Incumbent's Price Response to New Entry: The Case of Japanese Supermarkets[1]

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Abstract

Large-scale supermarkets have rapidly expanded in Japan over the past two decades, partly because of zoning deregulations for large-scale merchants. This study examines the effect of supermarket openings on the price of national brand products sold at local incumbents, using scanner price data with a panel structure. Detailed geographic information on store location enables us to define treatment and control groups to control for unobserved heterogeneity and temporary demand shock. The analysis reveals that stores in the treatment group lowered their prices of curry paste, bottled tea, instant noodles, and toothpaste by 0.4 to 3.1 percent more than stores in a control group in response to a large-scale supermarket opening.

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1. Introduction

The retail sector has been regarded as one of Japan's least productive industries. In 2000, the McKinsey Global Institute issued a very influential report, which found Japan's overall retail productivity is half of the US's; in particular, the productivity of small-scale retail stores is only 19 percent of that in the US. The report points out that the large share of unproductive small retail shops was the main cause of overall low productivity. The report claims that this lower productivity hurt Japanese consumers through high prices.

Since the report's issuance in 2000, the structure of Japanese retail industries has changed dramatically. Figure 1 displays the recent changes of the share by medium-large scale food stores, as well as total sales overall in Japan.[4] The figure clearly shows that medium- to large-scale food stores increased their presence in Japan. The numbers of large food stores and mom-and-pop shops are reported in Figure 2. From the figure, we can observe that since 1991, small food stores have decreased their number by about 50 percent, while the medium-large stores have increased by about 20 percent.

Although there are various reasons behind the changes, one of the most influential causes was the deregulation of store locations at the national level. Small retail shops in Japan had been protected from competition with large retail shops by governmental regulation. Under the large-scale retail store law (*Daikibo Kouri Tenpo Ho*), which was enacted in 1974, potential supermarkets entrants with 500 or more square meters had to obtain permission from local incumbent merchants, as well as

[4] In Figure 1, medium-large food shops include food stores that are larger than 250 square meters. In the total sales (solid line), we did not include sales by large department stores because we could not separate sales of foods from sales of other items. The data come from the Current Survey of Commerce, The Ministry of Economy, Trade and Industry.

confirmation from local authorities. That is, the entry of large retail shops that would compete with local stores was heavily regulated. In 2000, the Large-Scale Retail Store Law was replaced by the Large-Scale Retail Store Location Law (*Daikibo Kouri Tenpo Ricchi Ho*). This new law dropped the requirement for the local merchant union's agreement for approval, and local authorities almost automatically approved new stores if the applications proved that the new stores would not deteriorate the local community's environment, for example, by causing excessive noise or traffic jams, through an environmental assessment report. In response to this deregulation, new openings of large retail stores increased dramatically. Whether this rapid expansion of large retail shops benefited consumers through lower prices remains an empirical question.

Studies on the effect of large supermarket entry on local pricing are rapidly emerging. Basker (2005) examines the effect of Wal-Mart openings on the pricing of local incumbents, using a city-level quarterly panel price survey from the US. She selected 10 national brand items and found that Wal-Mart openings reduced the city's average price of several products by 1.5 to 3 percent. A follow-up study by Basker and Noel (2007), based on panel data, again reports a price reduction effect of 1 to 2 percent. Hausman and Leibtag (2005) report that Wal-Mart sells identical food items 15 to 25 percent lower than traditional supermarkets. Lira, Rivero and Vergara (2007) examine the effect of opening new supermarkets on the local price index of 15 food-related items and find that local prices are reduced by 7 to 11 percent, based on Chilean data. Manuszak and Moul (2008) examine the case of office supply stores in the US and report that a higher density of store locations in a local area results in lower prices, after controlling for the endogeneity of store locations. They identify the endogeneity of local store density because stores are located in areas with higher demand and correct for this endogeneity using distance from the supply chain headquarters as an instrumental variable.

Matsuura and Motohashi (2005) document the establishment-level dynamics of entry and exit for the Japanese retail sector and report the exit of establishments with lower labor productivity and the entry of establishments with higher potential for growth in labor productivity between 1997 and 2002. Their study clearly suggests that deregulation was efficiency enhancing, but it does not address its effect on prices that potentially lead to consumer welfare improvement because their data set does not contain detailed information on prices. Ariga, Matsui and Watanabe (2001) report very frequent price changes of curry pastes sold at a supermarket in Japan and propose an original model of dynamic price discrimination, in which the supermarket discriminates among its customers with heterogeneous reservation prices by varying selling prices over time. Their empirical findings suggest the strategic nature of pricing among Japanese supermarkets, while their study was limited to the consideration of monopolist behavior. Our current study explicitly considers the effect of competition on Japanese supermarkets' pricing strategies.

This study examines the effect of supermarket openings of two national chain stores on incumbents' pricing of national-brand products based on weekly scanner data compiled by a marketing company that precisely records the name of each product with a scanner bar code, the time of sale, the price, and the amount of units sold. The sales information is accompanied with the exact address of the store location. These features of the data enable us to implement the study without paying too much attention to measurement error of the price, timing, and product that are major concerns in previous studies. In addition, the detailed geographic information enables us to control for unobserved market heterogeneity across regions over time. Stores located within 1.5 kilometers are defined as treatment stores, while those located within a 15-minute driving distance but further than 3 kilometers are defined as control stores. This fine definition of treatment and control groups presumably controls for common unobserved local demand shocks.

The examination of scanner data clearly shows a drastic price decline between 1999 and 2007 for all six items in the analysis sample: curry paste, bottled tea, instant noodles, instant coffee, detergent, and toothpaste. The analysis results reveal that stores in the treatment group reduce the prices of national brand curry paste, bottled tea, and instant noodles by 0.4 percent to 3.1 percent after the opening of a new supermarket compared with stores in the control group. In contrast, we find very limited or no effects on detergent or toothpaste. We also confirm that the new entrants induce the exits of incumbent stores.

The rest of the paper is organized as follows. Section 2 describes the data and introduces descriptive statistics. Section 3 explains the empirical method used to identify the causal effect of new supermarket opening on the prices of incumbent stores. Section 4 introduces the basic results and discusses additional results. The last section provides conclusions and proposes possible extensions for future research.

2. Data

We use two data sources for this study. The first source relates to new store openings. The Large-Scale Store Location Law requires potential supermarket entrants to obtain the city office's permission for store openings. The application-related information is accessible to the public and available from the Ministry of Economy, Trade and Industry’s webpage. This information includes the street addresses of new supermarkets, as well as the dates of application and planned opening, which enable us to identify the presumable dates of new store openings and their street addresses.

Since there are too many store openings in this data set, this study focuses on new store openings of two large supermarket chains: Ito-Yokado and the Eion group. Founded in 1920, Ito-Yokado is the largest supermarket chain in Japan and is characterized as a mega-scale shopping mall. The Eion group holds several medium- to large-scale supermarket chains, such as Jusco, Yaohan, and Maxvalu. There are 20 new store openings by Ito-Yokado and 206 by Eion between the enactment date of the Large-Scale Retail Store Location Law (June 1, 2000) and the last week of 2007.

Among these 226 stores, 60 of Eion and 6 of Ito-Yokado have at least one treatment store and one control store. All of the Ito-Yokado are General Merchandise Stores (GMS), while 36 out of 60 in the Eion group are GMSs. The other 24 Eion group stores are large supermarkets. Panels A and B in Figure 3 show the geographic distributions of these stores. In our analysis sample, the median sales floor area of Ito-Yokado is 30,977 square meters and that of Eion is 6,650 square meters.

The second data source is price information from the incumbent stores collected through the scanner record compiled by the INTAGE Corporation. These data are designed for marketing purposes, and item name, price, and sales timing are precisely recorded. Store-level weekly average prices of national brand items are available from this data set. The street address of the store location, also included in the data set, is used to determine the stores that are affected by new supermarket openings (treatment group) and the stores located nearby but arguably not directly affected by new store openings (control group). For this purpose, we have obtained information for stores that are located within a 15-minutes driving distance from each new entrant.

The analysis sample constructed from INTAGE scanner data covers the period between the first week of 1999 and the last week of 2007 and supermarket stores with sale floors of 100 square meters or more. The treatment and control groups comprise 192 stores. Among these, 90 serve as treatment stores, 86 serve as control stores, and 16 serve as both treatment and control stores corresponding to different new openings. The stores are classified into one of four categories by size: General merchandise stores have a sales floor of 3,000 or more square meters with more than 50 employees (Each of food, clothing and household items floor should consist of 10 to 70 percent of total floor area); large supermarkets have more than 1,000 square meters; small supermarkets have between 500 and 999 square meters; and mini supermarkets have between 100 and 499 square meters.[5]

An examination of the effect of new supermarket entry on incumbent supermarkets' pricing requires careful control for local market conditions, because new supermarkets are presumably more likely to be located in areas with growing demand (Manuszak and Moul (2008)). To deal with this potential endogeneity of new store location, two groups of incumbent stores are defined based on the distance from the new supermarkets. Figure 4 shows the distribution of incumbent's distance from the new entrants in our data, which includes all INTAGE sample stores located within a 15-minute driving distance from new entrants. Panels A-F in Figure 5 show the relation

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[5] The definition of large, small and mini supermarkets excludes specialty stores or department stores by the following criteria: food floor should consist more than 50 percent of total floor or each of food or clothing and household item floor should consist of less than 50 percent of total floor area. Among the 192 incumbent stores in our dataset, 30 are GMS, 52 are large supermarkets, 57 are small supermarkets, and 53 are mini supermarkets.

between the price response of incumbent stores to the new opening and the incumbent stores' distance from new stores for each of the six commodities. Except for detergent and toothpaste, the prices after the new entry are lower than those before the entry. In addition, we can observe that the before and after price differentials decrease with distance. Based on Figures 4 and 5, we decide to define the treatment and control groups as follows. The treatment group consists of stores located less than 1.5 kilometers from a new supermarket; this group of stores is called the treatment group because these stores' pricing is presumably affected by the entry of a new supermarket. The 1.5 kilometer distance is selected because it is about a 20-minute walking distance, and stores located within this distance are arguably competing for the same customers. The control group consists of stores that are located within a 15-minute driving distance, but also located at least 3 kilometers away from the new supermarket. This control group presumably shares the local market demand condition with the treatment group, but its pricing strategy is not directly affected by new store openings. One could argue that the treatment group and control group may not share the same local market demand condition, or, that the control group is also affected by new store openings. Thus, the choice of control group is critical to the success of our research design. To address this concern, we check the robustness of our results by utilizing direct information of a continuous distance measure without relying on difference-in-difference estimators.

Table 1 tabulates the items used for this study, and Table 2 reports descriptive statistics of supermarkets' prices by treatment status of the stores and timing before and after the opening of new stores. The six commodities we use in this paper are popular national brands that are sold throughout Japan.[6] The means of prices clearly indicate a price drop in the "after" period, reflecting that the sample period covers a deflation period in the Japanese economy. The declining trend is clearly depicted in Figure 6, which shows the prices of our sample and the corresponding official Consumer Price Index.[7] The question is: How much of this price reduction can be attributed to competition induced by deregulation?

3. Empirical Methodology

Our empirical strategy is a difference-in-differences approach that compares the price changes of stores in the treatment and control groups before and after new supermarket openings. Because there are 54 observations of new supermarket openings and 469 sample weeks, there are 25,326 (=54×469) pairs of treatment and control groups.

To deal with this many observations in a systematic way, we model the price of a good sold at an incumbent store *i* in a market *j* in week *t* as:

$$\ln(p)_{ijt} = \alpha T_i + \beta \left(T_i \times A_{jt}\right) + c_{jt} + u_{ijt}. \quad (1)$$

The dummy variable T_i takes one if a new supermarket opens at week *t* within 1.5 kilometers of store *i*. The dummy variable A_{jt} takes one after a new

6 There is a possibility that the prices of popular items react to competitors' prices more than those of less popular items because of large advertisement effects. In this case, our estimates of price elasticity should be interpreted as the upper bound. However, it is also possible that to attract customers, a retailer does not have to cut the prices of popular items as much as those of less popular items because many people know the market level. Therefore, it is not certain whether our estimates have upper or lower biases.

7 According to the Statistical Bureau, from 1999 to 2007, the prices of curry paste, instant noodles, instant coffee, beverages, detergent, and toothpaste dropped by 11.5%, 11.6%, 21.1%, 12.9%, 23.3%, and 5.9%, respectively. Please note that the commodities chosen by the CPI might be different from the ones we used in this paper. Also note that the bargain price is not included in the CPI, while our price is the average of all the weekly prices, which might include temporary bargain prices.

supermarket opening in region *j*. If the new entry of a supermarket reduces the prices of treatment group incumbent stores, but does not affect those of the control group, parameter β is expected to have a negative sign. The fixed effects c_{jt} captures the region-week-specific shock or heterogeneity common across all stores in market *j* in period *t*. The linear term of A_{jt} is not included in the specification because its effect is already captured by c_{jt}. It is worth noting that allowing for the region-specific nonparametric trend in Equation (1) enables us to obtain an unbiased estimate of β, even if the new opening date is an endogenous variable that depends on regional economic states.

We have imposed several assumptions to identify β in Equation (1). The key assumption is that the price shock u_{ijt} is not correlated with T_i and $T_i \times A_{jt}$ conditional on region-week-specific shock, more explicitly, $E(u_{ijt} \mid T_i, A_{jt}, d_{jt}) = 0$. Price shock typically includes demand or marginal cost shocks. If stores in the treatment and control groups share the systematic part of these shocks, then the systematic shocks are captured by the dummy variables c_{jt} and the remaining shocks become uncorrelated with T_i and $T_i \times A_{jt}$; thus the exogeneity assumption holds. Additionally, we must have at least one treatment store and one control store in each market so that we can take the difference between the two stores. Finally, we have to assume that the prices in stores in the same region share the same trend.[8]

4. Results

[8] In Section 4.6., we generalize the assumption and allow for different linear trends between control and treatment stores.

4.1. Basic Specification

Table 3 reports the regression coefficients of price equation (1). Except for detergent, we find negative coefficients on the (Treatment×After) dummy variables, which implies that supermarket openings decrease neighborhood incumbent supermarket prices. Although the statistical significance is weak for instant coffee and toothpaste, we can observe that the prices of stores located close to newly opened supermarkets are reduced by 0.4 percent to 3.1 percent compared with other stores in the same region. The positive and significant effect of new store openings on detergent price and little effect on the price of toothpaste can be expected from Panels E and F of Figure 5. According to Panel E, the price of detergent *increased* after the new openings, while Panel F shows little change in toothpaste price during the period before and after the opening. Table 3 also shows that the prices of detergent and toothpaste are lower in GMSs than in other stores. We suspect that these commodities are mostly sold at GMSs or drugstores, not in supermarkets, so that our dataset, which covers no drug stores and has only 30 GMSs out of 192 incumbent stores, cannot capture the exact price effects of the new openings on incumbent stores.

The choice of control group stores, which are within a 15-minutes driving distance but further than 3 kilometers from the newly opened store, and treatment group stores, which are located within a 1.5 kilometer distance, could be arbitrary, and thus the results obtained in Table 3 could be sensitive to the choice of these groups. To address this concern, Table 4 estimates the identical price equation with an inverse of distance from the new entry instead of a treatment dummy variable. The results are essentially unchanged from Table 3. All but detergent and toothpaste have negative, significant coefficients for the interaction term, which implies the further the incumbent stores, the smaller the price effects become. The predicted values for large supermarkets are plotted in the Panels of Figure 5. The stability of the results regardless of how the control group is defined assures that the previous results are not driven by an arbitrary choice of control group.

4.2. Market Structure

The analysis so far assumes that the incumbent treatment stores respond to new store entry by reducing their prices by the same amount. However, the price response could be heterogeneous depending on preexisting market conditions. If the market is not competitive before the opening of a new store, then the incumbent store is expected to have charged high prices and to significantly reduce prices in response to the new store entry. However, if the new store opens in a competitive market, incumbent stores are expected to have had near-marginal cost pricing and are less likely to change prices in response to the new entry. In particular, if we assume Cournot competition among stores in a market with a linear demand function and a constant marginal cost, then the Nash equilibrium prices are inversely related to the number of stores in the market. The marginal effect of an additional store on equilibrium price declines at quadratic speed. Thus, the theory predicts a significant, marginal effect of a new store opening on price in monopolistic markets, but a trivial effect in markets with many existing stores. Tables 5 and 6 test these predictions.

Table 5 restricts the analysis sample to markets with only one store in the treatment group, which are presumably monopolistic markets. We can observe larger coefficients for the (Treatment × After) dummy variables for curry paste, bottled tea, and instant noodles. These estimates are smaller in Table 6, in which we restrict the markets with more than two treatment stores. In Table 6, we can find that only curry paste has significant, negative effects. We can also observe that the coefficients for the (Treatment × After) dummy are generally smaller in Table 6 than in Table 5, which partially confirms the prediction that price responses are larger in monopolistic markets than in competitive markets.[9]

4.3. GMSs versus Large Supermarkets

The newly opened stores of Ito-Yokado and Eion are either GMSs or large supermarkets. GMSs are different from large supermarkets in various respects. By definition, GMSs sell various items other than foods, and the share of food sales of GMSs is smaller than that of large supermarkets. In addition, GMSs are generally larger than large supermarkets. In our sample, the average floor space of GMSs is six times larger than that of large supermarkets, which implies that there might be strongly positive scale effects to the local markets. Unfortunately, we cannot obtain the actual sales share from foods from each new GMS. It is possible that in some markets, the new GMS is not a real threat to incumbent supermarkets because (1) food might not be important items for the GMS, and (2) positive scale merits might affect the entire local market positively.

Among the 66 new store openings in the analysis data, 24 were large supermarkets that mainly sell food items. The opening of large supermarkets is expected to have a stronger influence on prices of incumbent supermarkets, which respond the

[9] Note that there may be other stores not listed in our dataset near the newly opened store, which implies that we underestimate the market effects in Table 5. Therefore, we had better regard the coefficients as upper bounds.

most to new supermarket openings. Tables 7 and 8 test this prediction by splitting the sample into GMS openings and large supermarket openings.

Table 7 shows that the price responses to new GMSs are positive but mostly insignificant. On the contrary, Table 8 exhibits very large, negative, significant effects, except for detergent. We can interpret the positive effects of GMS openings in various ways. Newly opened GMSs might attract new customers, which cause an upward shift in the demand function in the area. Or, it is also possible that the new GMS entered a market in which the market demand function that the treatment stores are facing is shifting upward, but the demand for control stores is unchanged.[10] We need additional information to identify the cause of the positive price effects.[11]

4.5. Exit Decision

Next, we investigate the effects of new entry on the exit of incumbent stores. Instead of using the price equation, we estimate the following linear probability model of the exit decision,

$$Exit_{ijt} = \alpha T_i + \beta \left(T_i \times A_{jt}\right) + c_{jt} + u_{ijt}. \qquad (2)$$

$Exit_{ijt}$ is a dummy variable that takes zero until we observe non-missing data for the last time in the sample period. When we observe the last missing data, $Exit_{ijt}$ takes unity and stays at the same value. We define $Exit_{ijt}$ for both the store level and

10 In our dataset, we cannot allow for heterogeneous trends among stores inside the same markets. We will discuss this issue in a later section.

11 We could allow for heterogeneous price responses among incumbents by the type of incumbent stores. A regression with additional interaction terms among three variables, treatment dummy, after opening dummy, and store type dummies, does not give us stable results, probably because of an insufficient number of treatment and control stores of the same type in each market.

the commodity level. The store-level exit dummy carries information about the exit of the incumbent stores, while the commodity level exit dummy contains information about the withdrawal from competition over the product, which does not necessarily mean the store goes out of business.[12] As in the price equation, market- and time-specific fixed effects, c_{jt}, are allowed for.

Table 9 reports the regression coefficients of the exit equation. The positive and significant effects of the interaction term, except for toothpaste, imply that the new entry promotes the reduction of the number of incumbent stores that are competing with the new supermarkets. Column (1) in Table 9 shows the result of the store-level exit decision. The negative and significant effects of large supermarket dummies and small supermarket dummies imply significant, positive exit effects on incumbent GMSs. From column (1), we can observe that when a new large store opens, incumbent GMSs and mini supermarkets have a higher probability of going out of business than large and small supermarkets. The results in Tables 3 and 9 suggest that the entry of large supermarkets has two effects on the local market competition. The first effect is enhancing competition among incumbent stores through a reduction in prices, but the second effect hinders this competition by reducing the number of competitors. To evaluate the total welfare effects of the new supermarket entry, more detailed information on the exit of incumbent stores is needed.

[12] Missing observations might appear because of the withdrawal of incumbent stores from the price survey provided by INTAGE Co. The decision could be endogenous because store managers might be afraid of disclosing price data to new supermarkets. Unfortunately, we cannot distinguish between the store that goes out of business and the store that stops providing data. Therefore, our estimates of the exit equation should be interpreted as an upper bound.

4.6. Other Specifications

The main finding of this paper, a decrease in prices after new store openings, could be caused by temporary price cuts, rather than permanent price reductions. The analysis results heretofore, however, have been limited to popular commodities, such as Nissin Cup Noodles, which are likely to be loss-leaders because bargain sales of popular items can attract many potential customers. If the negative price response among incumbents is only temporary, then the welfare effects of increasing competition on the market is very limited. Table 10 addresses this concern by including several lead and lag terms from the new opening date. Although we cannot estimate the coefficients of lag and lead terms sharply, the interaction terms between the treatment dummy and lag dummies with more than 50 days are generally negative, indicating that the negative price effects are not temporal.

Some might be concerned that the new stores choose to locate where the demand curve is shifting downward for some reason over time.[13] If the downward shift is so local that a store located more than 3 kilometers away does not share the decline, our estimates in Table 3 might capture the difference in trends between control and treatment, not the effects of the new opening, because the market-specific time effects in equation (1) can control only for the common trend. Introduction of an additional interaction term between the treatment dummy and trend can account for the heterogeneous trend effects. Table 11 reports the price response equation with the new interaction term, $T_i \times Trend$.[14] Except for bottled tea, the result does not largely differ

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13 The store chose such a place because of a declining future rental cost of the land, although we do not know how common such decisions actually are.
14 The linear time trend for the control group is captured by Area × Weeks dummy variables. Because this new interaction term has a large correlation with the interaction

from those in Table 3 in terms of the sign of $T_i \times A_{jt}$, which implies that the heterogeneous trend between treatment and control is not serious in our estimate.

5. Summary and Conclusion

This paper reports evidence on how the entry of new supermarkets in a local market changes the prices of selected national brand items, such as processed food and groceries, at incumbent stores. We have contrasted the price changes of supermarkets that are closely located to the entrant and ones at a distance, based on scanner data with detailed geographic locations of supermarkets. We have found that stores located within 1.5 kilometers reduce prices of curry paste, bottled tea, instant coffee, instant noodles, and toothpaste by 0.9 to 3.1 percent. These results suggest that the entry of new supermarkets in a geographic region cuts the market power of incumbent supermarkets and leads them to lower prices. The degree of price reduction is greater when there is only one treatment store, which is consistent with Cournot's monopolistic competition model. The negative price effects of the new opening are not temporary, but last for a long time, which implies that the welfare gain for consumers is not negligible. We also found that it is large supermarket stores, not GMSs, that bring competition to incumbent food stores. This result suggests that GMSs might have positive spillover effects for an entire region.

At the same time, however, we observed that the new entry reduces the degree of market competition by inducing exits among incumbent stores. To evaluate the

between the treatment and the after-opening dummy, about 0.8, the regression analysis with both terms hardly gives us stable results. Therefore, we did not include the interaction term between treatment and trend in most regression analyses in this paper.

welfare effects of the new entry, we need additional data, such as precise exit information for each store, as well as quantity information for each product at the market level. A data set with a wider coverage of stores would enable us to quantify the consumer surplus. This would be a useful extension of this paper to derive implications for merchandise location policy, as in recent British studies by Griffith and Harmgard (2008).

There are many remaining issues to be pursued. In this paper, we have not estimated a structural model of monopolistic competition. To evaluate the welfare effects of the policy change, we need a rigorous structural model, such as those of Salop (1979) and Jia (2007). Other topics to be investigated include the effects on local labor markets, the effects on the productivity of incumbent stores, and regional productivity.

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Table 1: Items for Analysis

Item	Brand and Product	Description	JAN code
Curry Paste	S&B, Golden Curry	Medium Hot, 240g	4901002011604
Bottled Tea	Coca-Cola, Sokenbi Cha	Pet Bottle, 2000ml	4902102016513
Instant Coffee	Nestle, Nescafe gold blend	100g	49681123
Instant Noodles	Nisshin, Cup Noodle	Regular size, soy sauce flavor	49698114
Detergent	Kao, Attack	Powder, 1.1kg	4901301463111
Toothpaste	Sunstar, GUM	180g	4901616007673 4901616008250

Note: The JAN code is the abbreviation for Japanese Article Number code, which is compatible with the Universal Product Code (UPS).

Table 2: Descriptive Statistics

Item	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpaste
Control						
Before	196.23	206.21	603.81	103.29	376.81	411.32
	(39.52)	(30.68)	(131.91)	(19.02)	(57.3)	(41.03)
After	194.37	185.03	554.01	102.5	343.18	413.84
	(32.92)	(21.14)	(125.66)	(19.96)	(58.41)	(47.08)
Treatment						
Before	205.72	207.5	645.47	106.21	368.59	415.57
	(42.43)	(32.2)	(133.88)	(21.51)	(51.3)	(43.83)
After	196.92	183.98	567.58	102.88	337.67	414.2
	(35.89)	(17.45)	(121.65)	(19.35)	(45.98)	(47.39)
Total	198.12	195.69	591.3	103.65	359	413.78
	(37.97)	(28.44)	(133.07)	(20.01)	(56.2)	(45.61)

Note: Means are reported, and standard deviations are reported in parentheses.

Table 3: The Effect of New Entry on Incumbent Pricing

Dependent Variable: Log Price

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpast e
Treatment×After	-0.031	-0.004	-0.009	-0.009	0.019	-0.004
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Treatment	0.030	0.003	-0.002	0.012	-0.014	0.011
	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.003)
Large supermarket	-0.038	0.011	-0.033	0.027	0.048	0.025
	(0.004)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Small supermarket	-0.005	0.031	-0.021	0.040	0.089	0.030
	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Mini supermarket	0.027	0.082	0.017	0.085	0.167	0.026
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Area×Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47443	53336	47449	51125	42017	24887
Number of Groups	22354	23632	22105	22887	19635	12720
R-squared	0.024	0.074	0.008	0.023	0.163	0.011

Note: Standard errors are in parentheses. The group used in the fixed effect transformation is the product of shopping area for the newly opened store and time (Area×Week), which enables us to control for time-varying regional effects. Treatment takes unity when the store is within 1.5 kilometers of the newly opened store. “After” is a fixed effect that takes unity when it is after the opening of the new large store. The base category for store size is a general merchandise store that has 3,000 square meters or more for sales floors with more than 50 employees (Each of food, clothing and household items floor should consist of 10 to 70 percent of total floor area). Large supermarkets between 1,000 and 2,999 square meters; small supermarkets have between 500 and 999 square meters; and mini supermarket have between 100 and 499 square meters (Food floor should consist more than 50 percent of total floor or each of food or clothing and household item floor should consist of less than 50 percent of total floor area).

Table 4: Regression Using Continuous Distances from Entrants

Dependent Variable: Log Price

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergen t	Toothpas te
(1/Distance) ×After	-14.117	-5.885	-12.502	-30.923	11.044	-0.239
	(2.469)	(1.332)	(2.860)	(2.339)	(1.771)	(1.825)
(1/Distance)	15.195	-0.649	17.859	24.247	-9.565	5.402
	(1.986)	(1.026)	(2.289)	(1.872)	(1.293)	(1.531)
Large supermarket	-0.015	0.030	-0.045	0.012	0.055	0.014
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Small supermarket	0.013	0.047	-0.033	0.035	0.094	0.026
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)
Mini supermarket	0.039	0.099	0.004	0.071	0.159	0.042
	(0.002)	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Area×Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	124153	139617	125257	134574	107856	65436
Number of Groups	50348	52824	50307	51978	44268	28618
R-squared	0.012	0.086	0.011	0.022	0.158	0.020

Note: Standard errors are in parentheses. Mean distance for the analysis sample is 2,706 meters. See the footnote for Table 3 for details.

Table 5: The Impact in a "Monopolistic" Market

Dependent Variable: Log Price

Sample: Market with Two or Less Stores

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpast e
Treatment×After	-0.038	-0.027	-0.014	-0.040	0.033	0.004
	(0.007)	(0.004)	(0.008)	(0.007)	(0.005)	(0.006)
Treatment Status	0.000	0.018	-0.006	0.028	-0.000	-0.019
	(0.005)	(0.003)	(0.005)	(0.005)	(0.003)	(0.005)
Large supermarket	-0.083	-0.003	-0.024	-0.021	0.019	-0.011
	(0.007)	(0.004)	(0.008)	(0.007)	(0.005)	(0.006)
Small supermarket	-0.057	0.019	-0.019	-0.006	0.074	0.023
	(0.007)	(0.003)	(0.007)	(0.006)	(0.005)	(0.006)
Mini supermarket	-0.052	0.067	0.029	0.046	0.135	0.005
	(0.008)	(0.004)	(0.008)	(0.007)	(0.005)	(0.009)
Area×Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21537	23986	21309	22925	19489	9698
Number of Groups	15206	16327	14973	15738	13537	7223
R-squared	0.0253	0.0093	0.0093	0.0212	0.1384	0.0493

Note: Standard errors are in parentheses. The sample consists of the markets where only one treatment store is found.

Table 6: The Impact in a "Competitive" Market

Dependent Variable: Log Price

Sample: Market with Three or More Treatment Stores

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpast e
Treatment×After	-0.036	0.008	-0.007	0.006	0.014	-0.009
	(0.005)	(0.003)	(0.006)	(0.005)	(0.004)	(0.004)
Treatment Status	0.049	-0.005	-0.001	0.005	-0.021	0.024
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Large supermarket	-0.017	0.016	-0.035	0.043	0.055	0.036
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Small supermarket	0.019	0.037	-0.021	0.057	0.091	0.032
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Mini supermarket	0.053	0.087	0.013	0.101	0.177	0.027
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.004)
Area×Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	25906	29350	26140	28200	22528	15189
Number of group	7148	7305	7132	7149	6098	5497
R-squared	0.035	0.082	0.008	0.028	0.178	0.019

Note: Standard errors are in parentheses. The sample consists of the markets where three or more treatment stores are found.

Table 7: The Effects of New Openings of GMSs

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpaste
Treatment×After	0.004	0.030	0.030	0.019	0.012	0.006
	(0.009)	(0.004)	(0.010)	(0.008)	(0.006)	(0.008)
Treatment Status	-0.010	-0.023	-0.026	0.001	0.008	-0.025
	(0.006)	(0.003)	(0.007)	(0.006)	(0.003)	(0.006)
Large supermarket	-0.018	-0.006	0.092	0.014	-0.033	0.026
	(0.009)	(0.004)	(0.011)	(0.009)	(0.006)	(0.008)
Small supermarket	0.019	0.010	0.070	0.037	0.003	0.020
	(0.010)	(0.004)	(0.012)	(0.009)	(0.006)	(0.009)
Mini supermarket	0.046	0.020	0.081	0.094	0.038	0.044
	(0.009)	(0.004)	(0.011)	(0.009)	(0.006)	(0.009)
Area×Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	13758	15327	14149	15200	12695	6357
Number of group	7573	7974	7554	7952	6812	4057
R-squared	0.026	0.029	0.013	0.042	0.083	0.024

Note: Standard errors are in parentheses. The sample consists of the markets where the newly opened store is a General Merchandise Store.

Table 8: The Effects of New Openings of Large Supermarkets

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpast e
Treatment×After	-0.043	-0.014	-0.013	-0.018	0.022	-0.007
	(0.005)	(0.003)	(0.005)	(0.005)	(0.004)	(0.004)
Treatment Status	0.043	0.016	-0.001	0.017	-0.015	0.018
	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
Large supermarket	-0.036	0.016	-0.058	0.032	0.055	0.027
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Small supermarket	-0.004	0.038	-0.028	0.040	0.098	0.033
	(0.004)	(0.002)	(0.004)	(0.004)	(0.003)	(0.003)
Mini supermarket	0.029	0.104	0.017	0.080	0.195	0.022
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.004)
Area×Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	33685	38009	33300	35925	29322	18530
Number of group	14781	15658	14551	14935	12823	8663
R-squared	0.026	0.102	0.018	0.019	0.200	0.016

Note: Standard errors are in parentheses. The sample consists of the markets where the newly opened store is a large supermarket.

Table 9: The Effect of Entry on Incumbents' Exit and the Item Exit Given Shop Survival

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Exit	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Deterge nt	Toothpa ste
Treatment × After	0.020	0.038	0.008	0.008	0.024	0.029	-0.012
	(0.004)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.006)
Treatment	-0.023	-0.022	-0.005	-0.037	-0.024	-0.026	0.026
	(0.002)	(0.003)	(0.001)	(0.003)	(0.003)	(0.003)	(0.005)
Large supermarket	-0.110	0.034	-0.003	0.003	0.017	0.013	0.022
	(0.004)	(0.003)	(0.001)	(0.002)	(0.002)	(0.003)	(0.005)
Small supermarket	-0.090	0.029	-0.001	-0.015	0.007	0.009	0.100
	(0.004)	(0.003)	(0.000)	(0.003)	(0.002)	(0.003)	(0.005)
Mini supermarket	0.027	0.051	0.005	0.036	0.018	0.023	0.299
	(0.005)	(0.004)	(0.001)	(0.003)	(0.003)	(0.004)	(0.007)
Area × Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	85627	53801	53801	53801	53801	53801	53801
Number of Groups	23826	23826	23826	23826	23826	23826	23826
R-squared	0.040	0.016	0.009	0.038	0.011	0.005	0.123

Note: Linear probability models are estimated and heteroskedasticity robust standard errors are reported in parentheses.

Table 10: The Effect of New Entry on Incumbent Pricing with Leads and Lags

Dependent Variable: Log Price

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpaste
Treatment× Lead(51:100)	-0.004	-0.019	-0.000	-0.011	0.014	-0.016
	(0.014)	(0.007)	(0.016)	(0.013)	(0.009)	(0.010)
Treatment× Lead(11:50)	-0.019	-0.016	0.022	-0.022	-0.008	0.013
	(0.016)	(0.008)	(0.018)	(0.015)	(0.010)	(0.011)
Treatment× Lead(1:10)	-0.029	-0.018	0.005	0.021	0.013	-0.009
	(0.030)	(0.016)	(0.034)	(0.028)	(0.020)	(0.022)
Treatment× Lag(0:10)	-0.034	-0.014	-0.020	-0.033	0.032	0.034
	(0.029)	(0.016)	(0.034)	(0.028)	(0.020)	(0.023)
Treatment× Lag(11:50)	-0.022	-0.004	-0.003	-0.018	0.023	-0.015
	(0.016)	(0.008)	(0.018)	(0.015)	(0.010)	(0.011)
Treatment× Lag(51:100)	-0.031	-0.004	-0.006	-0.040	0.012	-0.006
	(0.014)	(0.007)	(0.016)	(0.013)	(0.009)	(0.010)
Treatment× Lag(101~)	-0.032	-0.004	-0.009	-0.007	0.020	-0.004
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Treatment	0.030	0.003	-0.002	0.012	-0.014	0.011
	(0.003)	(0.002)	(0.004)	(0.003)	(0.002)	(0.003)
Large supermarket	-0.038	0.011	-0.033	0.027	0.048	0.025
	(0.004)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Small supermarket	-0.005	0.031	-0.021	0.040	0.089	0.030
	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Mini supermarket	0.027	0.082	0.017	0.085	0.167	0.026
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Area × Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47443	53336	47449	51125	42017	24887
Number of Groups	22354	23632	22105	22887	19635	12720
R-squared	0.024	0.074	0.008	0.023	0.163	0.012

Note: Standard errors are in parentheses. Lag(x:y) takes unity when the time is between after x days and after y days from the new opening date. Lead(x:y) takes unity when the time is between before x days and before y days from the new opening.

Table 11 : The Effects of Different Trends between Control and Treatment

	(1)	(2)	(3)	(4)	(5)	(6)
	Curry Paste	Bottled Tea	Instant Coffee	Instant Noodles	Detergent	Toothpast e
Treatment×After	-0.035	0.003	-0.029	-0.008	0.020	-0.010
	(0.006)	(0.003)	(0.006)	(0.005)	(0.004)	(0.004)
Treatment Status	0.025	0.015	-0.037	0.013	-0.013	-0.011
	(0.007)	(0.004)	(0.008)	(0.007)	(0.005)	(0.008)
Treatment×Trend	0.000	-0.000	0.000	-0.000	-0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Large supermarket	-0.038	0.011	-0.034	0.027	0.048	0.025
	(0.004)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Small supermarket	-0.005	0.032	-0.022	0.040	0.089	0.030
	(0.003)	(0.002)	(0.004)	(0.003)	(0.003)	(0.003)
Mini supermarket	0.026	0.082	0.015	0.085	0.167	0.025
	(0.004)	(0.002)	(0.005)	(0.004)	(0.003)	(0.003)
Area×Week Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47443	53336	47449	51125	42017	24887
Number of group	22354	23632	22105	22887	19635	12720
R-squared	0.024	0.075	0.009	0.023	0.163	0.012

Note: Standard errors are in parentheses. Treatment×Trend is an interaction term between the treatment fixed effects and the linear trend.

Figure 1: Annual Sales of Retail Food Shops

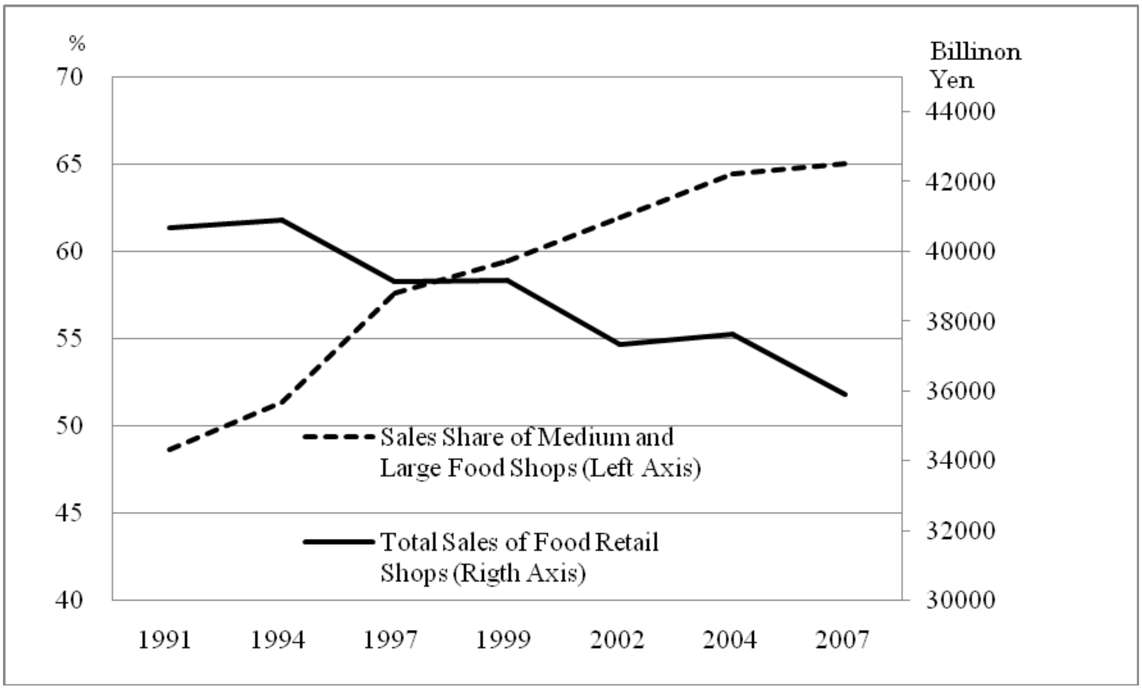


Figure 2: Number of Food Retail Shops

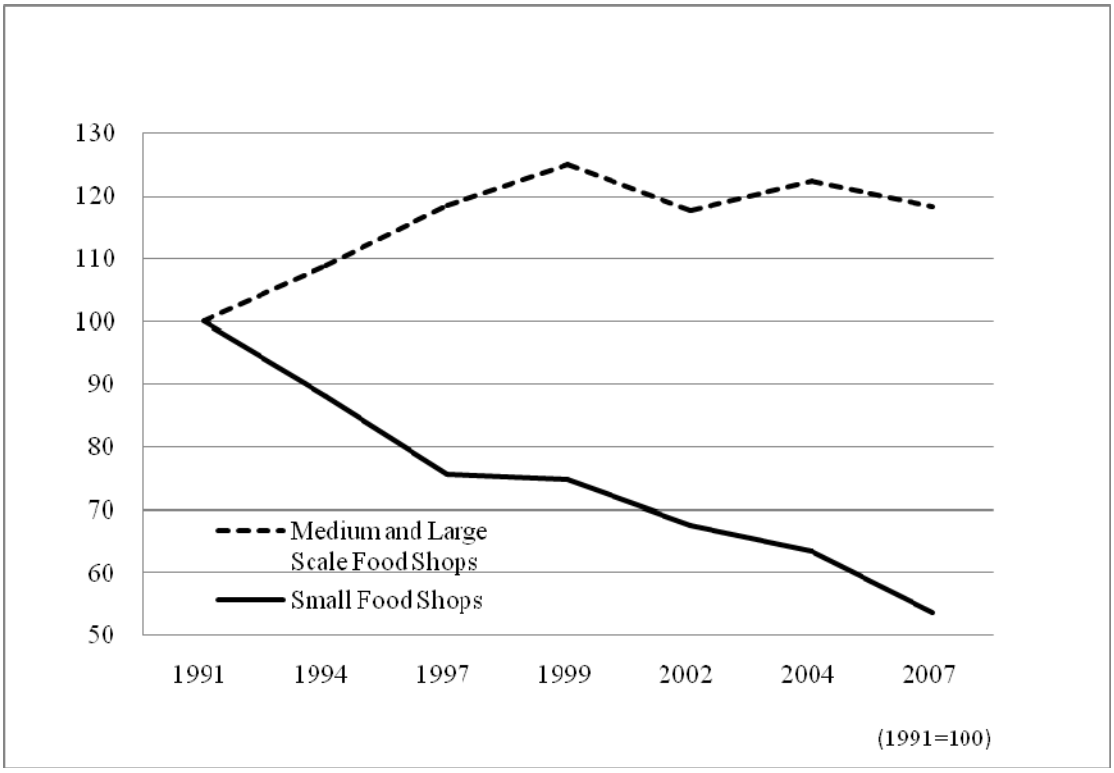


Figure 3: The Location of New Openings of Eion and Ito-Yokado Groups, 2000-2007

Panel A: Large Retail Shops that belong to the Eion group (60)

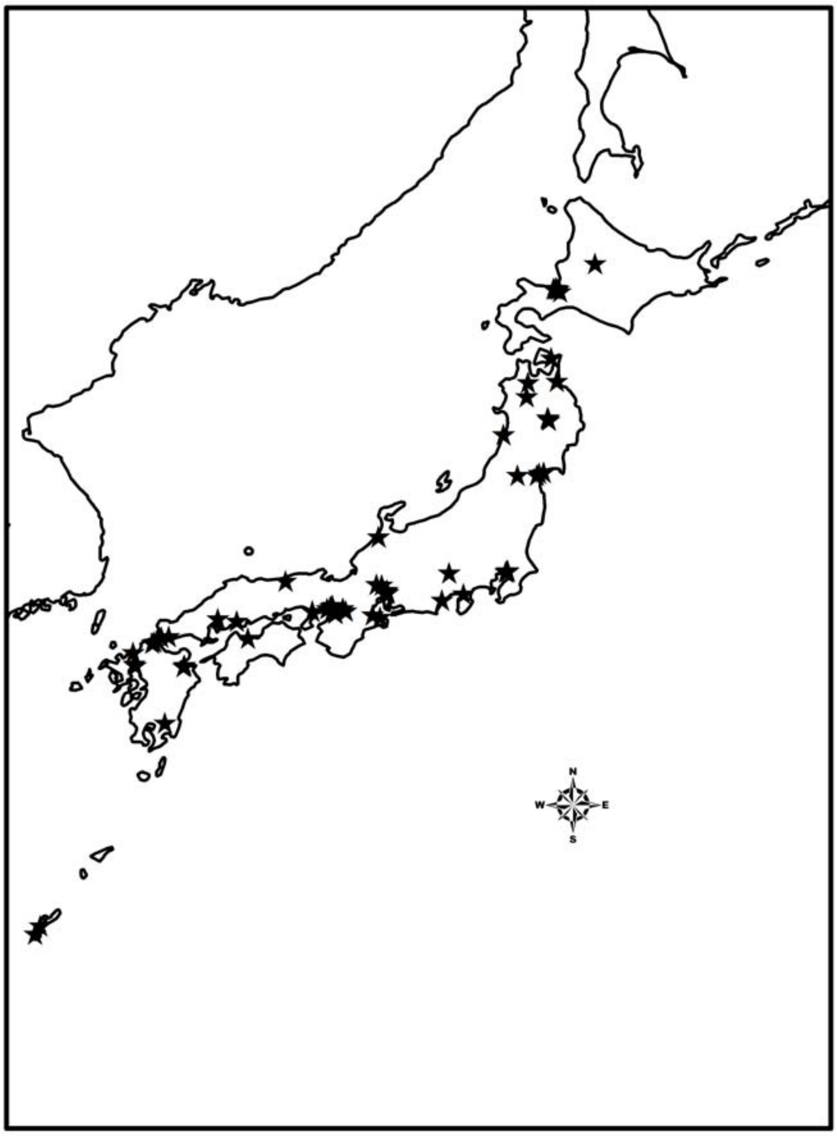


Figure 3: The Location of New Openings of Eion and Ito-Yokado Groups, 2000-2007

Panel B: Large Retail Shops that belong to the Ito-Yokado group (6)

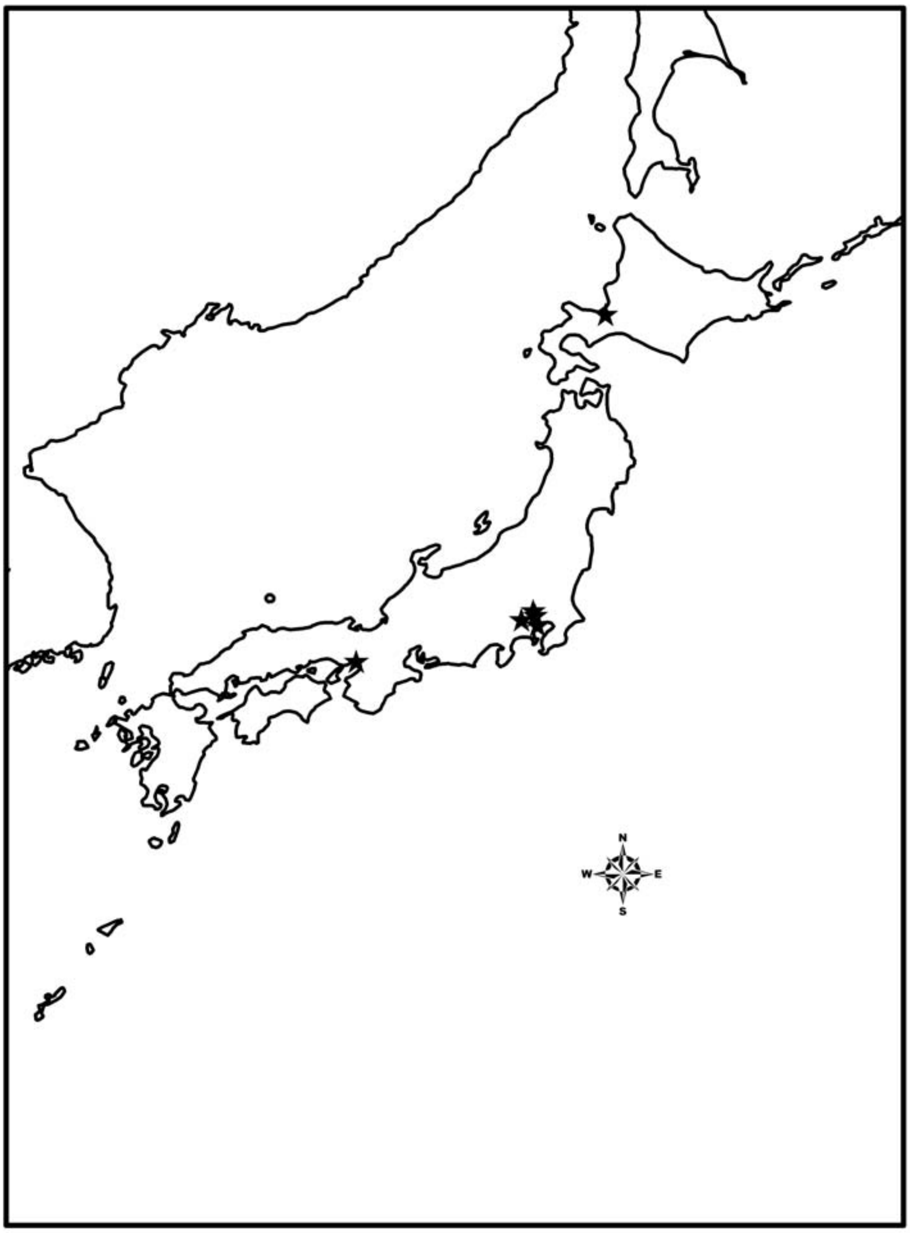


Figure 4: Distribution of Incumbent's Distance from Entrant

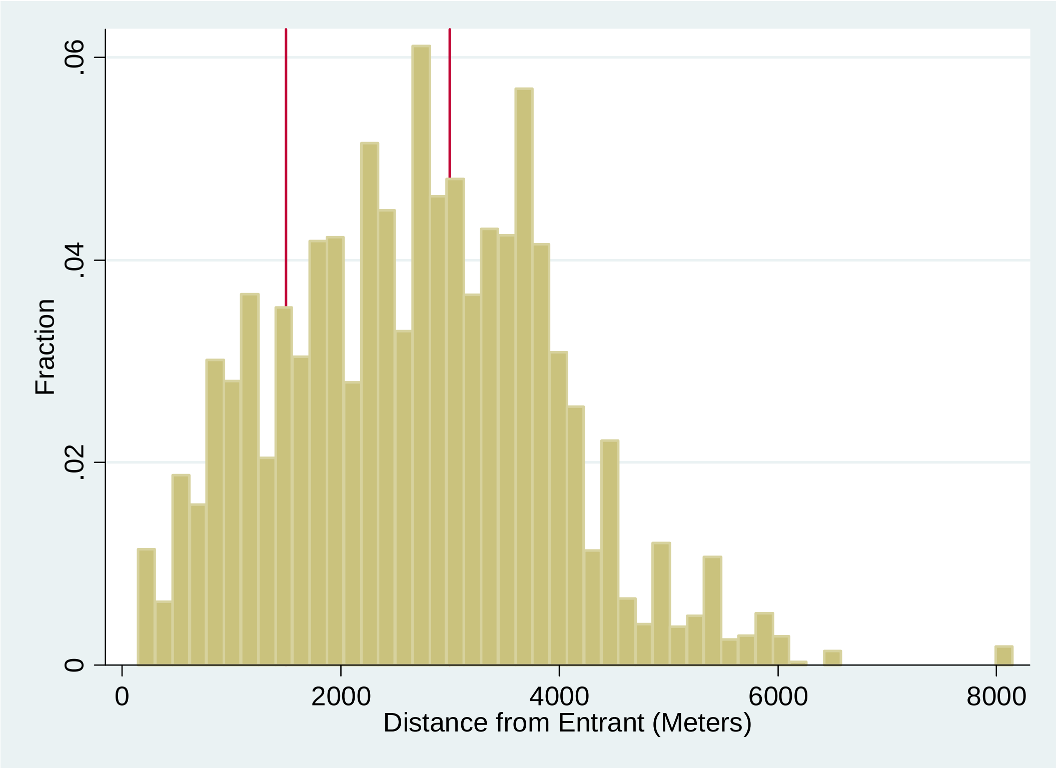
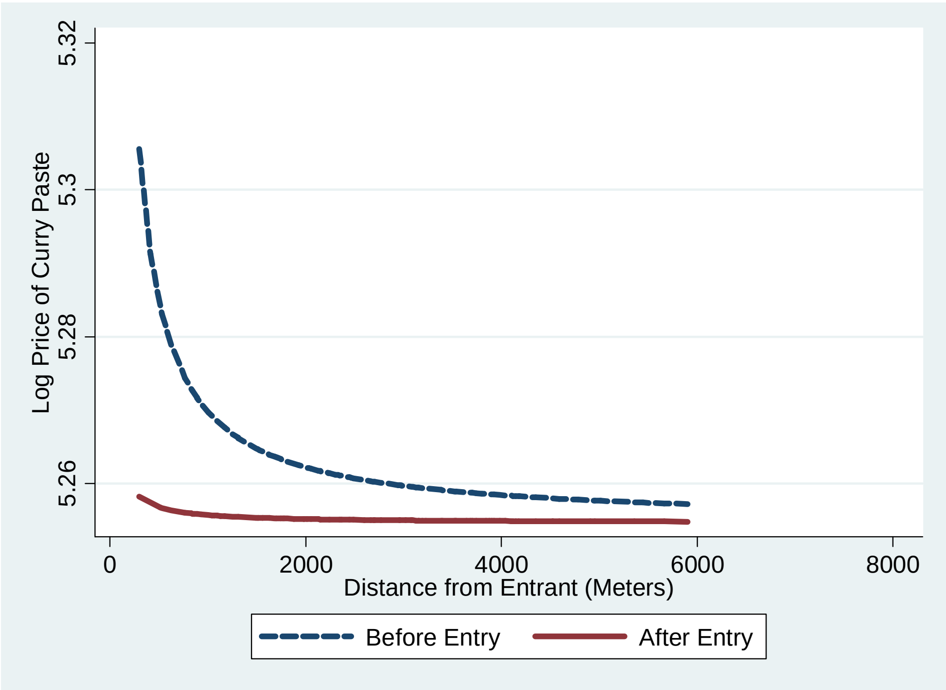
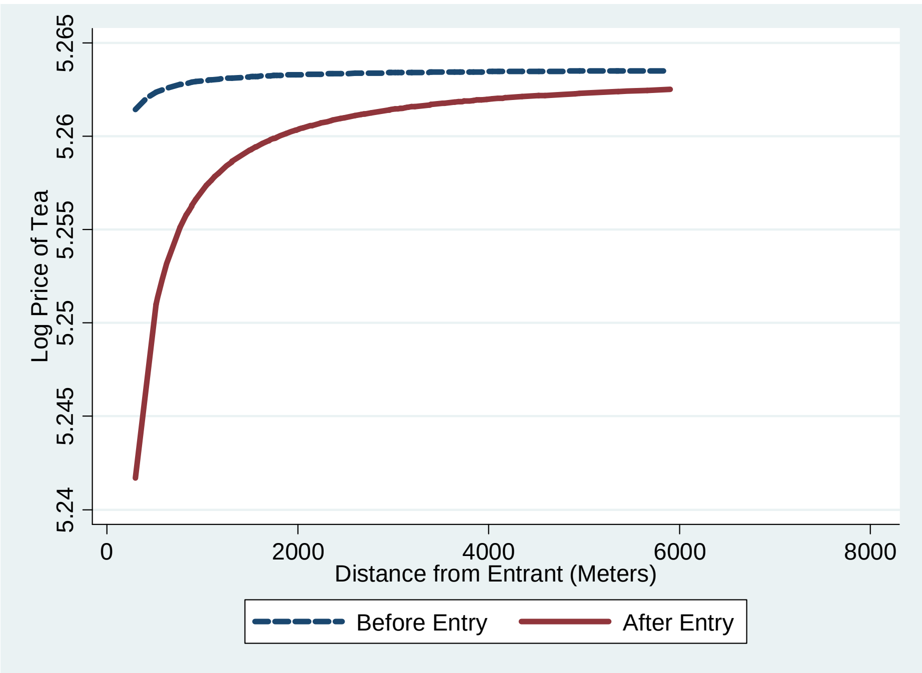


Figure 5: Price Response by Distance within a 15-Minute Driving Distance

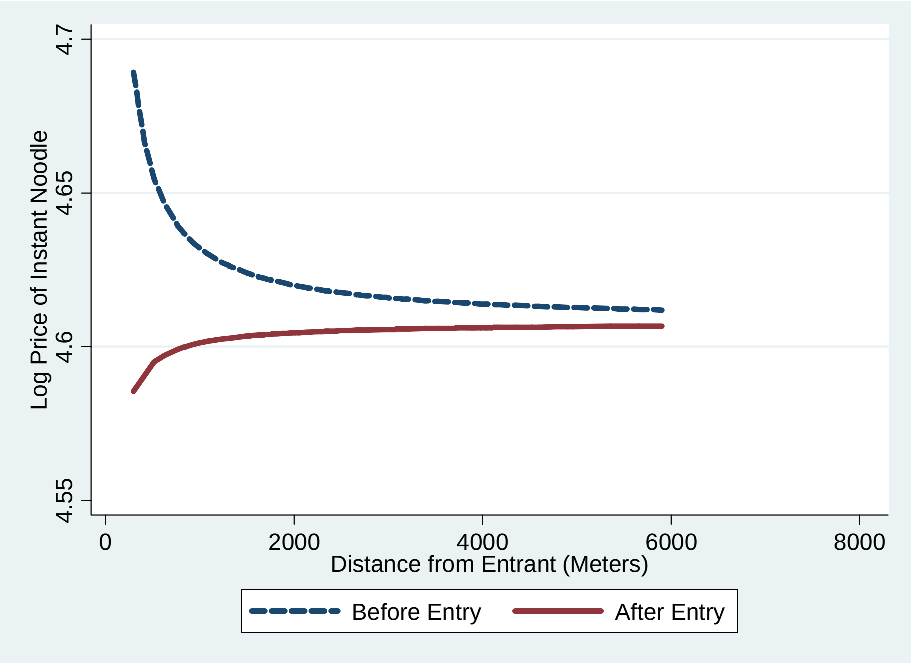
Panel A: Curry Paste



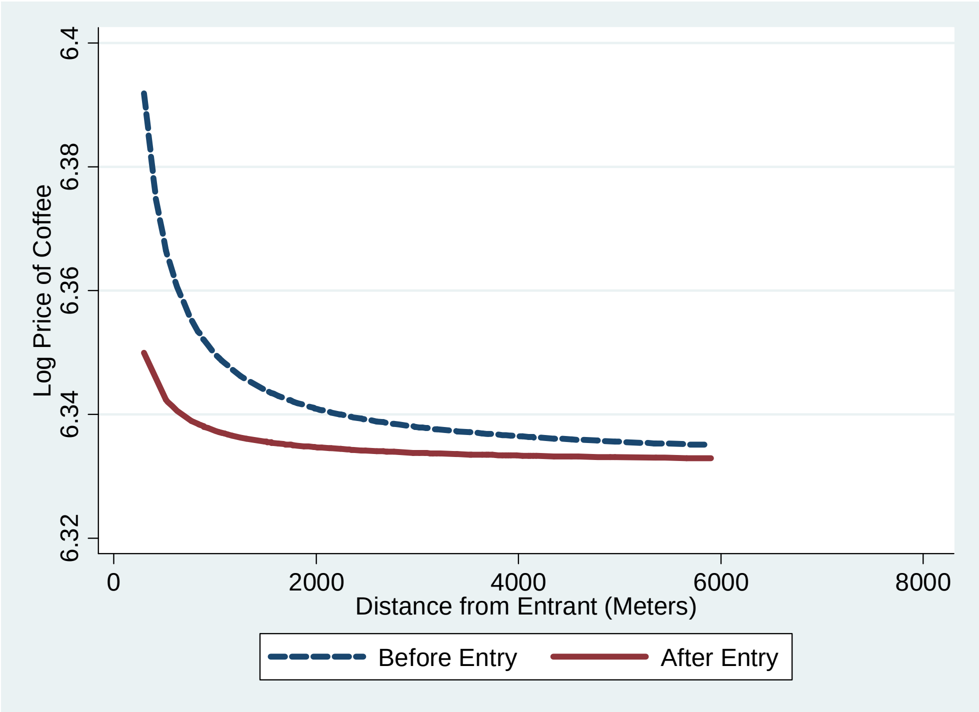
Panel B: Bottled Tea



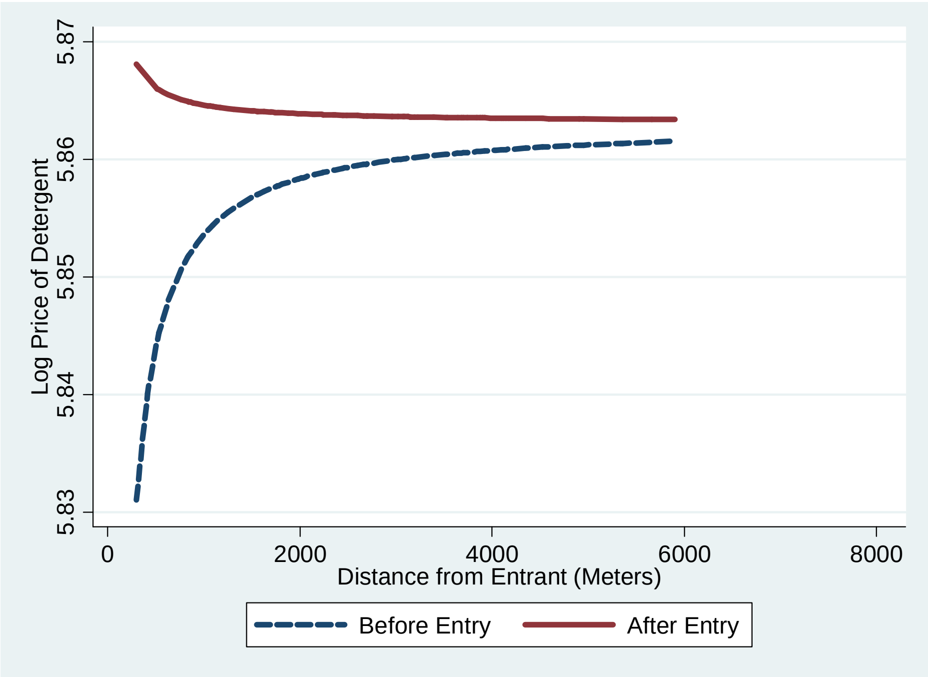
Panel C: Regular Instant Noodle



Panel D: Instant Coffee



Panel E: Detergent



Panel F: Dental Paste

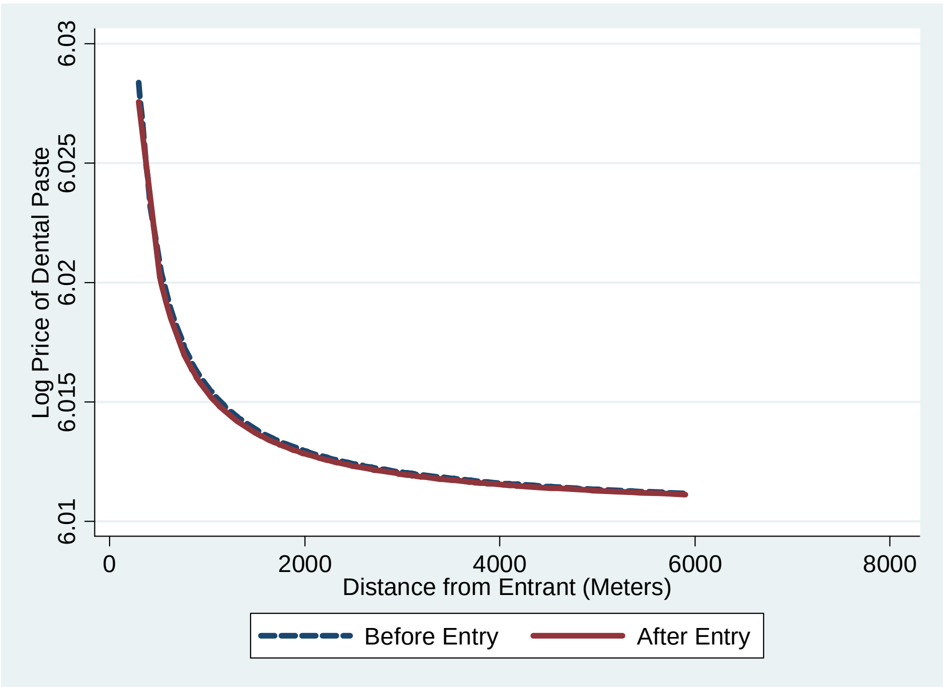
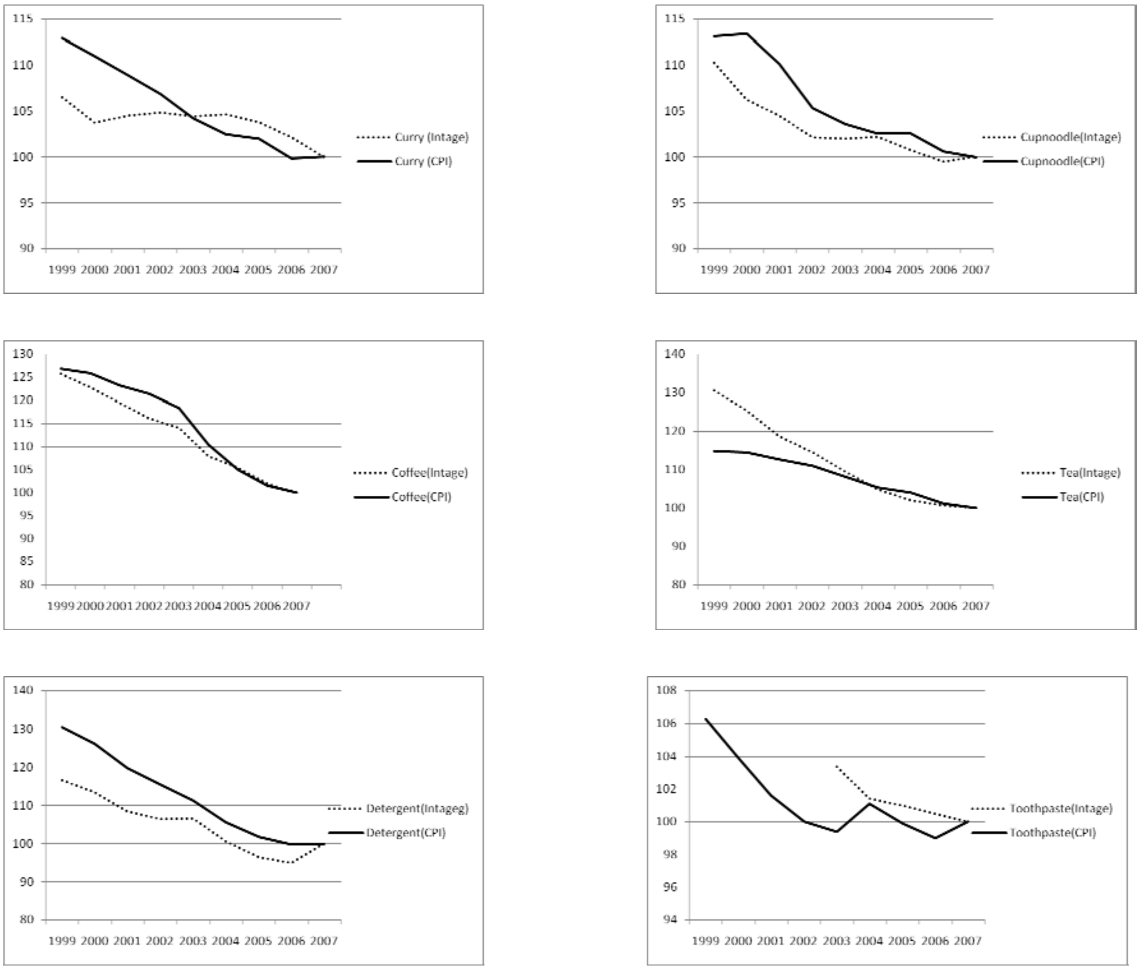


Figure 6: Time Series of Average Product Prices, Prices in Intage Stores, and Consumer Price Index



(CPI and Prices 2007 =100)

Note: Because toothpaste appeared in the market in 2003, the price series of toothpaste does not cover the whole period between 01 January 1999 and 31 December 2007. The Consumer Price Index is the annual average value reported by the Statistical Bureau. The CPI for tea is based on the price for other beverages.