査読論文

# Determinants of Retail Chain Density: Evidence from Japan

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**Abstract**

The rapid development of supermarkets, hypermarkets, specialty supermarkets, drug stores, discounters and convenience stores has replaced the traditional small-scale retail business over the world. A dramatic shift in the economy from a bubble to a recession in the 1990s, amendments to retail regulation, and the modernization of the distribution system transfigured the retail structure of Japan after 1990, which broadened the density of chain stores and compressed the number of small retail stores. The purpose of this study is to investigate the determinants of retail chain density in Japan. Three years of cross-sectional data across 47 prefectures of Japan are used to test the analytical framework of this study are transformed into panel data for more data variation. A social optimality model is adopted to examine the impacts of socio-economic factors on chain stores' density. It is conceptualized for this study that the variation of chain stores per household across Japan can be explained by the proxies of household storage cost and product reorder cost. The empirical results shows that the density of the population has a significant relationship with the number of retail chains, whereas the sizes of stores, sizes of houses, and proliferation of car ownership have an inverse relationship with the number of retail chains. The increase in car ownership, the increasing sizes of houses, and the growing sizes of shops have a significant influence on economizing consumers' household and reorder costs. The growing sizes of houses in urban areas make it convenient for people to store commodities for longtime household inventory, which lowers reorder costs. Moreover, the

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proliferation of car ownership for shopping has decreased the number of shopping trips of customers by reducing distance from retail stores to houses in the neighborhood, which has economized their transportation costs. The density of stores that deal in convenience goods have been found to be more sensitive to transport costs for households, and the storage cost effect is estimated to be larger for houses and stores that deal in shopping commodities.

**Keywords**

Japanese retailing, Japanese distribution system, large scale retail store law of Japan, household inventory cost, spatial competition, social optimal benefit.

**JEL**

L81, M31, O57

## 1. Introduction

Modern retail formats, such as supermarkets, hypermarkets, specialty supermarkets, drug stores, discounters, and convenience stores, have replaced or are gradually replacing traditional small-scale retail formats, such as family-owned neighborhood grocers all over the world (Altenburg et. al., 2016). Japan is not an exception among developed countries in the context of retail diversity, which is dominated by variety retail chains with little churn. The Japanese retail structure has been transformed from an abundance of small retail stores, such as family enterprise stores, to chain stores. There was a notable change in the Japanese retail industry in the 1990s with continuous variations. The commencement of certain techniques, such as self-service, self-choice, and chain store management, during the 1950s was marked as the beginning of the first phase of retail development in Japan. A period of major transformation in the Japanese retail industry commenced in the 2000s. In addition to traditional entities, such as department stores, supermarkets, and convenience stores, new retail business forms are emerging, including mega shopping mall developments led by real estate companies, and Japan railway (JR) terminals being turned into centers.

Macroeconomic changes in the mid-1990s, such as yen appreciation, economic recession, and changes in government regulations, have proliferated a variety of supermarkets, hypermarkets, and mega shopping malls. On the otherhand, increasing populations in large cities, shrinking populations in Japan, variation in the socio-economic structure, and the gradual shift of the retail structure from in-house operation to online delivery have been deteriorating the number of retail stores per 10,000 persons across in recent years. The following figure shows that the number of chain stores per 10,000 persons have been crumpling from 2004 to 2017.

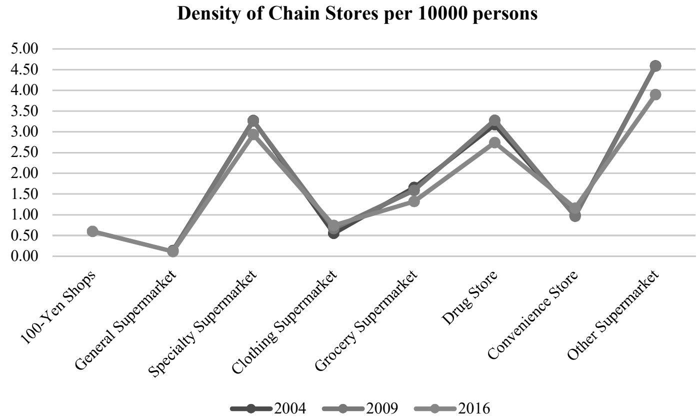


**Figure 1.1 Number of major chain stores per 10,000 persons**
Source: Authors' calculation based METI 2004, 2009, and 2016

The socio-economic developments have also had an impact on the continuous changes of the Japanese retail structure. These socio-economic structures of Japan have changed rapidly since the World War II. The major socio-economic changes in Japan after the late 1990s include the development of the countrywide railway network, the gradual expansion of the sizes of houses, increasing car ownership, rising consumer expenditure, the increasing aged population, shifting people from rural areas to densely populated urban areas, technological innovation, legal forms, and decreasing self-employment. Potjes et. al. (1992) claimed that the inefficiency of the Japanese distribution system accelerated the number of small stores and family enterprises from the 1930s due to a dualistic economy and large-scale store law. Flath and Nariu (2003) denied this argument and found that having a large number of stores is economically feasible due to the small sizes of Japanese houses and the low degree of car ownership.

The abundance of retail stores in Japan not only distributes consumer goods but also functions as a warehouse for people living in the neighborhood. Retailers perform this function due to the small sizes of Japanese houses. Little rooms are available for keeping stocks inside the house, and people only buy small amounts of daily necessities. Therefore, it has been significant for Japanese retailers to be located close to their clients to make daily shopping convenient. This study's aim is to investigate the new dynamics of the Japanese retail structure and the determinants of retail chain density in Japan. In-house storage space has increased because the sizes of houses have grown, and car ownership has increased rapidly, thus resulted in reduction of shopping by car. On the other hand, elderly people are assumed to rely on neighborhood stores due to their lower mobility and their preference for traditional ways of shopping. This study reveals that the number of retail chain depends on an economic basis rather than a cultural basis because the proliferation of car ownership can make shopping trips convenient by saving time and costs. Also, the increasing sizes of houses and the expansion of shop floors can economize the stocking and reorder costs of both customers and retailers.

Therefore, this study investigates the socio-economic aspects as the determinants of retail density across Japan, based on the social optimal model. It focuses on household inventory cost as the prime indicator of retail chains' density in Japan, where household goods' storage, reorder, and transportation costs are considered to be the proxy variable of household inventory costs. We also examine how the retail sector changed in Japan after the 2000s. The subsequent section describes some key issues of the gradual expansion of the diversified retail chain in Japan. Section 3 explores relevant literature, which includes the effect of large-scale retail store law on the density of the retail chain in Japan and models for explaining the geographical diversity of retail outlets. Section 4 describes data and the analytical approach, including empirical estimation. Section 5 describes the results of empirical estimations in details. The final section is the conclusion, which includes remaining issues for further study.

## 2. Development of Diverse Retail Chain in Japan

At the beginning of the 1900s, rapid increases in the populations and incomes in urban areas, and the overall development of the railway network forced people to live in rural areas and to travel into the cities to shop and so on. These changes led to the appearance of department stores as a new format of retail business in Japan. The growth of department stores rose steadily in the 1930s. These larger and fascinating stores offered a wide selection of Japanese and Western products to attract many customers, and this first retail chain exposed itself to the customer as "the place to spend time." Meyer-Ohle (2003) mentioned that tremendous changes have been taking place over the past 50 years in Japanese retailing, although some elements of it appeared traditional and somewhat outdated at first sight. New retail techniques and retail formats have been introduced continuously. Meyer-Ohle (2003) also explained that many innovations in Japanese retailing were borrowed from Western countries and were inspired by developments in foreign countries, and quite a few occurred within Japan.

The 1950s saw the first technological innovation, cash registers in Japan's retail industry, and this decade also experienced increases in the incomes of salaried worker households, with a steady increase in the average per-capita income of Japanese people. These changes brought the introduction of new retail techniques culminating in the formation of several new retail formats in the 1950s and 1960s. General merchandise stores (GMS) chains have been the most widely used retailers as well as the most innovative once since the 1960s. GMS chains operate large retail stores, second in size only to department stores, and both of these important store formats are operated by some of the largest retail companies. Daiei, Ito-Yokado, Aeon, Seiyu, and Uny are now the leading five chains in this sector. Being the pioneer in this regard, Daiei followed this concept further and operated six superstores, introducing its own brand in 1961. Operators of the GMSs entered a period of the rapid expansion of retail sales through the phases of the introduction and formation of the superstore format. This period of retail innovation in Japan can be characterized by the following developments [Meyer-Ohle (2003)][1]:

- Development of new locations, especially in the rapidly expanding dormitory suburbs of Tokyo
- Construction of shopping centers with superstores
- Expansion of sales floors: new stores that opened after 1965 averaged sales floors of more than 1,500 square meters; after 1969, this increased to 3,000 to 5,000 square meters, with single stores reaching sizes of up to 7,500 square meters.
- Introduction of elements such as self-service, self-choice, and centralized payment in various product categories
- Gradual broadening of assortments through the addition of new product lines

Overall, the period saw the continued development of the general superstore with the enlargement of sales floors and the addition of amenities and services. At the beginning of the 1970s, most stores were integrated into so called shopping centers. Although called shopping centers, these shopping complexes were relatively small overall, and each had only one anchor tenant that heavily dominated the complex. Even though the number of shopping centers reached 1695 by the end of 1992, their average size was only 11,322 square meters (Larke and Causton, 2005), of which the key tenant occupied 4761 square meters, and an average of 46 other tenants shared about 3,955 square meters (JCSC,[2] 1993).

Larke and Causton (2005) explained that the intensified competition in the 1970s between the operators of general superstores and the beginning saturation of certain regional markets also led to escalated efforts to expand the scope of operations. Companies in this period expanded their store networks as far as the relatively remote areas of Northern Japan and Hokkaido. Their initiatives were supported by the convergence of consumption patterns in rural and urban areas. Although significant differences in lifestyles and incomes between urban and rural areas existed until the oil crisis, these differences gradually declined during the 1970s through productivity increases, the government-guaranteed income in agriculture, and a slowdown of growth in the secondary industries. This period also experienced a gradual increase in prosperity in rural areas, which led to a high rate of car ownership with increasing mobility, and Western consumer goods were increasingly introduced into rural areas.

In the 1990s, low growth rates, rising unemployment, and a growing number of bankruptcies characterized a prolonged period of structural change and led to a lengthy slump in the market. Deregulation, such as the large-scale retail store law (LSRSL), brought about changes in the competitive retail environment after the bubble period (1990s). The consequences of revised retail laws after the 1990s led to an increase in the number of retail chains with structured floor sizes. This period saw the expansion of specialty retail stores, such as home electrical appliances, home centers, drug stores, convenience stores, 100-yen shops, etc. This period also experienced the expansion of large suburban shopping centers.

The 2000s saw the lower birthrate and more aging society in suburban areas, and it resulted in lower employment in the establishments. In addition, the stagnation of economic growth and rising fierce competition stimulated Japanese retailers to explore the new method of retailing. Consequently, the 2010s have witnessed the pursuit of the expansion of neighborhood shopping centers, JR-station stores, and online shopping.

## 3. Literature Review

### 3.1 Government Regulation: Large-Scale Retail Store Law

Previous studies adopt the spatial competition model, Nash pricing model, and social optimality model for explaining the retail density in Japan, USA, and in the developed countries in Europe. Flath (1990) and Flath and Nairu (1996) also claim that Large-Scale Retail Store Law (LSRSL) is a significant modifier of retail store density in Japan. This section's aim is to describe these relevant issues to determine retail chain density across Japan.

One of the hotly debated Japanese trade barriers in the 1990s was the LSRSL.[3] Since its enactment in 1974, the LSRSL strictly regulated the entry of large-scale retailers to protect local small and medium-sized incumbent stores. The LSRSL focused on retail stores rather than on businesses and included retail formats other than the department store model. Based on the French law and on an adaptation of the Department Store Law of 1956, the new law restricted the growth of large stores, such as supermarkets. It protected family-operated mom-and-pop stores and existing large stores from new competitors [Riethmuller, 1994]. Large stores were required to follow a specified application process if they exceeded 1500 m2, except for in large cities, where stores with an area of up to 3000 m2 were exempt from this special process [Guner et. al. (2006)][4].

In 1979, the law was reformed again. Two types of stores were now subject to restrictions.

I. Stores larger than 1500 m2 (3000 m2 in large cities) (Type 1 stores): Applications to open this type of store had to be made to the ministry of trade and industry (MITI).

II. Stores between 500 and 1500 m2 (Type 2 stores): For these stores, applications were accepted at the prefectural (local) level [Guner et. al. (2006)]. Firms or individuals planning to open a store with an area larger than the stipulated area were required to obtain the approval of several regulatory committees [Lothia and Subramaniam (2000)].

After the 1990s, the LSRSL was also amended to ease the opening of new large-scale retail stores and to stop excessive intervention by local business committees. The revision also raised expectations regarding an imminent revolution in the Japanese distribution system—specifically, that it would trigger a sharp increase in the number of large stores once the revised statute was enacted [Stern and Weitz (1997)]. It was also further anticipated that the increase in the number of large stores would unleash the power of a number of technological and socio-economic developments, thus further accelerating change. In the 2000s, the Large-Scale Retail Store Law was abolished and replaced with the Large-Scale Retail Store Location Law.

### 3.2 Models for Explaining Geographical Diversity of Retail Outlets

The traditional model of spatial competition follows the assumption of location theory [Mills and Lav (1964), Beckmann (1970), Greenhut and Ohta (1973), Hartwick (1973), Stern (1972)] that firms set prices as if they are monopolists within their market areas. Capozza and Order (1978) developed a generalized spatial model where they followed the similar price model of Hotelling (1929). Under the Hotelling (1929) assumption, each firm conjectures that all other firms leave their prices unchanged. We believe that this assumption is closer to the ways in which firms behave in most real-world situations.

The social optimality model is given by David Flath (1990). This model presumes that the density of retail stores is determined so as to minimize the combined storage and transport costs of households and of the distribution sector. Pricing model is presumed that the retail sector itself fully captures incremental savings of household storage and reorder costs that result from a greater density of outlets, perhaps by employing some form of multipart pricing. In accordance with this model, having more stores shortens the distance between the representative household and its nearest store, and it lowers households' costs of transporting goods. The lower transport costs induce households to shop more frequently for smaller loads to achieve further economies on the storage of nondurables. However, having more stores increases the stores' combined inventory costs, as it is more costly to restock many stores than it is to stock a few. The socially optimal density of stores is accordingly greater where households are less efficient at storage and reorder, or where the distribution sector is more efficient at storage and reorder. Also, a greater population density of chain stores shortens the distance between the house and the store given the number of stores per household. It is similar in its effect on the socially optimal number of stores per household to other factors, such as car ownership, that also reduce household shopping costs. Greater population density favors the social optimality of a lower number of stores per household. The basic specification of the model is presented as follows:

$$S\left(D_1\right)=12D\int_0^{12^{-1/4}D_1^{-1/2}}\int_0^{x/\sqrt{3}}\left(2krq\right)^{1/2}\left(x^2+y^2\right)^{1/4}dy\,dx$$

Here, $D_1$ is retail density. Flath (1990) assumes that the market served by each retailer is a hexagon with area $D_1^{-1}$ and radius $D_1^{-1}12^{-1/4}$. In accordance with this model, exogenous changes that increase households' costs of storage and reorder induce an increase in the density of retail outlets, thus economizes by shifting more of the storage and reorder costs onto the retailers. Exogenous changes that increase the retailers' costs of storage and reorder induce a fall in the density of retail outlets, which economizes by shifting more of the storage and reorder costs back to the households.

Therefore, the density of retail stores leads to the minimum “social cost of household inventory,” which includes consumers’ shopping costs and household storage costs together with retailers’ reorder costs and storage costs. Flath (1990) showed that the optimal level of store density is:

$$n^* / m = \left(2as / 9btm\right)^{1/2} \quad \text{.......... (1)}$$

Here, $n^*$ refers the optimal number of retailers, and $m$ denotes the number of households around the perimeter of a circle with circumference 1. We assume that each household buys from the nearest retailer so that each retailer has $m/n$ customers. In addition, $a$ and $s$ denote here customers’ shopping (transportation) costs and fixed inventory (storage) cost respectively. Similarly, retailers’ reorder cost is $b$ and inventory cost is $t$.

Nash pricing with the free-entry model, explicitly represents the pricing choices of retailers as the outcome of a noncooperative game. In this model, the density of retail outlets is the greatest, consistent with positive profits. Capozza and Order (1978), Heal (1980), Gabszewicz and Thisse (1986), and others adopted this approach. Not surprisingly, when retail pricing is modeled as a Bertrand game with free entry, the equilibrium density of outlets need not be socially optimal. In the Nash-pricing-with-free-entry model, factors that raise all households’ costs of storing and transporting goods lead the households to offer higher premiums to retailers located closer to their dwellings, which makes a greater number of stores profitable. Factors that raise retailers’ storage and reorder costs make it less profitable to accommodate households’ preference for shorter shopping trips, and they lower the profitability of a profusion of stores. The comparative statics are therefore qualitatively the same as for the social optimality model.

The two basic models are distinct in this sense. Nevertheless, the two models are observationally equivalent in that their comparative statics are qualitatively the same. In both models, exogenous factors that raise household costs of transporting or storing goods favor a greater profusion of stores, whereas factors that raise the retail sector’s costs of storing and restocking goods favor fewer stores. We investigate the following research questions based on previous studies:

(1) How has the retail sector changed in Japan since the 1990s?

(2) What are the determinants of retail density in Japan?

## 4. Data and Methodology:

This study is aimed at investigating the determinants of retail density in Japan. Empirical models which describe the geographic density of retail outlets are an implicit feature of the spatial competition literature [Capozza and Order (1978), Salop (1979), Heal (1980), Novshek (1980), Flath (1990)]. This study adopts the empirical regression model by Flath (1990) to examine the impacts of socio-economic factors on retail density. This study conceptualizes that the variation of retail diversity in the number of stores per household across 47 prefectures of Japan can be explained by the proxies of household storage cost and product reorder cost. Following Flath (1990) the specification of log-log variables from the following equation:

$$ln\left(n^{*}/m\right)=\left(1/2\right)\left[\left(ln2/9\right)+ln\left(a\right)+ln\left(s\right)-ln\left(b\right)-ln\left(t\right)-ln\left(m\right)\right] \quad \text{.......}(2)$$

We have used the following estimated equation by replacing the empirical counterparts for examining the impact of socio-economic factors on the retail density across 47 prefectures:

$$\ln DR_{it} = \beta_0 + \beta_1 \ln DPoP_{it} + \beta_2 \ln S\_Stores_{it} + \beta_3 \ln S\_Houses_{it} + \beta_4 \ln Cars_{it} + \varepsilon_{it} \quad \text{.......}(3)$$

Where,

In$DR_{it}$ = number of retailers per household

In$DPoP_{it}$ = density of population (Number of retail store / population)

In$S_Stores_{it}$ = floor sizes of stores ($m^2$)

In$S_Houses_{it}$ = average size of house ($m^2$)

In$Cars_{it}$ = number of cars per household, and

ln indicates natural log

The subscript of $i$ represents prefecture, and $t$ represents the year of the census of commerce. The variable of $\varepsilon_{it}$ denotes the error term. The signs of the coefficients predicted in the theoretical model of this study are $\beta_1 > 0$; $\beta_2 < 0$; $\beta_3 < 0$; and $\beta_4 < 0$. An analytical model of this study describes that the number of retail chains across Japan's 47 prefectures depends upon the household inventory cost, which includes the household cost of storing and transporting goods from stores to houses, and upon population density. Household storage cost and reorder cost are explained by proxy variables such as average size of stores, size of house per person, and motor vehicles per household. This study presumed that a greater density of household leads to a decrease in the number of retail stores; the increasing sizes of stores decrease the density of retail stores; the increase in the house size induces inhabitants to reduce household inventory costs, which allures retailers to expand geographically; and the abundance of cars per household shortens the shipping trips of inhabitants, in addition to reducing the transportation costs. The number of cars per household has been increasing in Japan after 2000 and the big cities have many car parking shortage due to rising the growth of population (Appendix B). We can summarize the expected signs of the coefficients as in Table 4.1.

**Table 4.1: Expected result of variables**

| Name of Variable | Hypothesis | Expected Signs |
|---|---|---|
| Density of population (DPoP) | Greater density of household leads to a decrease in the number of retailers | Positive |
| Size of stores (S_Stores) | Increasing sizes of stores (per square meter) decrease the density of retailers | Negative |
| Size of houses (S_Houses) | Increases in house sizes induce inhabitants to reduce household inventory costs, which allures retailers to expand geographically | Negative |
| No. of cars per person (Cars) | In countries where the number of cars per household is more extensive, households have lower costs of transporting goods from stores to dwellings. | Negative |

Previous studies find that retail density in Japan depends on the social benefit of the inhabitants. Flath (1990) constructs an analytical model for explaining the geographical density of retail outlets in an economy. The author explains that retail density in Japan minimizes the consumers' and retailers' combined storage and reorder costs, which is precisely related to cost parameters and to the geographic density of households. This study is the extension of Flath's (1990) study, which uses extended data and adapts the OLS model and random effects (GLS) model.

In contrast to Flath (1990), we investigate the impact of the changes in socio-economic variables in a dynamic approach to determine the effects of changes in the number of chain stores on the household inventory costs of inhabitants across Japan from 2000 to 2016. During this period, the living space per person increased almost four times, car ownership almost more than tripled, and a growing number of people were living in the densely populated areas, whereas the number of retail chains per 10,000 persons decreased gradually.

We consider density of population (DPoP)[5], size of stores (S_Stores), size of houses (S_

Houses), and number of cars per person (Cars)[6,7] to be the determinants of the density of retail stores. This study uses a total number of retailers (TR_Stores)[8] and diverse formats of chain stores in Japan such, as 100-yen shops, supermarkets (Super_Mkts), other supermarkets (Other_SMkts), drug stores (D_Stores), and convenient stores (C_Stores), as dependent variables because these retail chains are mostly seen in densely inhabited areas, and they sell daily household goods. We adopt log-log specification for variables to minimize the skewness relationship among variables. Data for the number of retailers and store sizes are collected from the census of commerce, conducted by Japan the Ministry of Economy, Trade and Industry (METI). In addition, for population density, house sizes and numbers are collected from the Geospatial Information Authority of Japan; Ministry of Land, Infrastructure, Transport and Tourism (MLITT); the Statistical Survey Department, Statistics Bureau; Ministry of Internal Affairs and Communications; and the Automobile Information Division of Automotive Safety Bureau respectively. To test the analytical framework, this study uses panel data of 47 prefectures of Japan in 2016, 2009, and 2003. Three years of cross-sectional data are transformed into panel data for more data variation, and more degrees of freedom.

## 5. Empirical Result

### 5.1 Descriptive Statistics

Descriptive statistics enable us to explore the data at our disposal. We use 141 observations across Japan to investigate the determinants of retail density.

**Table 5.1: Summary of Statistics**

| Name of Variable | Observations | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| DPoP | 141 | 671.54 | 1183.433 | 64.51 | 6416.807 |
| S_Stores | 141 | 139.03 | 32.08 | 2.84 | 221.78 |
| S_Houses | 141 | 108.04 | 19.46 | 63.94 | 156.54 |
| Cars | 141 | .55 | .16 | .25 | .89 |

Table 5.2 shows the Spearman's rank correlation to reduce any distortions among variables. We pick Spearman's Rank Correlation over Pearson's because the latter can unfortunately be prone to influence by outliers and other factors, such as unequal variances.

**Table 5.2: Spearman's Correlation Coefficient**

| Variables | Correlation coefficient between variables | | | |
|---|---|---|---|---|
| Density of Population | 1.0000 | | | |
| Size of stores | 0.0590 | 1.0000 | | |
| Size of houses | –0.5486 | 0.0839 | 1.0000 | |
| Number of cars | –0.3152 | 0.7255 | 0.3976 | 1.0000 |

### 5.2 Empirical Estimation

In accordance with the Hausman test, the fixed effect model is more appropriate for investigating the socio-economic effects on the retail density of Japan. The probability of the Hausman specification test (1978) for this study is Prob > chi2 = 0.000. Although the Hausman test recommends adopting the fixed effect model for examining our hypothesis, the estimated result of the fixed effect model (Appendix – 1) was not satisfactory. Gujarati (2004)[9] recommends that the fixed effect model is convenient for longitudinal panel data, but this study is confined to three years of cross-sectional data, which are transformed into panel data. Thus, the random effect model is adopted and OLS is treated as a reference. Table 5.3 shows the estimated results.

*Density of total retailers (LTR_Stores)*

The OLS result shows that independent variables are significant except for LS_Stores. On the other hand, REM estimates support our hypothesis, where all explanatory variables have a significant impact on the density of total retailers in Japan. The estimated results show that the increase of the population intensifies the number of chain stores, but the statistical data of MLITT and METI show that both the population and the number of total retailers in Japan decreased gradually during the period of the 1990s to 2010s. The increasing sizes of stores, sizes of houses, and number of cars decrease the number of total retailers.

*Density of 100-yen Chain shops (L100_yen_shops)*

For L100_yen chain shops, only OLS is available due to the existence of one year data on the total number of 100-yen retail chain establishments. The results reveal that the density of 100-yen shops can vary across Japan in terms of the density of the population, the sizes of stores, the sizes of houses, and the number of cars. In this case, the coefficients of all explanatory variables are positive except for sizes of houses. In terms of 100-yen shops, the absolute value of the coefficient on LS_House is high and inversely significant, which is consistent with our hypothesis. In this regard, only the restoring and reordering costs of customers are significant for the expansion of 100-yen shops.

*Density of Chain Supermarkets (LSuper_Mkts)*

The LSuper_Mkts estimates for OLS regression find that the density of the population and the sizes of houses have a significant effect on the number of supermarkets in Japan. On the other hand, the estimation of the REM reveals that the density of the population and the number of cars only have an impact on the number of supermarkets. Here, the coefficient value of cars per person describes a negative relationship between LCars and retail chain density. This study presumes that increase population, size of house and proliferation of car ownership per household can increasing the density of retail chain stores since expansion of household size makes the storage cost for goods in household expensive which can be economize having frequent shopping trips with cars. Using cars for shopping is convenient and less expensive than other means of transportation for household goods. This means that consumers are likely to shop in supermarkets using cars and that transportation costs would have a large impact on diverse supermarkets in this sense. The sizes of stores and sizes of houses are insignificant for the expansion of supermarkets, which does not support our hypothesis. This means that restocking and reordering costs may not have an impact on the density of supermarkets.

**Table 5.3: Results of OLS Regression and Random Effect Model (REM)**

| | LTR_Stores | | L100_ yen_ shops | LSuper_Mkts | | LOther_SMkts | | LD_Stores | | LC_Stores | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | OLS | REM | OLS | OLS | REM | OLS | REM | OLS | REM | OLS | REM |
| Cons | 11.56 (1.50) | 15.47 (1.98) | 16.73 (4.59) | 8.68 (1.59) | 6.49 (2.21) | 9.54 (1.93) | 10.61 (2.88) | 6.76 (2.08) | 6.87 (3.12) | 9.49 (2.02) | 12.33 (2.62) |
| LDPoP | .24*** (.05) | .14* (.08) | .55*** (.15) | .28*** (.05) | .36*** (.08) | .31*** (.06) | .31*** (.10) | .45*** (.07) | .48*** (.11) | .37*** (.07) | .31*** (.10) |
| LS_Stores | .07 (.10) | −.05*** (.02) | .73** (.31) | .14 (.11) | .00 (.03) | .11 (.13) | −.04 (.06) | .18 (.14) | .02 (.06) | .13 (.14) | −.04 (.03) |
| LS_Houses | −.86*** (.26) | −1.45*** (.36) | −3.77*** (.80) | −.90*** (.28) | −.38 (.40) | −1.15*** (.34) | −1.21** (.53) | −1.08*** (.36) | −.96* (.57) | −1.31*** (.35) | −1.67*** (.48) |
| LCars | −.78*** (.15) | −.77*** (.03) | 6.77*** (.47) | −.24 (.16) | −.21*** (.04) | −.33* (.20) | −.24*** (.08) | −.10 (.21) | .05 (.08) | −.33 (.21) | −.28*** (.04) |
| $R^2$ | .59 | .94 | .69 | .49 | .40 | .48 | .19 | .52 | .00 | .53 | .57 |

*Dependent Variable:* LTR_Stores, L100_yen shops, LSuper_Mkts, LOther_SMkts, LD_Stores, LC_Stores
**** p<0.01, ** p<0.05, * p<0.1,* Parentheses are the standard error of the coefficients.

*Density of other Chain Supermarkets (LOther_SMkts)*

The examination of LOther_SMkts estimates for both OLS and the REM finds almost the same impacts of explanatory variables on the dependent variable of this study. LDPoP, LS_Houses, and LCars have significant relationships with the number of other retailers in Japan. The coefficients of significant independent variable are negative except for LDPoP. Both transportation and restocking costs might have a significant impact on the number of other supermarkets, such as specialty supermarkets and clothing supermarkets. A few specialty supermarkets are found in densely inhabited areas, where shoppers travel using cars as the means of convenient transportation. Gradual increases in the sizes of houses and the proliferation of cars would decrease the number of other supermarkets, which is consistent with our hypothesis.

*Density of Chain Drug Stores (LD_Stores)*

The estimated results for both OLS and the REM identify that LDPoP and LS_Houses have significant impacts on the number of drug stores in Japan. Transportation cost does not have any influence on the expansion of drug store chains because the coefficient value of car per person remains insignificant for determining the number of drug stores, whereas restocking and reordering costs are significant modifiers for the determination of drug stores.

*Density of Chain Convenient Stores (LC_Stores)*

The OLS result shows that LDPoP and LS_Houses have an significant impacts on the number of convenient store chains in Japan. On the contrary, the examination of estimates for the REM finds significant impact of LDPoP, LS_Houses, and LCars on the density of convenient stores in Japan. The coefficient value of significant estimates for the REM are negative except for LDPoP, which implies that the number of convenient stores depends on the restocking cost and transportation cost of the consumer, which is allied with our hypothesis.

### 5.3 Discussion

The empirical results of this study vary from one type of retail chain to another, and conform the hypothesis of this study to be consistent in most cases. Variation in empirical results befalls due to the influences of external forces on a large variety of retail chains since the 1950s. Changing to an efficient distribution system from an inefficient one, and shifting the economy from a bubble to a recession had a momentous impact on the socio-economic changes in Japan, which further contributed to determining the density of retail chains in the inhabited areas of Japan. Meyer-Ohle (2003) point out that the Japanese distribution system seems to be a prime example of the stable relationships between a variety of chain stores and consumers' shopping behavior. Although the retail sector has shown some change, the wholesale sector has demonstrated an astonishing pattern of structural constancy that persisted even throughout the 1990s. The underlying reasons for this stability are to be found mainly in the attitudes shown by manufacturers, wholesalers, and retailers toward their positions and roles in the distribution channel. Coordination rather than mobilization is the dominant feature of change in the Japanese distribution from manufacturers' dominance to retailers' dominance. Flath (1990) claims the dualistic economy of Japan to be a prime means of the inefficient distribution sector. Before the 1970s, a large number of small retail stores in Japan showed symptoms of economically wasteful overemployment. Since the 1980s, several shop types started to modernize and became relatively efficient [e.g., department stores, supermarkets, convenience stores, and specialty chain stores].

In addition, the Japanese distribution system in the 1990s has been considered to be a revolutionary change for the retail industry. This transformation was related to the number of factors, most significantly deregulation, the stricter application of fair-trade regulations, changes in consumer behavior, the entry of foreign retailers, and increasing imports through the appreciation of the yen. The most significant and successful change in the distribution channels of Japanese retailing ascended after the introduction of the convenience store. Meyer-Ohle (2003) describ that with convenience store companies having proceeded so far already in the organization of their supply chains, Seven-Eleven finally went even one step further. In November 1997, Seven-Eleven organized 25 wholesalers to establish a separate new company with the exclusive purpose of supplying the company's convenience stores with daily miscellaneous goods and sundries. The establishment of this company was its final move to transform a manufactured-oriented distribution structure into a retail-oriented one. Eventually, this newly developed distribution channel was followed by retailers characterized by small sales floors, limited storage space, broad assortments, and long business hours.

## 6. Conclusion

This study investigated the retail structure across Japan. The retail structure of Japan has been diversified substantially since the 1990s due to multifold changes in the Japanese economy. Significantly, the proliferation of small stores has declined sharply, and the number of chain stores with larger floor space has increased gradually. The Japanese retail industry encountered this structural change due to government regulations [Potjes et. al (1992), Matsuura and Motohashi (2005), and Takei et. al (2006)] and suburbanization (Flath, 1990). On the one hand, Dawson and Larke (2004) claim the stagnated economy of Japan was the reason for diversification in Japanese retail industry. This study adopted the social optimality model to examine the impacts of socio-economic factors on retail density where we performed OLS, random effect and fixed effect regression to find the best suited empirical result of our hypothesis. This research found that the LSRSL, the fall of the economy, and rapid urbanization since the 1990s brought a major change in the retail industry of Japan. On the other hand, we found that household costs for transporting and storing goods, as well as the inventory costs of retailers also reflected the structural change of retail density.

Having more stores makes shopping more convenient for households but makes restocking somewhat more costly for the aggregate of stores. The greater restoking costs will be reelected in prices, but consumers will be willing to pay these higher prices if the added convenience of next-door shopping is worth it to them. The increasing number of cars can make the shopping trip convenient and cheap even if it is not next-door shopping. Using cars, people can go on less frequent shopping trips in nearby supermarkets, drug stores, convenience stores, and 100-yen stores for their daily necessary goods, which saves time and people's consumption costs. The sizes of houses are increasing across the country, the rate of the aging population is growing, and inhabitants are increasing in urban areas, although the number of total retailers per 1000 inhabitants decreased steeply in the 2010s. The expansion of the sizes of houses helps people to maintain an inventory of household goods for a long time, which also economizes household restocking costs. In addition, store sizes have been increasing since 1995 after the amendments of the LSRSL to permit giant retail store chains from Western countries. This was the first wind of reducing the intensity of small stores in Japan. These socio-economic changes make shopping convenient for people in Japan, and changes in consumer behavior have pushed retailers to introduce new formats of retail business.

The advancement of the retail chain, the increasing number of cars, and the expansion of the sizes of dwellings makes household shopping more convenient and enables economies of scale effects on household storage space and travel time. High household storage costs and low retailer reorder costs favor the rationality of a distribution system with many small stores (Flath, 1990) which is consistent with this study. We found that the density of small stores shrunk steeply, and the number of retail chains is growing, which reflects on the expansion of household inventory facility and declining retail density per household. The decentralization of distribution systems by supermarkets, drug stores, convenience stores, and 100-yen stores reflect significantly on the economies of restocking and reordering the products of retailers and consumers.

Direct retail sales have been replacing gradually by e-retailing, which is termed a *virtual store* in the modern retail industry. This format of retailing uses cutting-edge communication technology to economize the costs and time of consumers. Gradually, new retail formats will emerge, and others will fade away due to the steady change of technology and the socio-economic structure, which can pave the way for investigating retail store density. This study was confined to socio-economic factors as the determinants of retail density in Japan. Ageing population, number of other personal vehicles like bicycle, location selection, financing, staffing, product mix, and service mix are also key determinants of retail density in a neighborhood. This research follows the social optimal model (1990) to investigate the determinants of retail chain density in Japan. We recognize that this implicitly overlooks work in other disciplines, such as location characteristics for retail chain density, price competition, and the urbanization of retail chains. The final caveat concerns the omission of several variables that might influence the number of retail chains and focus on limited samples for examining the effect of the social optimal model after 2000. Further studies can uncover the caveats of this study. A few research questions might consider exploring the future efforts of unfolding the limitations of this study. For example, why is location choice important for retailers, and how does location analysis strategy facilitate the store performance of global retailers? Another related question concerns potential location characteristics for the internationalization of retailers. Simply said, does a retailer's performance relate to the store location's surrounding competitor density? To investigate these uncovered issues, further research will be extended to explore the determinants of entire distribution system of Japan and how this distribution system affects on the retailers' performance.

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## Notes

1 Meyer-Ohle (2003) pp. 22–25

2 Japan Council of Shopping Centers (JCSC) was established in April 1973 to promote better lifestyles for consumers and to stimulate local communities through the development of shopping centers. http://www.jcsc.or.jp/sc_english/

3 *Daikibo kouri tenpo in okeru kourigyou nojigyon kaLsutdou no dzousci ni kansurn horitsuu* [Law Concerning the Adjustment of Retail Business Activities of LargeScale Retail Stores], Law No. 109 of 1973 [hereinafter Large Stores Law].

4 Guner et. al. (2006) p. 305

5 Aging population has been increasing in Japan gradually and it has remarkable effect on the development of retail business as well as the entire economy of Japan. We use DoP as a key determinant of retail chain density in Japan which includes the percentage of aging population along with other age group.

6 Cars are the most popular vehicle in developed countries to transport goods from shopping centers to households since its time saving and fuel consumption benefit. Apart from Cars, Japanese consumers widely use bicycle and walking for shopping in the neighborhood retail shops. There is easy access to bicycles everywhere in Japan. These are much less expensive than cars for households. But these vehicles are not convenient for transporting bulk of products from nearby retail shops to households. Using bicycle, motor bikes and walking increase the shopping trips of consumers and increase the inventory costs per household. Nonetheless, we planned to use private transports like bicycle and motor bikes apart from cars per household. Data unavailability in this regard does not permit us to use this variable. Also, data on average walking distance from neighborhood retailers to households is unavailable. Previous studies [(Flath, 1990), (Potjes et. al., 1992), (Flath and Nariu, 1996), (Matsui and Yukimoto, 2004) suggest using number of cars per household to measure the average shopping trips from per household to nearby retail stores.

7 In addition, shortage of car parking in urban areas makes people reluctant to use cars for shopping trips although using cars in shopping has economic benefits for household inventory costs. Error term in our model includes these omitted variables and they correlated with the variables which makes this study small bias.

8 This study focuses on the retail chain density of Japan. Although the product line of retail chain stores are different from each other this study considers retail chains which sell daily commodities and non-durable goods, and the type of shops are available in neighborhood. To see the determinants of all types of retailers, we consider “TR_Stores” as

a dependent variable.

9 Gujarati (2004) pp. 650–651

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# Appendices

## Appendix A

**Table 1A: Results of Fixed Effect Regression**

| | LTR_Stores | LSuper_Mkts | LOther_SMkts | LD_Stores | LC_Stores |
|---|---|---|---|---|---|
| Cons | 24.79<br>(3.46) | −2.94<br>(4.63) | 14.50<br>(10.44) | 6.02<br>(10.84) | 18.87<br>(4.78) |
| LDPoP | −.82**<br>(.36) | 1.06**<br>(.48) | .23<br>(1.09) | −61<br>(1.13) | −.41<br>(.50) |
| LS_Stores | −.05***<br>(.02) | −.00<br>(.03) | −.05<br>(.06) | .02<br>(.06) | −.04<br>(.03) |
| LS_Houses | −2.26***<br>(.57) | .77<br>(.77) | −1.93<br>(1.73) | .58<br>(1.79) | −2.17***<br>(.79) |
| LCars | −.84***<br>(.04) | −.17***<br>(.05) | −.24**<br>(.11) | −.02<br>(.11) | −.32***<br>(.05) |
| $R^2$ | .94 | .43 | .20 | .01 | .58 |

*Dependent Variable:* LTR_Stores, L100_yen shops, LSuper_Mkts, LOther_SMkts, LD_Stores, LC_Stores

**** p<0.01, ** p<0.05, * p<0.1* Parentheses are the standard error of the coefficients.

## Appendix B

**Table 1B: Number of cars per household (2003–2017)**

| | Prefecture | 2004 | 2009 | 2016 | | Prefecture | 2004 | 2009 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Hokkaido | 0.418 | 0.488 | 0.69 | 26 | Kyoto | 0.333 | 0.371 | 0.52 |
| 2 | Aomori | 0.391 | 0.497 | 0.75 | 27 | Osaka | 0.286 | 0.307 | 0.42 |
| 3 | Iwata | 0.405 | 0.509 | 0.79 | 28 | Hyogo | 0.339 | 0.393 | 0.60 |
| 4 | Miyagi | 0.406 | 0.494 | 0.73 | 29 | Nara | 0.371 | 0.446 | 0.76 |
| 5 | Akita | 0.423 | 0.524 | 0.78 | 30 | Wakayama | 0.410 | 0.499 | 0.54 |
| 6 | Yamagata | 0.445 | 0.556 | 0.83 | 31 | Tottori | 0.419 | 0.538 | 0.80 |
| 7 | Fukushima | 0.441 | 0.550 | 0.85 | 32 | Shimane | 0.415 | 0.522 | 0.79 |
| 8 | Ibaraki | 0.486 | 0.599 | 0.87 | 33 | Okayama | 0.444 | 0.545 | 0.79 |
| 9 | Tochigi | 0.489 | 0.604 | 0.86 | 34 | Hiroshima | 0.389 | 0.472 | 0.66 |
| 10 | Gunma | 0.524 | 0.631 | 0.89 | 35 | Yamaguchi | 0.439 | 0.530 | 0.76 |
| 11 | Saitama | 0.364 | 0.420 | 0.55 | 36 | Tokushima | 0.433 | 0.537 | 0.80 |
| 12 | Chiba | 0.365 | 0.422 | 0.57 | 37 | Kagawa | 0.430 | 0.537 | 0.78 |
| 13 | Tokyo | 0.246 | 0.246 | 0.33 | 38 | Ehime | 0.380 | 0.479 | 0.72 |
| 14 | Kanagawa | 0.311 | 0.337 | 0.44 | 39 | Kochi | 0.389 | 0.479 | 0.76 |
| 15 | Niigata | 0.433 | 0.543 | 0.89 | 40 | Fukuoka | 0.384 | 0.463 | 0.65 |
| 16 | Toyama | 0.493 | 0.603 | 0.79 | 41 | Saga | 0.419 | 0.529 | 0.80 |
| 17 | Ishikawa | 0.464 | 0.565 | 0.83 | 42 | Nagasaki | 0.356 | 0.447 | 0.67 |
| 18 | Fukui | 0.475 | 0.583 | 0.78 | 43 | Kumamoto | 0.398 | 0.508 | 0.75 |

| | Prefecture | 2004 | 2009 | 2016 | | Prefecture | 2004 | 2009 | 2016 |
|---|---|---|---|---|---|---|---|---|---|
| 19 | Yamanashi | 0.475 | 0.587 | 0.89 | 44 | Oita | 0.416 | 0.528 | 0.77 |
| 20 | Nagano | 0.482 | 0.593 | 0.83 | 45 | Miyazaki | 0.428 | 0.539 | 0.83 |
| 21 | Gifu | 0.489 | 0.589 | 0.81 | 46 | Kagoshima | 0.393 | 0.506 | 0.80 |
| 22 | Shizuoka | 0.445 | 0.545 | 0.76 | 47 | Okinawa | 0.382 | 0.486 | 0.75 |
| 23 | Aichi | 0.436 | 0.517 | 0.69 | | | | | |
| 24 | Mie | 0.457 | 0.570 | 0.81 | | | | | |
| 25 | Shiga | 0.404 | 0.511 | 0.72 | | | | | |