predict the sales per store would be permanently higher for the first entrant, after controlling for several factors, including density of own outlets, because a particular chain brand would preempt a consumer's perceptual space. Similarly, Kardes et al. (1993) provide experimental evidence that entry order affects consumer learning and judgment, leading to a pioneering advantage that later entrants will have difficulty overcoming with the same level of advertising. Alpert and Kamins (1995), using a survey-based approach, find support for the persistent advantage for early entrants through more favorable perceptions for pioneering brands than non-pioneering brands. In either case, a pioneer chain brand may preempt a consumer's perceptual space, thereby leading to higher average store sales for the first entrant, ceteris paribus. Note that a strand of literature argues how brand loyalty extends to chain loyalty. For instance, Carman (1970) reports a positive correlation between chain loyalty and brand loyalty.

Hypothesis 3 (H3): All else being equal, the first entrant does not have higher sales per outlet than those of non-first entrants, when controlling for the density of own outlets in the market (β_l^{sales}, $l \in \{first, order\}$, is not statistically significant at the 5% level).

Because an outlet of a chain competes with other outlets of the same chain and rival chains, I expect the density of own outlets and other chains' outlet in a market to affect the sales per outlet through competition among outlets ("business-stealing effect"). Combined with the aforementioned possibility of nonlinearity in the repetition effect, we would expect the sales per outlet may increase in the number of own outlets when the number is low, because the repetition effect, which is positive in the wear-in phase, dominates the negative competition effect. However, as the number increases, sales per outlet start to decrease in the density of own outlets, because (1) the negative competition effect increases and (2) the repetition effect eventually levels off.

Hypothesis 4 (H4): All else being equal, the sales per outlet increase in the density of own outlets when the density is low, but eventually decrease in the density when the density of own outlets is high ($\lambda_1^{own} > 0$ and $\lambda_2^{own} < 0$).

Finally, this paper examines an alternative explanation for higher sales per outlet for first entrants. The first entrant may be able to preempt scarce assets, such as prime retailing location (Lieberman and Montgomery 1988). Using land prices as the proxy for the attractiveness of a location, and denoting the parameter for this proxy in the regression equation as $\beta^{location}$, we have the following hypothesis:

Hypothesis 5 (H5): All else being equal, the first entrant tends to locate where rent is higher than what non-first entrants pay ($\beta_{first}^{location} > 0$). Similarly, a negative relationship exists between entry order and rent ($\beta_{order}^{location} < 0$).

With all five hypotheses, the empirical questions concern whether the actual data would be consistent with those theoretical predictions. I now turn to the description of the industry and data sets.

3 Industry and Data

The convenience-store industry in Japan. The convenience-store industry has been expanding successfully in many countries. For instance, 7-Eleven, which started its business in 1927 in Dallas, Texas, has become the world's largest convenience-store chain, operating in more than 16 countries with more than 44,700 outlets in 2012. The current parent company is Seven & i Holdings Co., Ltd in Japan. The total number of 7-Eleven stores in the world exceeds the number of Wal-Mart stores or McDonald's by approximately 34,000 and 11,000, respectively. Despite the convenience stores' presence in retailing, little research has analyzed the industry.

Since the mid-1970s, the major convenience-store chains in Japan, such as 7-Eleven, LAWSON, and Family Mart, started this new business category as subsidiary companies of nation-wide supermarket and hypermarket chains that had difficulty expanding due to a regulation enacted in 1973 to discourage the entry by large-scale retailers. Since then, these major convenience-store chains have expanded their businesses enormously, and independent (or non-chain affiliated) convenience stores have emerged as fringe firms within the industry. The business category has been expanding and the failures of the convenience-store chains are quite limited in Japan during the data period. The store density (i.e., number of stores per population) has become tremendously high in most areas as described below, and they offer a wide range of products and services, including lunchboxes, soft drinks, alcohol, cosmetics, books and magazines, ATMs, ticket reservations, bill payments, delivery services, and so on. Appendix C covers more detailed descriptions of the data and the industry's history and features.

[*Insert Table 1 around here*]

Table 1 shows the industry is concentrated in Japan: it comprises a small number of nationwide large multistore firms. 7-Eleven, the largest chain, represents 21% and 31% of the total number of outlets and sales in 2001, respectively. LAWSON Inc., the second largest chain, originally started its business in 1975 and has 19% of outlets and sales in 2001. The six-firm concentration ratio is 82%. A large number of outlets allow chains to achieve the economies of scale in distribution, advertising, product developments, and purchasing power, as in the case of discount retailers or supermarket chains.

[*Insert Figure 1 around here*]

Figure 1 presents the market shares by prefectures for 7-Eleven (left) and LAWSON (right). Together with Figure 2 in Section 4.1, Figure 1 illustrates that the market shares in the prefectures each chain entered as the first entrant indeed tend to be the highest among all chains. These two figures suggest a negative correlation between entry order and the market shares, which I investigate in the next section.

The six major chains are similar in terms of store size in floor space, number of store-keeping units (SKUs) in a store, services, and pricing. Appendix C presents the evidence of this similarity, and Table A1 confirms no major systematic differences exist across chains in the sales floor space per outlet. All six chains adopt uniform pricing across outlets within a chain. This feature of uniform product assortments and pricing allows us to avoid the issue of confounding the price and volume effects, which is a typical drawback of using market shares as the performance metric. The fraction of corporate outlets is not high in this industry. For instance, the fraction of corporate outlets to all outlets is 4.6%, 9.3%, and 4.6% for 7-Eleven, LAWSON, and Family Mart, respectively, in 2001. The remaining percentage is franchise outlets. Those convenience-store chains mostly rent their store locations. According to the estimates based on chains' financial statements in fiscal year ending 2006 and store development guidelines, the three major chains, 7-Eleven, LAWSON, Family Mart, own their outlets' locations for 2% -11% of all stores. For the remaining stores, those chains lease the space from a third party.

Japanese and US convenience stores differ in two dimensions. First, unlike convenience stores in North America, most outlets in Japan do not sell motor fuels. For instance, in 2010, only 0.2% of all 7-Eleven stores in Japan had gas stations, whereas 28% of 7-Eleven stores in the United States sold gasoline.[5] In 2010, the total number of convenience stores in Japan was $43,372$, and was $149,220$ ($= 25,931$ without gas stations $+$ $123,289$ with gas stations) in the United States.[6] As a result, the density of stores measured by the number of convenience stores per population is quite high in Japan ($3,387$ stores per million people) compared the store density in the United States (840 stores without gas stations). This outlet density of $3,387$ stores is also strikingly high compared to other businesses in the United States, such as drug stores ($1,319$), supermarkets ($1,075$), and dollar stores (780). Second, outlets in Japan have more items than outlets in the United States. The average store's floor space in Japan is around $1,743\text{ft}^2$, which is smaller than the average space in the United States ($2,800\text{ft}^2$). However, the number of SKUs a typical Japanese store carries is over $3,000$, which is larger than that of a typical convenience store in the United States. Each convenience-store chain in Japan strives to increase the fraction of sales from its unique private-label products of food and drinks against the national-brand products, such as Coca-Cola, and the fraction reached 55% of total sales for 7-Eleven Japan in 2007.[7]

Dependent variables. I employ various sources to construct the dependent variables, such as market shares, outlet shares, and sales per outlet. The primary source of market-share data is the annual financial statements from the six largest convenience-store chains, which provide the prefecture-level annual sales and the number of stores for each chain. The coverage ranges from 1991 through 2007, and the data are an unbalanced panel, because several markets exist in which certain chains have not entered. These sales at the prefecture level serve as the numerator when calculating a particular chain's market share in a given prefecture. I deflate the nominal sales across years by using the Consumer Price Index from the Cabinet Office. The Census of Commerce from the Ministry of Economy, Trade and Industry provides the prefecture-level aggregate sales and store counts of all convenience stores, including regional chain and non-chain independent outlets, for the years 1991, 1994, 1997, 1999, 2002, 2004, and 2007. These aggregate sales at the prefecture level do

[5] See the 2010 corporate outline report from the Seven & i Holdings Co., Ltd at http://www.7andi.com/dbps_data/_template_/_user_/_SITE_/localhost/_res/ir/library/co/pdf/2010_06.pdf.

[6] See the fact sheets from the National Association of Convenience Stores at http://www.nacsonline.com/Research/FactSheets/ScopeofIndustry/Pages/IndustryStoreCount.aspx.

[7] See the report from Japan Marketing Research Institute at http://www.jmr-g.co.jp/reports/report10.html.

not have a breakdown by chains, and they serve as the denominator when calculating the market share or outlet share of a particular chain. Japan has 47 prefectures, and each is a governmental body with a governor. This paper treats these prefectures as 47 independent geographic markets in the market-share regressions.

Spillovers across markets either in demand or costs or both may make observations non-independently. For instance, people may travel across the boundary of prefectures (demand), and a distribution center may serve stores in different prefectures (costs). The spillover effects on the demand side might not pose an immediate concern for this industry, because the demand for a convenience store is typically confined within a $2,000$-meter radius. Appendix F explores the main specification's robustness checks to include the density of outlets in adjacent markets. The results do not find evidence of dependence of markets in sales.

In addition to sales and store counts, I use consumers' brand-loyalty data from two distinct surveys. The first survey in 2005 comes from NTT Navispace Corporation, and the second survey in 2010 comes from Interwired Corporation. Although these six chains are all nationwide chains, consumers' preferences for their favorite chain brands vary widely across regions, which this paper exploits later. Finally, this paper uses the cross-sectional data on outlet-level location from the Convenience Store Almanac in 2002 (TBC 2002), which provides chain affiliations and physical addresses for all $40,112$ convenience-store outlets in Japan in 2001, including non-chain outlets. I translated each outlet's physical address into a latitude and longitude.

Variables of interest: entry timing and density of outlets. For the entry timing, I manually collected the historical data on each chain's roll-out year at a given prefecture either from the financial statements, direct communication with each chain's headquarters, or past local Yellow Pages obtained from the National Diet Library. I do not distinguish the entry timing within a year: if multiple chains enter a market in the same year, these chains' entry order will be the same.

[*Insert Table 2 around here*]

Table 2 presents the number of prefectures by entry order for each chain as of 2011. The table shows entry orders vary within a chain for all chains. Whereas LAWSON and Family Mart have been the fourth entrant at the latest in every prefecture, the largest chain, 7-Eleven, is the fifth or sixth entrant in 10 prefectures, and still has eight prefectures with no outlet. Furthermore, the table shows 7-Eleven was the first entrant less than 30% of the time in Japan (i.e., in 14 markets out of 47 markets). This entry-order information is at the market level, and I do not have store-level information on the entry timing for a given market.

[*Insert Table 3 around here*]

Table 3 presents sample descriptive statistics by market. As the bottom row of Table 3 shows, the market population differs across prefectures and years. To measure the density of outlets in a given market, I construct the density of own (rival) outlets as the number of own (rival) outlets divided by the thousand population in the market. This table also summarizes market-level descriptive statistics for the six largest chains. The table excludes observations with no outlet in a given prefecture. Both the market share and the number of outlets vary widely across prefectures within a chain and across chains. By contrast, the average per-outlet sales are reasonably similar across chains except 7-Eleven, which exhibits around 30% higher sales per outlet than the per-outlet sales of the remaining five chains. For first entrants, we observe higher sales per outlet than non-first entrants' sales per outlet. The maximum and minimum values in the years since a firm's first outlet in a given market show six chains started to operate in Japan around $26-32$ years ago, and these chains were still entering a prefecture as of 2007, which is the last year in our sample.

4 Empirical Evidence of First Entrant's Advantage

This paper's empirical investigation begins with formally establishing the (non-) existence of market-share advantage for the first entrant. This paper then decomposes the observed market-share advantage for the first entrant into the outlet-share and per-outlet-sales advantages.

4.1 Effects of Entry Order on Market Shares

This subsection examines the entry-order effects on market shares (H1) using the empirical specification outlined in Equation (1).

Addressing endogeneity of entry order. A typical concern when estimating entry-order effects on market shares is that entry timing may be potentially endogenous. For instance, chains that enter a geographical market earlier than competitors are systematically different from later-mover chains, such that the parameters on an entry-order variable does not necessarily measure the entry-order effects on market shares, but rather some other factors about type at the chain level and chain-market level.

To see this endogeneity problem in this work's specific context, consider, for instance, estimating Equation (1) through the ordinary least squares (OLS). OLS would treat the regressors, including entry-order indicators, First $\text{Entrant}_{i,m}$ or Entry $\text{Order}_{i,m}$, as exogenously given. Chains may, however, deliberately choose the entry timing and which market to enter, depending on unobservables in the market that affect sales, such as a demand shock at the chain-market level. For example, if a chain anticipates consumers' market-chain-specific taste or goodwill over the chain's brand that would positively affect chain i's sales in that market m, such as a potential good match between chain i's horizontal differentiation in products and the market-specific taste, the chain may choose to enter market m earlier than the case in which a chain receives a negative demand shock. Because the entry-order indicator is no longer independent of the error term, the coefficient on the endogenous variable may be biased and inconsistent.

This paper addresses the endogeneity issue in the following two ways. First, because the data are panel, I include chain-brand fixed effects in all specifications to control for the unobserved chain-brand type. In addition, Table 2 confirms that order of entry varies across markets for all chains, suggesting that no particular chain dominantly behaves as the first entrant. Second, to control for the endogeneity at the chain-market level, this paper utilizes an instrument variable (IV) that affects a chain's entry-timing decisions but does not affect unobservables, following the IV approach taken by Moore, Boulding, and Goodstein (1991), Boulding and Staelin (1993), and Boulding and Christensen (2003). Because the dependent variable is sales (market share), ideally we would like to have a cost shifter (hence affecting the entry-timing decision) that varies across chains and market. Given the availability of multiple geographical markets, I exploit the distance to the headquarters of the largest shareholding company for each convenience-store chain as the instrument for this paper. The use of this instrument is related in spirit to Neumark, Zhang, and Ciccarella (2008), Jia (2008), and Zhu and Singh (2009), who utilize the geographical distance to the headquarters of the firm as an instrument or exclusion restriction.

[*Insert Table 4 around here*]

I now discuss the three conditions for the validity of instruments and how this instrument is likely to work for the convenience-store industry in Japan. The first condition is that the instrument needs to be correlated with the endogenous variable that is instrumented, conditioning on other exogenous variables, and this paper presents three reasons why the instrument is related to the order of entry. First, several studies in the franchising literature confirm the distance from the monitoring headquarters is related to the measure of the control/behavioral monitoring costs. The idea behind the correlation is that the cost of sending a company employee to monitor the outlet in a given market may increase as the distance to the market from the headquarter increases (see, e.g., Brickley and Dark 1987; Minkler 1990). Second, given the industry's institutional background, the distance from the headquarters of the shareholding company is likely to affect the behavior of its subsidiary company in the convenience-store industry in Japan. Six different major retail chains initially developed and owned all six of these convenience-store chains in Japan in the late 1970s and early 80s. For instance, Table 4 illustrates that the largest shareholder of 7-Eleven in 1974 was Ito-Yokado Co., Ltd., which was a general-merchandise-store chain. Similarly, the largest shareholder of LAWSON in 1975 was The Daiei Inc., which was one of the largest supermarket chains in Japan. Finally, this paper indeed observes a correlation between the instrument and order of entry. Figures 2a and 2b illustrate the distance to the shareholding company's headquarters negatively correlates with the entry order (and thus the geographical roll-out decisions) for the largest and the second largest chains, respectively, and we find similar patterns for the rest of the chains.

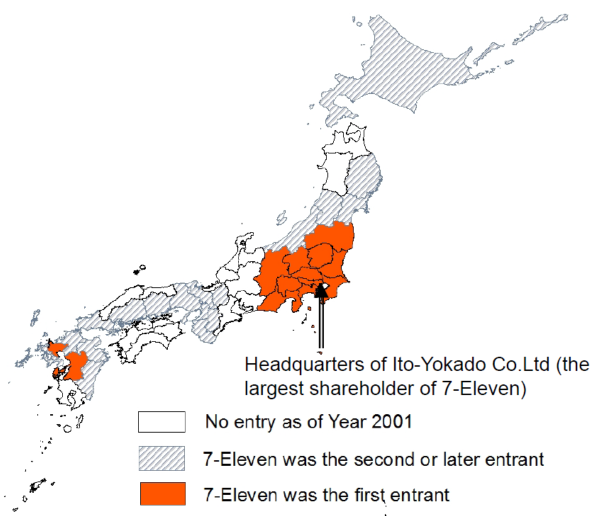

Figure 2a.

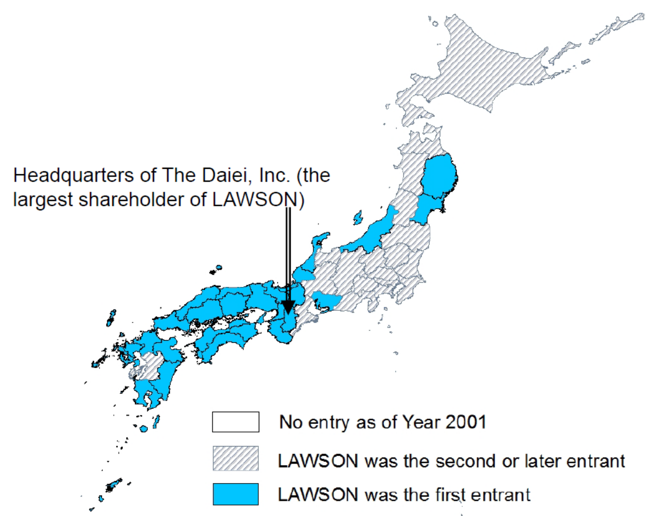

Figure 2b.

The second condition is that an instrument needs to be uncorrelated with unobservables in the market-share and sales-per-outlet regression equations. The industry is likely to satisfy this exclusion restriction for two reasons. First, as I discussed in the previous paragraph, the instrument, the distance to the headquarters of the largest shareholding company for each convenience-store chain, is a cost shifter, and thus unlikely to be correlated with the unobserved demand shocks in Equation (1), because market-share variables are based on sales. Second, because sales are driven mostly by demand-side factors, we are particularly concerned with whether any unobserved demand shifters, such as consumers' market-brand-specific taste or goodwill over the chain's brand, are related to the largest shareholder company's brand name (hence location). The instrument and a demand shock are likely to be uncorrelated when consumers shopping at a convenience-store chain do not recognize the store's shareholder chain brand or company name. The non-correlation is plausible in our study, in which, for two reasons, not many consumers notice the affiliations between convenience-store chain brands and the largest shareholder's retail chain brand or company name. The first reason is that these shareholding retail companies and convenience-store chains are operated separately, and their brands were never jointly advertised. The second reason is that the business category is different (i.e., convenience-store industry vs. supermarket, general merchandise, or trading industry), so consumers are unlikely to have the opportunity to associate these chain brands of the shareholding company with the convenience-store chain. Note that if we were regressing profits, which are revenue minus costs, instead of market shares, we would have a much more serious concern with the use of this instrument, because it is likely to be correlated with the cost shocks in the regression equations.

Finally, because entry timing differs across chain brands, we have the third condition that the instrument needs to provide independent variations across firms within the same market-year observations. The proposed instrument creates a variation across convenience-store chains' entry orders within a given market, because the locations of the headquarters of the largest shareholder companies differ across these six convenience-store chains. The instrument provides some variations across time, because ownership turnovers exist for all chains (Table 4).

Estimation results. [*Insert Table 5 around here*]

Columns 1 through 6 in Table 5 report the results from the IV regressions of market shares, outlet shares, and per-store-outlet shares on the first-entrant indicator and other controls. All specifications include the market fixed effects and chain-brand fixed effects, in which we use ministop, a chain brand, as the reference group for chain-brand fixed effects. By including the chain-brand fixed effects, I control for any systematic differences in the dependent variables across chains that are constant over time, such as the chain-level heterogeneity in the store size, pricing, product quality, brand equity, and depth of product assortment. Given the panel-data structure, I cluster the standard errors on the panel identifier (a market-chain combination), which imposes no restrictions on the variance matrix over time for a given panel identifier, including serial correlation.

Column 1 presents instrumental variable (IV) estimates of the first-entrant effects on market shares, β^{s}_{first}. The results presented in column 1 document the first entrant obtains a higher market share than later entrants by a wide margin. Similarly, column 4 shows a negative relationship between entry order and market shares. The sign on the first-entrant indicator variable and entry-order variable is statistically significant at the 5% level and 1% level, respectively. A separately run one-sided test yields the probability of rejecting H1's null hypothesis H0: $\beta^{s}_{first} \leq 0$ when H0 is true as 0.008, and this value is below the 5% significance level, which I use as the critical value for rejecting hypotheses throughout the paper. Although the magnitudes of the first entrant may seem somewhat large ($\hat{\beta}^{s}_{first} = 115.3\%$ increase), these parameter coefficients are relative to the market share of the base category (non-first entrants). For instance, consider an example in which each non-first entrant has a market share of 20%. Applying the frequently used linear approximation, the first-entrant parameter estimates in column 1 imply that all else being equal (i.e., chain brands and number of years), the market share of the first entrant would be $43.1\%(= 20\% * (1 + 1.153))$. Meanwhile, the coefficient on the 7-Eleven-brand fixed effect is 1.129, implying the leading chain brand in Japan, 7-Eleven, from the ministop chain brand (base category) would have the market share of $42.6\%(= 20\% * (1 + 1.129))$ if ministop has a market share of 20%, all else being equal. Although not shown in the table, the results are robust to the exclusion of time in market.

Several tests are available to examine the performance of the instrument. The statistic proposed for testing for underidentification is 27.658, implying the rejection of the null hypothesis that the estimation equation is underidentified. The Kleibergen-Paap (2006) Wald rk F statistic is 40.946, rejecting the hypothesis that the instrument has a weak identification problem. The endogeneity test statistics yield the p-values of 0.003, rejecting the null hypothesis that the indicator variable for the first entrant can be treated as exogenous in the estimation equation. Given these results, this paper does not find major issues with this instrument.

Overall, we confirm the presence of a market-share advantage (H1). A natural question would be which mechanisms drive this market-share advantage for first entrants, which I explore in the next subsection.

4.2 Decomposing Market-Share Advantage into Outlet-Share and Per-Outlet-Sales-Share Advantages

This subsection focuses on the role of distribution and sales performance by decomposing market shares into outlet shares and per-outlet-sales shares.

Columns 1 through 3 in Table 5 present the decomposition results. Columns 2 and 3 use the log outlet share and log per-outlet share as the dependent variable, respectively. As Equation (3) shows, the regression coefficients of a given regressor in columns 2 and 3 add up to the coefficient of the corresponding variable in column 1.

The second and third columns in Table 5 show the first-entrant effect on outlet share and per-store-sales share, β^n_{first} and β^v_{first}, is positive and statistically significant at the 5% and 1% levels. A separately run one-sided test rejects H2's null hypothesis at the 5% significance level. These two columns reveal how these two advantages are quantitatively important. Specifically, although most of the market-share advantage (1.153) for the first entrant comes from the outlet-share advantage ($\hat{\beta}^n_{first} = 1.107$), the sales-per-outlet advantage ($\hat{\beta}^v_{first} = 0.136$) is positive and significant both statistically and economically. In other words, the first entrant's market share will be larger than that of non-first entrants by 115.3%, of which 13.6 percentage points come from higher sales per outlet and the remaining 101.7 percentage points come from a higher number of outlets. The decomposition of chain-brand fixed effects in column 1 into columns 2 and 3 is informative of how each chain achieves its market shares- either by quantity, namely, the number of outlets, or by outlet quality, namely, the sales per outlet, or both. The results are robust to the exclusion of time in market and the use of the historical entry-order variable instead of the first-entrant indicator (columns 4 through 6).

With regard to the hypothesis on the first entrant's advantage in developing the number of outlets (H2), both the coefficients on the first-entrant indicator variable and entry-order variable in columns 2 (β^n_{first}) and 5 (β^n_{order}) suggest the data favor the preemption of market demand via sequential quantity competition with credible commitment. This result is qualitatively consistent with the characteristics of the industry: the entry-timing decisions are made over a long period of time, such as decades, which allows each chain– before making a decision– to observe and react to other chains' decisions on entry timing and number of outlets. Moreover, the costs of relocating or closing an outlet within a market are sizeable. Annual financial statements reveal a chain incurs costs of approximately US$100,000 on average for closing one of its stores. Given these industry features, we should probably not be surprised to see that sequential-move games with high exit costs provide a more realistic description of order of entry and number of outlets than sequential-move games with low or no exit costs, or Cournot's simultaneous-move game with complete information.

4.3 Investigating Per-Outlet-Sales Advantage

Entry-order effects on individual store's performance. I now turn to the finding that the first entrant achieves by a nontrivial margin ($\hat{\beta}^{v}_{first} = 13.6\%$) a higher sales-per-outlet share. Several theoretical models and pieces of anecdotal evidence suggest the density of own and rival outlets affect per-outlet sales through competition and advertising. To investigate how the density of outlets affects the per-outlet performance in detail, I estimate Equation (4).

[*Insert Table 6 around here*]

Column 1 in Table 6 presents the results from the full specification. This table indicates the entry-order effect on per-store sales is non-existent with a control for the outlet density, whereas the density of outlets (own and rival), which accounts for competition and advertising, seems to drive the permanent sales-per-outlet increase. Specifically, the effect of the first-entrant indicator does not seem to directly affect the sales per outlet. Meanwhile, the density of own outlets enters positively when the density is low. This result is qualitatively consistent with H3. Given the first entrant attains a higher number of own outlets (H2), it may achieve the higher individual store sales through the density of own stores. The empirical finding is robust across specifications that either use the historical entry order or exclude market fixed effects and/or years since entry.

Another pattern that emerges from the estimation is the inverted-U relationship between the number of own outlets and the sales per store ($\hat{\lambda}^{own}_1 > 0$ and $\hat{\lambda}^{own}_2 < 0$), as expected according to H4. I reject the null joint hypothesis at the 5% significance level.

[*Insert Figure 3 around here*]

To understand how this nonlinearity appears, Figure 3 plots the prediction of the own density effect on the sales per outlet implied by the estimated parameters in column 1 in Table 6. This figure shows the individual store performance in sales improves in the number of own outlets when the density is low, but eventually the sales per outlet start to decrease after the density of own outlets exceeds a certain threshold. The maximum is attained at a density of 0.108 outlets per $1,000$ people, and the effect will be negative at a density of 0.215. Given the maximum density of own outlets in the data is around 0.165, chains seem not to develop outlets in the region of the negative effect. This nonlinearity is qualitatively consistent with the dynamics of the trade-off between the repetition effect and the cannibalization effect, both of which are driven by own density. Namely, the repetition effect through exposure may be dominating the cannibalization effect when the density of own outlets is at its low level, because the repetition effect is high when the repetition is low. The increase in the density of own outlets helps the firm increase the individual store performance, because the chain brand is more advertised through increased repeated purchases because of a denser network of outlets. However, the cannibalization effect increases as the own density increases, and eventually it dominates the repetition effect because the marginal effect of the repetition effect might level off, whereas the marginal effect of cannibalization might not. Meanwhile, the density of competitors' outlets decreases the per-outlet sales significantly because of business-stealing effects. In summary, the order of entry only affects the sales per outlet through distribution. Entering the market earlier than rivals helps the chain because the first entrant is likely to face a smaller business-stealing effect from competitors, which monotonically increases in the density of rival outlets. Because all chains provide similar services and products, not observing positive spillover effects across chains because of clustering is natural in this industry, unlike shopping malls. The above results do not change either qualitatively or quantitatively, after I include the log number of supermarkets in the market as a regressor.

Overall, the results (H2) support the preemption of geographical space with outlet proliferation and the repetition effect through outlet developments. The sole results may not be convincing, however, because the results above do not eliminate other explanations, such as prime location for the first entrant. To address these issues, the next section employs two additional cross-sectional data: the supplemental surveys and outlet-level location.

5 Discussions

The first two subsections supplement the previous section's findings with evidence from the brand-preference surveys and outlet-level location data.

Verifying the repetition effect with survey data. This subsection examines whether the development of brand loyalty through density of outlets indeed drives the findings in the previous section (H3). I supplement the market-level aggregate data with two cross-sectional surveys. These surveys contain information on geographical variations in the degree of consumers' brand loyalty to a particular chain brand.[8]

[8] The strength of consumers' brand loyalty in the convenience-store industry is an empirical question. On one hand, each chain is differentiated in particular goods or services that are specific to that chain, such as ticketing and own brand's lunchbox and other private-label items. If an advantage exists for the first entrant in shaping the consumers' perceptions, we should observe a higher degree of brand loyalty for earlier entrants, which may eventually increase the willingness to pay for the chain brand's outlets. On the other hand, convenience-store chains carry national

For this purpose, I regress the log fraction of consumers who vote for one of the convenience-store chains on the first-entrant indicator and other controls. I denote the parameter on the first-entrant indicator and entry-order variable as β^{brand}_{first} and β^{brand}_{order}, respectively. I use two distinct cross-sectional surveys, one from 2005 and the other from 2010. Because these surveys publish the consumers' responses aggregated at the regional level, I changed the right-hand-side variable accordingly. For instance, the first-entrant indicator is the average of the first-entrant indices across prefectures within a given region. The first two columns show the results from the 2005 survey, and the next two columns show the results from the 2010 survey. Note that 10 regions exist in Japan, where a region is a unit of an administrative district, and each has one to eight prefectures.

[*Insert Table 7 around here*]

Columns 1 through 8 in Table 7 show the density of own outlets drives a statistically and economically significant return from being the first entrant on the brand preference. For instance, column 4 implies that after taking into account the number of years and outlet density, the first entrant obtains 4 points more on average than non-first entrants on a scale of $0-100$ points, which is, however, not precisely estimated even at the 10% level, all else being equal. In other words, the density of own outlets is strongly associated with brand preference, qualitatively consistent with the results from Table 6. The above results are robust to the use of an historical entry variable or the exclusion of region and chain-brand fixed effects.

Overall, the results suggest the entry order might affect the preference for a chain's brand through the density of the chain's outlets. The next subsection considers whether the location preemption may explain the per-outlet-sales advantage for the first entrant.

Alternative explanation: preemption of prime physical location. This subsection examines whether the first entrant is successful in achieving a higher market share by obtaining physical resources, such as good locations (H5). When taking the cost side into account, such as cost of space, the predictions on the profitability per store for the first entrant may not be as obvious as the sales per store, because better locations with larger sales may suffer from increased costs. To investigate whether the first entrant tends to achieve a "better" or attractive location as measured by a higher land price in the neighborhood, I complement the market-level information on entry

brand items, too. For instance, any outlet would carry Coke and other popular soft-drink brands, and consumers would choose the geographically closest outlet from their location. The effect of brand loyalty or switching costs on purchasing decisions may not be as clear in the retailing industry as in other industries, such as the consumer packaged-goods industry.

order with geographical location for all convenience stores in Japan in 2001. To assess whether the data support H5, I use several measures of the attractiveness of retail location with publicly available location data. These variables include nighttime population, number of workers, number of households, and the land price in 2001. The unit of analysis is an outlet. For a given convenience store, I construct population, number of workers, and number of households from demographics of the 1km^2 mesh grid in which the outlet falls. I also use population at the census block in which the outlet is located. For land price, I use the closest price point from the outlet's location. The population from the census block is normalized by the geographical size of the census block, because each census block has a different geographical area. To associate these outlet-level demographics with the market-level entry-order information, I average these demographic variables across outlets of the same chain in a given prefecture. I denote the parameter on the first-entrant indicator as $\beta_{first}^{location}$.

[*Insert Table 8 around here*]

Table 8 presents the results of regressing the above demographic variables at the chain-market level on the first-entrant indicator or entry-order variable and other controls, including chain-brand and market fixed effects, to account for differences across markets and chains. Columns 1 and 3 use the log nighttime population as the dependent variable as a proxy for attractiveness of outlet location. The estimated magnitude of coefficients on first entrant is positive, but most of these coefficients are not precisely estimated at the 5% level. The same pattern applies to the specifications in column 5, 7, and 9, in which we use the log number of households, log number of workers, and log land price, respectively, as the measures of location attractiveness. The above results are robust to the use of an historical entry variable, although the evidence is a bit stronger than that of the indicator-variable specifications.

Overall, no evident pattern emerges from these regressions regarding how entry order is associated with attractiveness of outlets' location.

Robustness checks. To see how the results are sensitive to the specifications, I conduct eight robustness checks. First, Appendix D examines whether the results are robust to an unbalanced versus balanced panel structure. The results in Table A4 yield the magnitude of market-share and other advantages quantitatively similar to the baseline results in Table 5. Second, Table A7 uses an alternative density measure, which is the number of outlets in level, to verify the robustness of the measures for the presence of outlets in the same market. The results yield a non-linear relationship between the number of own outlets and sales per outlet, similar to Table 6. Third, Appendix E examines the strategic choice of spatial outlet location, another potential mechanism for the per-outlet-sales advantage for early entrants. I focus on whether the first entrant locates its outlets close to or distant from other outlets of own chain or rival chains. Using cross-sectional location data, I find no evidence of entry orders affecting strategic location choice. Fourth, Appendix F examines whether the presence of own and competitors' chains in adjacent markets poses a concern about dependency among 47 markets. The results confirm that the presence of outlets in neighboring markets has little effect on sales. Fifth, the current operationalization with a single variable regarding entry order may yield the very large estimated effect. The limitation is that the baseline specifications have to be restricted to one variable on entry order, because we only have one available instrument, such that the entry-order effects will be under-identified when we have more entry-order indices. To examine this concern, I jointly investigate the effects on the first, second, third, fourth, and fifth entrants, using standard fixed-effect regressions without using instruments. The results in Appendix G show the entry-order effects are diminishing in entry order, but these entry-order effects go away once we control for the outlet density, confirming the baseline results in Tables 5 and 6. Sixth, Appendix H confirms the robustness of the results to more aggregated data, such as regional and national-level observations. Seventh, to investigate how contingency factors affect the magnitudes of entry-order effects, I enrich the specifications in Tables 5 and 6 by including a market growth rate as a marketplace variable (Appendix I). Finally, to see how the results in Table 6 are sensitive to the choice of instrument, Table A8 utilizes both OLS and instrumental variable approach with the distance to the first store of the convenience-store chain as an alternative instrument. Both results confirm the findings from Table 6: the sales per outlet do not correlate with the first-entrant index, whereas the sales per outlet are nonmonotonically related to density of own outlets.

Managerial implications. Because two actionable levers for chains in this study are entry-order decisions and outlet-density decisions, the results in this paper offer rich managerial implications to managers in at least two ways. First, this paper shows and quantifies a trade-off between new markets and existing markets. One of the major managerial implications from marketers' viewpoint is that according to the results from Tables 5 and 6, when expanding a certain number of outlets, a chain is able to decide whether to prioritize rushing into a new market over increasing its outlet density in existing markets. By entering new markets earlier than its competitors, a firm may obtain a substantial first-mover advantage in outlet share, which increases the total sales from the market via a higher number of outlets. Alternatively, a firm may want to develop its existing markets to have a higher density of outlets, which leads to a higher sales performance at the store level and thus higher total sales. The optimal decision hinges on how many outlets a chain has developed in existing markets, because the results from Table 6 suggest that due to a nonmonotonic (inverted-U) relationship between density of own outlets and sales per outlet, the marginal benefit from increasing the store density is decreasing in its density. Namely, when the store density is at a low range, a chain may want to exploit the advertising effect through repetition to increase the individual store performance in sales. To do so, a chain would increase the store density in existing markets rather than rush to enter a new market earlier than competitors. When the store density goes beyond 0.11 per thousand people, however, the chain may want to switch to developing its outlets in a new market, because of the business-stealing effects within a chain ("cannibalization"). With a better understanding of this trade-off, managers should be in a better position to yield higher revenues. Note that the density of outlets is directly related to the two following marketing variables: product line and distribution in the retail setting. First, because the number of outlets in a geographical space corresponds to the number of product lines in a product space, one may use the outlet density as a measure of how the product line is proliferated in retail and service sectors. Second, as Section 2.1 describes, one may use the density of outlets as a measure that researches use to approximate the degree of distribution.

Second, the positive effect of the density of outlets on individual store sales suggests another use of corporate outlets for retailers. The results imply the higher density of outlets, not the entry order per se, increases the store-level sales performance, especially when the outlet density is at a low level. Corporate-owned outlets may also be helpful in achieving higher sales per outlet via exposure effects when the chain has just entered the market.

6 Conclusions

An investigation of entry order on performance is important to marketing, economics, and strategic management. Consequently, a sizable literature has grown around entry-order effects on market shares and profits, both theoretically and empirically. However, little is known about whether distribution, which affects market shares, helps us better understand the entry-order effects.

This paper examines the entry-order effects on firms' performance, with an emphasis on the geographical expansion of distribution. Recognizing that retail and service industries are characterized by their physical outlets, this paper documents and decomposes the market-share advantage into outlet-share and per-outlet-sales advantages. Using the manually collected panel information on store counts, sales, and entry timing of the convenience-store industry in Japan for each of 47 distinct geographic markets between 1991 through 2007, this article documents that for a given market, the first entrant would obtain a higher market share than non-first entrants. This paper finds a strong role of distribution in market-share advantage, which is qualitatively consistent with the sequential-move preemption games. This paper also finds a non-linear relationship between sales performance at the store level and distribution, suggesting a trade-off between business-stealing from own-chain outlets ("cannibalization") and a repetition effect through repeated exposures. This paper blends cross-sectional survey data on chain-brand preference with the historical entry-timing information to confirm the interpretation of the baseline results. The empirical evidence is robust to several alternative specifications.

This paper's empirical findings are based on the data regarding geographical entry in the convenience-store industry in Japan, but extending the decomposition analysis beyond (1) entry in geographical space and (2) a single industry in a single country would be interesting. First, a researcher may be interested in applying the market-share decompositions beyond entry in geographical space. For instance, a researcher could alternatively focus on the spatial preemption in the product space, such as product proliferation in a ready-to-eat breakfast cereal industry discussed in Schmalensee (1978), such that a researcher is able to measure and decompose the entry-order effects on market shares into the entry-order effects on the number of products and sales per product. Second, spatial preemption in geographical space is ubiquitous, and one may apply this market-share decomposition where spatial preemption is a key component behind changes in market structure and rapid expansion. Some evidence of such spatial preemption matters includes a study on the supermarket industry (West 1981). Because store counts and location data, current and historic, are mostly publicly observable for many retail and service sectors, extending the decomposition approach to rapid expansion and geographical preemption in other industries, such as the US premium-ice-cream industry (Murphy 2006), may prove useful.

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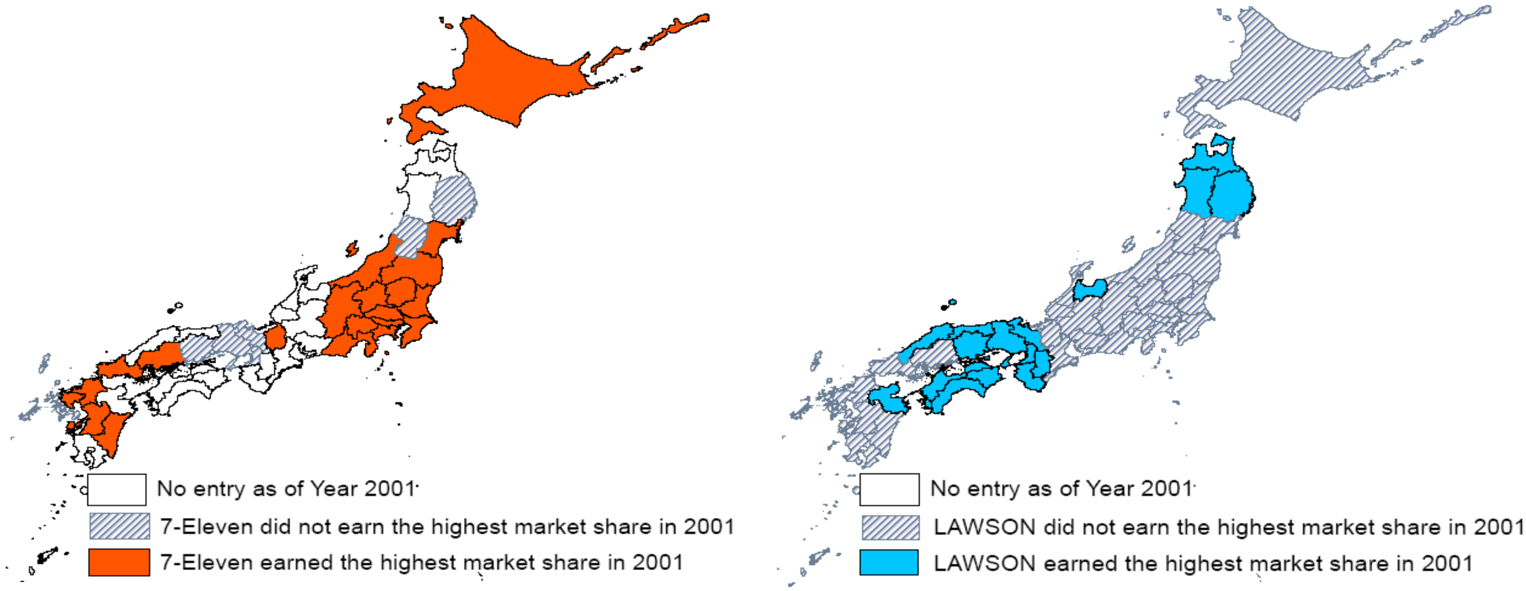

Figure 1. Market Shares by Prefecture for 7-Eleven (left) and LAWSON (right)

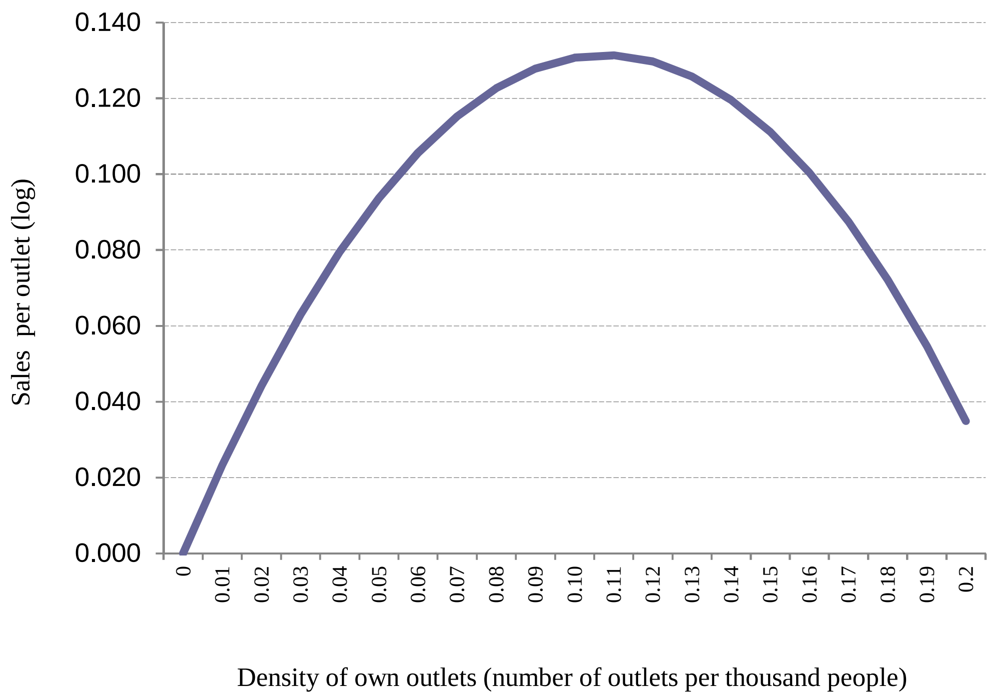

Figure 3. The Relationship between Density of Outlets and Sales per Outlet Implied by the Estimates

Table 1
The Number of Convenience-Store Outlets and Total Sales in 2001

Chain	Number of Outlets	Percent	Cumulative	Sales (in thousand US$)	Percent	Cumulative
7-Eleven	8,416	21.0	21.0	204,664	30.5	30.5
LAWSON	7,419	18.5	39.5	127,536	19.0	49.5
Family Mart	5,805	14.5	54.0	94,607	14.1	63.6
sunkus	2,744	6.8	60.8	49,702	7.4	71.0
circleK	2,696	6.7	67.5	47,854	7.1	78.1
ministop	1,491	3.7	71.2	21,676	3.2	81.3
Others	11,541	28.8	100.0	125,330	18.7	100.0
Total	40,112	100		671,369	100	

Note: Others include both chain and non-chain (i.e., independent) convenience-store outlets.

Table 2
Number of Prefectures by Historical Entry Order, 2011

	Entry Order							
Chain	1st	2nd	3rd	4th	5th	6th	No entry	Sum
7-Eleven	14	4	6	5	5	5	8	47
LAWSON	27	16	4	0	0	0	0	47
Family Mart	2	13	20	12	0	0	0	47
sunkus	2	6	6	9	11	1	12	47
circleK	6	5	10	2	1	2	21	47
ministop	0	0	1	10	9	5	22	47
Sum	51	44	47	38	26	13		

Note: The sum of first entrants, 51, exceeds the total number of markets (=47), because there were some "ties." Namely, some chains entered a market in the same year.

Table 3
Sample Descriptive Statistics by Prefecture, 1991 - 2007

Variable	Mean	Std. Dev.	Min	Max	Number of obs.
Market share					
7-Eleven	0.43	0.19	0.02	0.80	150
LAWSON	0.25	0.15	0.07	0.93	188
Family Mart	0.17	0.09	0.00	0.54	193
sunkus	0.11	0.08	0.00	0.34	106
circleK	0.19	0.16	0.00	0.73	93
ministop	0.05	0.03	0.00	0.18	93
Overall	0.22	0.18	0.00	0.93	823
Number of outlets					
7-Eleven	290.6	253.8	6	1,328	150
LAWSON	165.6	174.2	21	926	188
Family Mart	162.6	192.9	3	1,025	193
sunkus	90.7	93.7	4	503	106
circleK	119.3	161.7	1	847	93
ministop	78.0	74.6	1	301	93
Overall	162.9	191.4	1	1,328	823
Per-outlet sales (daily, US$)					
7-Eleven	6,163	652	4,126	7,384	150
LAWSON	4,440	473	3,568	6,026	188
Family Mart	4,274	499	2,621	5,570	191
sunkus	4,625	618	2,876	5,749	104
circleK	4,478	430	3,179	5,693	90
ministop	4,200	545	1,492	5,737	83
First entrant	5,293	1,078	3,201	7,490	224
Second entrant	4,622	819	2,760	7,140	187
Third entrant	4,620	602	2,900	6,370	176
Fourth entrant	4,509	674	2,916	6,440	113
Fifth entrant	4,625	799	1,547	5,871	66
Sixth entrant	4,378	478	3,521	5,809	26
Overall	4,724	886	1,492	7,384	806
Time in market (years)					
7-Eleven	15.7	7.657	1	30	150
LAWSON	18.1	7.295	2	32	188
Family Mart	13.2	7.073	1	30	193
sunkus	11.1	6.174	1	27	106
circleK	13.1	5.617	1	25	93
ministop	9.8	7.322	1	26	93
Overall	14.1	7.517	1	32	823
Density of own outlets	0.0525	0.0342	0.0008	0.1652	806
Density of rival outlets	0.2518	0.0673	0.0750	0.4549	806
Population (thousand people)	3,418	2,915	600	12,758	806

Note: The data years are 1991, 1994, 1997, 1999, 2002, 2004, and 2007. The per-outlet sales are daily sales in US dollars. Summary statistics for years since entry are limited to the the year-chain-prefecture combinations with no missing market-share information. I exclude observations with no outlet in a given prefecture.

Table 4
The Largest Shareholding Company for Each of Six Convenience-Store Chains in Japan, 1973 - 2007

<table>
<tr><th rowspan="2">Year</th><th colspan="6">Convenience-Store Chain</th></tr>
<tr><th>7-Eleven</th><th>LAWSON</th><th>Family Mart</th><th>sunkus</th><th>circle K</th><th>ministop</th></tr>
<tr><td>1973</td><td></td><td rowspan="2"></td><td rowspan="5">Seiyu GK.</td><td rowspan="3"></td><td rowspan="3"></td><td rowspan="3"></td></tr>
<tr><td>1974</td><td rowspan="6">Ito-Yokado Co., Ltd.</td></tr>
<tr><td>1975-79</td><td rowspan="4">The Daiei, Inc.</td></tr>
<tr><td>1980-93</td><td>Nagasakiya Co., Ltd.</td><td rowspan="3">UNY Co., Ltd.</td><td rowspan="5">JUSCO Co., Ltd. (renamed AEON Co., Ltd. from 1989)</td></tr>
<tr><td>1994-97</td><td>Ono Group</td></tr>
<tr><td>1998-2000</td><td rowspan="3">ITOCHU Corporation</td><td>UNY Co., Ltd.</td></tr>
<tr><td>2001-04</td><td rowspan="2">Mitsubishi Corporation</td><td colspan="2" rowspan="2">UNY Co., Ltd</td></tr>
<tr><td>2005-07</td><td>Seven & i Holdings Co., Ltd.</td></tr>
</table>

Table 5
The Decomposition of the Entry-Order Effects, 1991- 2007

Dependent share variable (log)	(1) Market Share	(2) Number of Outlets	(3) Sales per Outlet	(4) Market Share	(5) Number of Outlets	(6) Sales per Outlet
First entrant (β_{first}) in H1 & H2	1.153*	1.017*	0.136**			
	(0.482)	(0.454)	(0.043)			
Entry order (β_{order}) In H1 & H2				-0.783**	-0.690**	-0.092*
				(0.222)	(0.202)	(0.036)
Time in market (γ)	0.643**	0.628**	0.016	0.066	0.118	-0.052
	(0.158)	(0.138)	(0.033)	(0.280)	(0.248)	(0.054)
7-Eleven	1.129**	0.751**	0.378**	0.079	-0.175	0.254**
	(0.245)	(0.231)	(0.027)	(0.479)	(0.440)	(0.071)
LAWSON	0.210	0.210	0.000	-0.927*	-0.793+	-0.134*
	(0.213)	(0.198)	(0.027)	(0.453)	(0.415)	(0.067)
Family Mart	0.747**	0.717**	0.030	-0.379	-0.276	-0.102*
	(0.136)	(0.121)	(0.028)	(0.336)	(0.309)	(0.049)
sunkus	0.173	0.073	0.100**	-0.425+	-0.454+	0.029
	(0.158)	(0.144)	(0.025)	(0.255)	(0.233)	(0.036)
circleK	0.175	0.143	0.032	-0.744+	-0.667+	-0.076
	(0.246)	(0.231)	(0.024)	(0.387)	(0.356)	(0.059)
ministop	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)	(omitted)
R-squared	0.594	0.597	0.545	0.468	0.455	0.537

Note: The instrumental variable for the first-entrant indicator variable is the log geographical distance to the headquarters of the chain's largest shareholding company. The data years are 1991, 1994, 1997, 1999, 2002, 2004, and 2007. A prefecture constitutes a market. Standard errors reported in parentheses are based on two-tail t-tests for parameter estimates. I cluster the standard errors on the panel identifier (i.e., a market-chain combination). All specifications include market fixed effects. For purposes of exposition, the table suppresses the intercept and market fixed effects. (**)significant at the 1% level. (*)significant at the 5% level. (+)significant at the 10% level. The number of observations is 806.

Table 6
The Entry-Order Effects on Outlet-level Sales, 1991- 2007

	(1)	(2)	(3)	(4)
Dependent variable (log)	Sales per Outlet	Sales per Outlet	Sales per Outlet	Sales per Outlet
First entrant (β^{sales}_{first}) in H3 & H4	0.016	0.014		
	(0.027)	(0.027)		
Entry order (β^{sales}_{order}) in H3 & H4			-0.021	-0.016
			(0.040)	(0.031)
Time in market (γ^{sales})	0.015	0.007	-0.007	-0.007
	(0.018)	(0.017)	(0.055)	(0.039)
Density of own outlets (λ^{own}_1) in H3 & H4	2.440**	2.705**	2.175**	2.574**
	(0.496)	(0.493)	(0.714)	(0.556)
Density of own outlets squared (λ^{own}_2) in H3 & H4	-11.327**	-11.148**	-10.118**	-9.960**
	(2.995)	(3.038)	(3.312)	(3.468)
Density of competitors' outlets (λ^{rival})	-0.547**	-0.379**	-0.521*	-0.249
	(0.208)	(0.136)	(0.222)	(0.357)
Chain-brand fixed effects	Yes	Yes	Yes	Yes
Market fixed effect	Yes	Yes	Yes	Yes
Year fixed effect	Yes		Yes	
R-squared	0.817	0.811	0.806	0.805

Note: The instrumental variable for the first-entrant indicator variable is the log geographical distance to the headquarters of the chain's largest shareholding company. The data years are 1991, 1994, 1997, 1999, 2002, 2004, and 2007. A prefecture constitutes a market. Density of own outlets is the number of outlets of the same chain in market *m* in year *t* divided by the population in market *m* in year *t.* Density of competitors' outlets is defined similarly. For purposes of exposition, the table suppresses the intercept, year fixed effects, and chain-brand fixed effects. The number of observations is 784. Standard errors reported in parentheses are based on 2-tail t-tests for parameter estimates. I cluster the standard errors on the panel identifier (i.e., a market-chain combination). (**)significant at the 1% level. (*)significant at the 5% level. (+)significant at the 10% level.

Table 7
The Entry Order and Brand Preference, 2005 and 2010

	2005 Survey				2010 Survey			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
First entrant (β^{brand}_{first})	14.407*		4.325		8.825*		-0.829	
	(5.477)		(4.596)		(3.792)		(3.422)	
Entry order (β^{brand}_{order})		-5.042**		-0.532		-2.469*		1.172
		(1.501)		(1.574)		(0.949)		(0.984)
Time in market (γ)	1.925	-0.296	-2.402	-2.690	5.753**	4.206+	-0.298	-0.196
	(2.830)	(2.800)	(2.308)	(2.323)	(1.970)	(2.130)	(1.880)	(1.830)
Density of own outlets			323.465**	332.138**			219.859**	250.641**
			(62.079)	(73.886)			(39.705)	(45.051)
Chain-brand fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	43	43	43	43	53	53	53	53
R-squared	0.804	0.822	0.890	0.887	0.827	0.832	0.898	0.901

Note: A unit of observation is a chain-region combination. The data contain 10 regions. The dependent variable is the percentage of people who voted for chain i in region r in 2005 and 2010. The survey in 2005 asked, "What is your favorite convenience-store chain (Pick one)?" The 2005 survey did not include circleK in the choice set of convenience-store chains. The survey in 2010 asked, "Which convenience-store chain do you like the most?" Standard errors reported in parentheses are based on two-tail t-tests for parameter estimates. For purposes of exposition, the table suppresses the intercept and chain-brand fixed ffects. (**)significant at the 1% level. (*)significant at the 5% level. (+)significant at the 10% level.

Table 8
The Entry Order and Measures of Attractiveness of Location, 2001

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Measure	Number of residents		Number of residents		Number of households		Number of workers		Land price	
Data source	Census, 1km mesh grid level		Census, block level		Census, 1km mesh grid level		Census, 1km mesh grid level		National survey	
First entrant ($\beta^{ocation}_{first}$) in H5	0.098+		0.137+		0.123+		0.170+		0.062	
	(0.058)		(0.078)		(0.065)		(0.099)		(0.044)	
Entry order ($\beta^{location}_{order}$) in H5		-0.109**		-0.171**		-0.129**		-0.145*		-0.029
		(0.034)		(0.048)		(0.038)		(0.059)		(0.026)
Chain-brand fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Market fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.865	0.861	0.808	0.803	0.861	0.856	0.744	0.745	0.933	0.926

Note: A prefecture constitutes a market. The dependent variable in column (1) is the log of the average number of residents at the 1km-mesh-grid level across outlets of chain i in market m in 2001. The dependent variable in column (2) is the log of the average number of households at the 1km-mesh-grid level across outlets of chain i in market m in 2001. The dependent variable in column (3) is the log of the average number of workers at the 1km-mesh-grid level across outlets of chain i in market m in 2001. The dependent variable in column (4) is the log of the average number of residents at the census block level across outlets of chain i in market m in 2001. The dependent variable in column (5) is the log of the average land price across outlets of chain i in market m in 2001.The number of observations is 186. For purposes of exposition, the table suppresses the intercept. Standard errors reported in parentheses are based on two-tail t-tests for parameter estimates. (**)significant at the 1% level. (*)significant at the 5% level. (+)significant at the 10% level.