連鎖速食店的競爭與決策：
以台灣實證結果為例

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摘　　要

　　速食連鎖業佔台灣餐飲市場總額已超過30%，也變成餐飲消費市場最具影響力之一類，過去已有文獻探討影響速食業獨特銷售主張的因素，像是描述在地方上的競爭力，也有研究提到特許經營是解決速食業總部和餐廳之間資訊不對稱最常見的方法，雖然競爭和特許經營的議題在台灣速食業非常重大，但是大部分的研究都著重在歐洲和美國地區；因此，本研究以探討速食業在台灣的獨特性來填補這個缺口，結果顯示速食店多集中在人口密集的區域而不是較多年輕人的地方，也指出當市場規模夠大或孩童比例高時，摩斯漢堡傾向於搬離麥當勞；而麥當勞往往開在人口較少的地區，但與分店提供的配套服務低度相關。

關鍵詞：區域策略、特許經營、速食業、競爭

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The Competition and Franchise Decision in Fast-Food Industry: Empirical Results in Taiwan

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Abstract

With shares over 30% in the restaurant market, the fast-food industry has recently become one of the most influential restaurant businesses of Taiwan. The literature has discussed factors that affect the USP (Unique Selling Point) of fast-food companies such as the state of how vigorous the local competition is, furthermore some studies mentioned that a franchise system is the most common solution to the problem of asymmetric information between headquarters and restaurants for the fast-food industry. Although the competition and franchising issues are significant in the Taiwanese fast-food industry, most empirical studies are focused on cases in Europe and America. This study fills that gap by exploring empirically the unique features of this industry in Taiwan. The results show that more fast-food outlets are concentrated in more crowded districts compared to those where the population of the area is mostly the younger society. The analysis also indicate that MOS Burger tends to move away from McDonald's when the market size is large or when proportion of children in the district is high. Finally, McDonald's in Taiwan tends to franchise the outlets in districts which are less populated, but have a low correlation with the auxiliary services provided by outlets.

Key words: Competition, Fast-food Industry, Franchising, Location Strategy

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I. Introduction

As there is a growing sector of the food industry in Taiwan, there are a number of pertinent issues that the fast-food industry is facing. Hu (2002) mentioned that compared to other restaurant industries, western fast-food firms can easily enter a market which is not limited by deeply ingrained local food culture. After the western fast-food industry came into the Taiwanese market in the mid-1980s, they significantly changed the traditional restaurant patterns of Taiwan, leading the industry into a new era. Marketing themselves as a symbol of youth and vitality, fast-food outlets sprang up all over Taiwan. Presently, there are thousands of outlets across every county.

As the domestic market gradually became diminished, fast-food firms started to switch from market expansion strategies to customer acquisition and retention strategies. As a restaurant business needs fame among consumers, the location of an outlet is one of the most important considerations for a fast-food firm. Moreover, since most of the desirable heavy-traffic areas are occupied by incumbent competitors, determining an outlet's final location is even more challenging. Therefore, it is an interesting and worthwhile research issue to understand the location strategies of the firms.

How do fast-food firms choose their outlet locations? Well, their strategies can be roughly divided into two different types: one strategy is based on considerations of local market situations such as demographic factors, consumer preferences, ease of transportation, etc. On the other hand there is also the competition with other fast-food firms. Distances between the competitor's outlets are also an important factor and are considered by many fast-food chains when deciding the location since the similarity of different fast-food firms would influence a customer's decision and affect revenues.

In addition, firms are not always able to locate their outlets at the most suitable districts. The literature mentioned that, to solve the problem of asymmetric information caused by geographic isolation, franchising systems are most commonly used by western fast-food firms. Franchising systems are popular with restaurants and retail businesses in Taiwan, including bubble-tea stands and convenience stores. As an important solution to solve principal-agent problems, it might be another interesting sector related to location strategy of fast-food industry in Taiwan.

From the interesting phenomenon mentioned above, this paper tries to formulate three research questions. According to the two different types of location strategies, two models to examine empirical data are used. This paper tries to find the factors affecting the

density of fast-food outlets, such as demographic factors and transportation convenience in the first model. In the second model, the distance to the nearest competitors' outlets is a proxy for competition. Finally, for the franchise problem, the third model tries to identify the factors affecting firm's franchise decision. Three models are introduced respectively in the following paragraphs.

The first part of this paper tries to find the factors affecting the location strategies of the fast-food industry in Taiwan. In addition to demographic factors, the customer's preferences, and ease of transportation mentioned above, Thomadsen (2007) mentioned that retail outlet locations in the fast-food industry depend on the market size. This part analyzes domestic fast-food outlets data to examine the outlet density in individual markets under the effects of important demographic factors and outlet characteristics.

Competition with other fast-food firms is another important factor affecting a fast-food firm's location strategy mentioned above. In Taiwan, the first leader of fast-food industry is McDonald's, and the second firm is MOS Burger (MOS). To make the analysis easier, this model, as Thomadsen did consider McDonald as a stronger firm and MOS as a weaker firm. There is another interesting phenomenon in Taiwan: you could easily find a MOS outlet beside a McDonald's most of the time. Since MOS entered the market later, most MOS outlets were created after the McDonald outlets. Therefore, this phenomenon can be seen as a location strategy of MOS. The second part of this paper tries to identify the factors affecting the distance between McDonald's and MOS Burger. Thomadsen suggested that the stronger firm would prefer to be located beside the weaker firm in a small market area. However, if the market is large enough, the stronger firm will be located away from the weaker firm and each firm will be allowed to dominate in its own area. In contrast, the weaker firm's profits always increase with greater differentiation. It would be interesting if there exists location strategies different from past literature, or unique reasons that can explain the special phenomenon.

However, it is hard for every fast-food firm to locate their outlets at the most desirable districts. Sometimes firms face restrictions, and have no choice but to be located at a place lack of desirable advantages. To solve the problems caused by external restrictions, franchising systems are the most commonly used solution for restaurant businesses. As a new business form, franchising is not only one of the best solutions to principal-agent problems caused by asymmetric information, but also a popular organizational decision for retail firms. In recent years, franchised businesses have become one of the most popular business structures in the world, and Taiwan is no exception.

In fact, franchise systems have been developed very well in Taiwan, as seen in bubble-tea stands, convenience stores, and a number of other food industries. The influence of franchise systems on the food industry is an important issue. The final part of this study tries to identify the factors affecting the franchise decisions in the fast-food industry. Franchising makes franchisors develop rapidly and easily, efficiently building brand name capital (Hunt, 1973; Hunt and Nevin, 1974; Norton, 1995; Oxenfeldt and Thompson, 1968; Hsu et al., 2010). As an industry requires high homogeneity in outlets, fast-food industry benefits from franchising by quickly setting up a uniformed management system.

However, the fast-food industry in Taiwan seems to be different from that in western countries. In Taiwan, most of the famous fast-food firms are foreign companies, including McDonald's, Kentucky Fried Chicken (K.F.C.), MOS Burger (MOS), and Burger King. Among the brands mentioned above, only McDonald's is determined to have outlets franchised in Taiwan. Therefore, only McDonald's data is used in our analysis. Besides, much of the existing empirical analysis has been done by using North American data (Maruyama and Yamashita, 2010); this paper tries to use Taiwanese data to assess the robustness of the empirical results in different geographic areas.

Most of our data are secondary, collected from official websites of McDonald's, K.F.C., MOS, Burger King, and Dan-Dan Burgers, including outlets information, auxiliary services provided, and business hours, etc. Also, some demographic data is collected from government's databases of Ministry of the Interior (M.O.I.), Ministry of Finance (M.O.F.), and Ministry of Transportation and Communications (M.O.T.C.). In addition, this paper used ArcGIS to identify the distance of every McDonald's outlet to its nearest MOS outlet and the area of every administration district. Finally, since the franchise information of McDonald's is unavailable from the website, related data are collected by telephone surveys. Among the responses of the questionnaires, there are also various research sources about McDonald's franchisees that can be used for further work.

By using these data, our regression results show that demographic factors affect significantly both outlets density and the distance to the nearest competitors. In the first model, the higher the population density and the more convenient for transportation of an administration district, the more fast-food outlets are located at that district. On the contrary, the higher the average age of a district, the less fast-food outlets are located there. As for the second model considering competition relationships, the population of a district has great positive influence on an outlet's distance to its nearest competitors.

Besides, the results also show that if the district is large in area, MOS tends to move away from McDonald's more. Another interesting result is found in this regression result, which is scarcely mentioned in the literature. In this model, it is shown that in a district with higher proportion of children, the distance between MOS and McDonald's outlets become greater. The reason might be stronger distinctiveness of the two fast-food firms towards children.

Finally, the last part of regression results show that the lower the population level, the higher the likelihood of a McDonald's outlet being franchised. However, among four chosen auxiliary service, only the drive-through service has a positive impact on the decision that a McDonald's outlet be franchised, which is consistent with the literature.

The rest of this article proceeds as follows. In Section 2, we provide a brief introduction on the fast-food industry and its history of development in Taiwan. In Section 3, relevant literature is introduced. Section 4 illustrates the data and descriptive statistics of the variables. Section 5 presents the three different models and the methodology. In Section 6, estimation results and analysis are reported. Finally, Section 7 concludes.

II. Fast-food Industry in Taiwan

The fast-food industry is a modern restaurant business originated from western countries, and its definition differs from thesis to thesis. Robbins and Hass (1981) suggested that fast-food restaurants are defined as eating places that use standard food preparations, services, equipment, management systems, and labor savings technologies in providing a limited food menu. As for the case in Taiwan, Lin (1986) suggested that fast-food restaurants should feature convenience, simplicity, economy and hygiene. Besides, the process of production, manufacture and sale are almost simultaneously completed. Customer satisfaction is the most prominent in this industry. Outlets are usually clean and tidy, and friendly services are also required. Also, compared to other restaurants, fast-food outlets tend to provide self-services rather than traditional table-services (Chen, 2011).

Different from the U.S.A. and most western countries, foreign fast-food industry had made a lot of change when they came into Taiwan. Most foreign firms adjusted their menu and meal size for the purpose of appealing to local consumers. For example, McDonald's once supplied rice burgers to fit Taiwanese eating habits. On the other hand, Americans usually eat much more than Asians, so western fast-food firms, such as McDonald's, K.F.C., and Burger King, reduced the size of meal to cut down the cost. Since the first western fast-food firm, McDonald's, entered the Taiwanese market in 1984; the Taiwanese fast-

food industry has changed out of all recognition. In fact, western fast-food industry developed very well in Taiwan. According to Lu (2009), the annual revenue of foreign fast-food industries was 28.4 billion NTD in 2008, accounting for a large proportion, 32.16%, of the whole restaurant business. The history and development of fast-food industry in Taiwan will be briefly introduced in the following paragraphs.

In the early 1980s, there are only few local fast-food restaurants in Taiwan because of the protection policy. However, the government lifted the restriction under the political pressure of the U.S.A. It was not until January 1984 did a western fast-food firm, McDonald's, set up its first outlet in Taipei. In the same year, other American fast-food firms, such as K.F.C. and Wendy's, set up their outlets in succession. After that, western fast-food firms became progressively more popular in Taiwan.

The second major entrance of western fast-food firms began in 1986. Hardee's, Church's, and Lotteria entered and made the market more competitive and diversified. In addition, another typical fast-food firm, pizza industry, entered in the late 1980s, including Pizza Hut and Dominos. Since then, western fast-food industry gradually matured with the rapid growth of the Taiwan local market.

In early 1990s, the first Japanese-style fast-food firm, MOS Burger, set up its first outlet in Taipei, beginning to develop its business in Taiwan. Simultaneously, the world-famous fast-food brand, Burger King, also opened its first Taiwanese outlet in 1990. Facing the almost saturated domestic fast-food market, many firms tried to change their strategies so as to adapt themselves to the much competitive environment. Due to stronger competition and more difficult environment at that time, most firms tended to differentiate their products to attract specific groups of consumers. Besides, some firms even adjusted their operating pattern to improve their competitiveness. For example, McDonald's withdrew the concession of its joint company, Kuan-ta Food Cooperation in 1994, managing all of the original outlets by head office in the United States. A few years later, McDonald's authorized the Taiwanese headquarter to franchise some of the outlets.

After 1994, some obsolete and traditional fast-food firms gradually exited the market, due to the competition from those strong international fast-food brands. McDonald's maintained the leading position and kept moderately developing. On the other hand, because of the successful differentiated strategies from McDonald's, MOS and K.F.C. defeated other competitors and claims the second and third highest market shares. Figure 1 illustrates the outlets variation of these leading firms from 1998 to 2010. It also shows that MOS performed relatively better than the other two firms in terms of an increase in

the number of outlets. In 2008, MOS even defeated K.F.C. and became the second leader in Taiwan. In contrast, late entrants like Burger King did not do well and shut down its Taichung outlet in 2013, completely exiting the fast-food market southern Taiwan. A local fast-food firm called "Dan-Dan Burgers" dominated the southern Taiwanese market instead. Dan-Dan combined western fast-food with Taiwan local-style food, such as a set with a burger and a bowl of oyster thin noodles. The localization strategy brought Dan-Dan great success in the southern Taiwanese fast-food market until now.
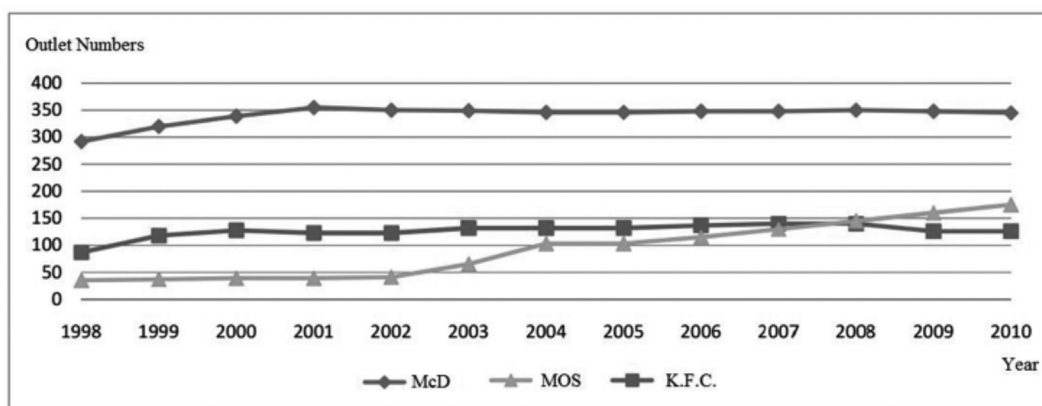
Sources: Lu (2009), Effects of Country of Origin Image and Exotic Food Image on Purchase Intention.

Figure 1　Outlets Variation from 1998 to 2010

Nowadays, the fast-food industry in Taiwan symbolizes fashion, trend, modernity, and youth. In the U.S.A., fast-food restaurants are usually considered lower-tier eating establishments. People in the U.S.A. often eat at fast-food outlets only when time is limited, or when they don't have the sufficient amount of money for high-class restaurants. According to different impressions from the U.S.A, this paper uses unique local data to examine whether empirical results are also different from those in the literature. Before showing empirical results using Taiwan data, some past literature will be introduced in the next part.

III. Literature Review

There is a number of literature concerning the competition and franchise decision in the fast-food industry. Among numerous issues mentioned above, this paper classifies

these concerns into three topics. The first topic is "demographic factors." Much literature found that there are demographic factors affecting the outlet density in a given market area. The second topic is "distance to nearest competitor," Under which some papers focus on relationships between location strategy and competition. The final topic is "franchising." This part introduces some papers discussing the use of franchise systems to solve principal-agent problems.

The literature of three different topics will be introduced in sequence below.

1. Demographic factors

According to Rydell et al. (2008), there are several studies which have examined the demographic characteristics of those who eat at fast-food restaurants. People's preferences of fast-food have a great effect on the firms' decision of whether or not to set up an outlet in the specific area. This paper tries to use these demographic factors to explain the different outlet densities in each administration district.

Results from these studies indicate that those who are younger are more likely to consume fast-food. Paeratakul et al. (2003) showed that fast-food consumption is varied with demographic factors and are higher among children, adolescents and young adults. Blanck, et al. (2009) indicated that younger adults relied more on fast-food districts: since younger people seem to consume fast-food much more, firms should set up outlets in a district where the population of children and adolescents are greater.

Besides, some studies have also shown that men are more likely to consume fast-food. Paeratakul et al. (2003) mentioned that men are reported to have more frequent consumption of fast food than women. Also, in a survey aiming towards students in Minnesota, United States, a greater proportion of females students (27%) than males (22.8%) reported never visiting a fast-food restaurant during the past week (French et al. 2001).

2. Distance to the nearest competitor

The theoretical literature mostly focuses on whether firms should minimally or maximally differentiate their products (Thomadsen, 2007). Distance to another outlet is one of the most critical factors that can identify the difference of the firms' products. Empirically, Chan et al. (2007) used a minimum distance method to estimate the location model with a primary data of a gasoline market in Singapore. In addition, there are a diverse amount of empirical papers discussing the distance of different outlets (Netz

and Taylor, 2002; Smith, 2006; Eckert, 2013). Most of them include gasoline stations and supermarkets for empirical data sets, but there are few who use fast-food outlets as examples.

D'Aspremont et al. (1979) had shown that in order to soften price competition, identical firms tend to maximize their differentiation based on a Hotelling model. Seim (2006) indicated that there is a trade-off between getting close to large demand and differentiation from other competitors geographically.

However, some improved models mentioned different results about the firms' geographic competition relationship. Anderson et al. (1992) proposed an exception that firms will locate together at the center of Hotelling line if their consumers have heterogeneous preferences. Irmen and Thisse (1998) used Lancasterian models of product differentiation to show that standard results on prices and locations no longer hold when firms compete in a multi-characteristics space.

3. Franchising

The most common explanation for franchising is the agency theory (Brickley and Dark, 1987; Lafontaine, 1992). According to the theory, managers (the agents) paying a fixed salary tend to shirk and make the firm (the principal) incur monitoring costs to avoid the inefficiency of company-owned outlets. To solve the principal-agent problem, firms use franchise contracts to let franchisees share the profits and risks. Since the franchised outlets are compensated by residual claims from their outlets and put their own capital at risk, they are usually more motivated to run effective operations to maximize their profits (Shane, 1998).

Therefore, franchisors tend to franchise outlets with characteristics that increase the monitoring costs. One of the important characteristics is physical dispersion of operations. Norton (1988) suggested that franchising should be more common with physically dispersed operations, as in rural areas, since it costs more to monitor those outlets located far from the city. Lafontaine (1992), Scott (1995), and Maruyama and Yamashita (2010) also attempted to use some notions of geographic dispersion of outlets due to the difficulties in monitoring franchisee efforts. Accordingly, it is expected that the more physically dispersed an outlet is, the more likely it is to be franchised.

Another factor that may affect agency costs is the franchisee's effort. Shepard (1993) mentioned that the agent's effort may not be the subject to direct control because it is unobservable. If an unobservable effort is important to a specific auxiliary service,

managers of outlets providing these services have greater incentive to shirk. Therefore, it is assumed that the more specific auxiliary services (which need more unobservable effort) an outlet provides, the more likely it is to be franchised (Affuso, 2002).

The literature mentioned above mostly used American data for their empirical results. One of the purposes of this paper is trying to use Taiwan fast-food industry data to test if the theory and results are robust domestically. In the next part, the data from fast-food industry and government statistical information in Taiwan are reported.

IV. Data and Variables

The data of every individual outlet are collected from the Taiwan official websites of McDonalds, MOS, K.F.C., and Burger King. Also, since all of the Burger King's outlets are located in northern Taiwan, this paper used another local fast-food brand located at southern Taiwan to balance the effect, which is called "Dan-Dan Burgers." Information on outlet locations, business hours, access to wireless internet, delivery, playground and drive-through are reported for each outlet. For McDonald's, the information of whether an outlet is franchised or company-owned is also reported. The outlets distribution in Table 1 shows that, McDonald's is the leader of fast-food industry in Taiwan with totally 405 outlets. MOS, a Japanese firm, keeps its step with McDonalds with 234 outlets. Surprisingly, the world-famous American fast-food brand: Burger King, only has 25 outlets in Taiwan, and most of them are located in Taipei. It is also an interesting issue to find the reason why an international fast-food dominator cannot develop successfully in Taiwan.

As for controlling the physically dispersed operation related factors, this paper uses demographic data to identify rural and urban areas in Taiwan. The total population and the percentage of men of every district are collected from the Department of Household Registration, M.O.I. Also, this paper uses the average age and the percentage of child, adult and elderly in order to control the effects of age distribution.

Besides, this paper uses the average annual total net income of every administration district to represent the income. The data is collected from the Taxation Administration, M.O.F.

In addition, since not only local residents have great impacts on the firm's organizational decision, but also tourists are an important factor. Therefore, the attractions dummy is added into our data in order to control impact by tourists. The data are collected from the Tourism Bureau, M.O.T.C.

Table 1　Outlets Distribution in Taiwan (July 2014)

County	McD	MOS	KFC	BK	DD	Total
Taipei	77	95	20	18	0	211
Hsinpei	65	39	23	2	0	129
Keelung	4	1	2	1	0	8
Taoyuan	39	15	15	3	0	72
Hsinchu County	5	4	2	0	0	11
Hsinchu City	13	7	4	1	0	25
Miaoli	8	1	2	0	0	11
Taichung	57	27	17	0	0	101
Changhua	15	3	5	0	0	23
Yunlin	5	3	2	0	0	10
Nantou	5	2	2	0	0	9
Chiayi County	3	1	0	0	0	4
Chiayi City	7	3	3	0	0	13
Tainan	29	9	8	0	14	60
Kaohsiung	50	16	15	0	27	108
Pingtung	11	2	2	0	3	18
Yilan	5	3	3	0	0	11
Hualien	4	1	1	0	0	6
Taitung	2	0	1	0	0	3
Penghu	1	1	0	0	0	2
Kinmen	0	1	0	0	0	1
Total	405	234	127	25	44	836

Sources: Official websites of each fast-food company.

In order to measure the geographic differentiation between McDonald's and MOS Burger, this paper uses ArcGIS to identify the distance of every McDonald's outlet to its nearest MOS outlet; the area of every administration district is reported by ArcGIS.

The data of these demographic factors are reported in December, 2013.

Apart from the data available from the Internet, this paper also uses the method of telephone survey to acquire specific information about McDonald's outlets. (See Questionnaire 1 in the Appendix). According to the questionnaire results, it is possible to distinguish between franchised outlets and company-owned outlets. In addition, the

results show that most outlets owned by the same franchisee are close to each other geographically. Besides, most franchisees were engaged in finance, electronics and information industries before they joined McDonald's franchising system. There are many reasons why they decided to become McDonald's franchisees. Most common reasons mentioned by franchisees are good corporate image, matured and sound franchising system, and powerful support from the headquarters. As for the location of outlets, some franchisees said that their outlets originally had been company-owned. Most of the information will not be used in the regression analysis, but it is still an important material for topics about franchisees' tendency of being involved in franchising.

In the next part, the dependent variables in three different models along with some specific independent variables and control variables are presented.

1. Demographic factors

In order to identify factors affecting the decision of set-ups of fast-food outlets', this paper classifies different markets by administration districts. The dependent variable is the number of outlets in every district. Table 2 shows the descriptive statistics of all 367 administration districts in Taiwan. **Total** is used as the dependent variable, which is the number of total fast-food outlets in each different district.

2. Distance to the nearest competitor

This model uses **MOS_Dist** as the dependent variable, which is the distance to the nearest MOS outlet from a McDonald's outlet. There are two reasons that the distance to nearest McDonald's outlet from a MOS outlet is not used as a dependent variable. First, McDonald's is an incumbent firm, while MOS entered Taiwan around 15 years later. Observing McDonald's outlets rather than MOS is better because it explains the entry strategy of MOS. Secondly, since the count of McDonald's outlets are greater than MOS outlets, the set of distances from MOS to the nearest McDonald's is a subset of the set of distances from McDonald's to nearest MOS. Observing MOS outlets would lead to omission of some McDonald's outlets, which would underestimate the competitor's strength.

To identify the market size, this model uses **Area_km2** as an independent variable, which is area of the administration districts in location of the McDonald's outlets, measured by ArcGIS. Some McDonald's outlets and their nearest MOS outlets might be

Table 2　Demographic Variable Definitions and Descriptive Statistics

Variable Definition		Mean	Standard Deviation	Maximum
Total	Outlets numbers of each administration district	2.27248	4.82218	31
Population	Total population of each administration district (thousands people)	63.67569	81.5345	556.92
Density	Population density (population divided by area) of each administration district	.2687849	.5532762	3.715546
Pct_Men	Men Percentage of the total population	51.61038	1.97269	58.924
Avg_Age	Average age of each administration district	40.62047	2.839645	47.92621
Pct_Child	Children Percentage of the total population	13.72404	3.157061	31.59749
Pct_Elder	Elderly Percentage of the total population	13.47191	4.63419	30.63203
Edu_Year[1]	Average completed years of schooling of the people of each administration district	10.78525	1.301783	13.61474
Income	Annual total net consolidated income of each administration district (thousands NTD)	13558.12	23925.24	189758.3
Avg_Income	Income divided by total population (NTD/person)	722.1853	170.7973	1775
Attractions	Tour attractions at each administration district	3.918256	6.325322	73
TRA_rank[2]	Taiwan railway stations at each administration district, ranked by six level	1.656676	2.836502	16
HRS_rank[3]	Taiwan high speed rail stations at each administration district, ranked by six level	.119891	.8076222	6
Airport_rank[4]	Airport at each district, ranked by six level	1498638	.7731094	6

Sources: Department of Household Registration, M.O.I., Taxation Administration, M.O.F., Tourism Bureau, M.O.T.C., Taiwan Railways Administration, Taiwan High Speed Rail, Civil Aeronautics Administration, M.O.T.C.

1 Education year counting: Uneducated and self-study people are 0 year; elementary school graduated people are 6 years; junior high school graduated people are 9 year; junior vocational school graduated people are 11 years; high school or high vocational school graduated people are 12 years; junior college (five/two-year program) graduated people are 14 years; three-year program graduated people are 15 years; technology institute, college, independent college graduated people are 16 years; M.A. graduated people are 18 years; Ph.D. graduated people are 22 years.

2 Taiwan Railway station are ranked by 6 class: the special class stations are weighted by 6; the first class stations are weighted by 5; the second class stations are weighted by 4; the third class stations are weighted by 3; the simple stations are weighted by 2; and the staffless stations are weighted by 1.

3 Taiwan High Speed Rail stations are ranked by 2 class: Taipei, Banqiao, Taichung, Zuoying are ranked as the special class stations of TRA, and weighted by 6; Taoyuan, Hsinchu, Chiayi, Tainan are ranked as the first class stations are weighted of TRA, and weighted by 5.

4 Airport are ranked by 5 class: the special class airport, Taoyuan International Airport, is weighted by 6; the first class airports, Taipei and Kaohsiung International airports, are weighted by 5; the second class airports are weighted by 4; the third class airports are weighted by 3; the fourth class airports are weighted by 2.

located at different districts. To control this effect, the **Diff_Dis** dummy is added in, which is equal to 1 if the McDonald's outlet and its nearest MOS outlet are located in different districts. However, there may be two situations: one is that the two outlets are located at the border of districts, which means that although the two outlets are located in different district, they are actually close to each other geographically. In this situation, the **Area_km2** dummy can still explain the local market size well. The other situation is that the distance between the two outlets located in different districts is large. In this situation, the McDonald's outlet is a local monopolist at least in this market. The influence power of MOS to this McDonald's outlet is relatively low. Therefore, to identify the influence of different degrees of distance, the **Dis_kn** dummies are also added, where **n** is between 2 to 5.

Table 3 shows the descriptive statistics of all 405 McDonald's outlets' distance-related variables used in the second model.

3. Franchising

In this part, the primary objective is to identify what factors affect the firm's franchising decision. Thus, this paper classifies McDonald's outlets into two categories: franchised outlets and company-owned outlets. The dependent variable is a dummy, which equals to 1 if the outlet is franchised, and equals to 0 if it is owned by McDonald's.

Some demographic variables are considered a proxy for physical dispersion. Similar to Norton (1988), Lafontaine (1992), Scott (1995), and Maruyama and Yamashita (2010), **Population** can be used to define urban areas and rural areas in Taiwan. The descriptive statistics of demographic factors are reported in Table 2.

To classify auxiliary services, this paper tries to define what services need more unobservable efforts. An outlet providing greater varieties of services is more likely to be franchised. Based on Shepard (1993), this paper classifies **24HRs** and **WIFI** into observable services, and **Drivethru** and **Playground** into unobservable services. It is easy for McDonald's headquarter to examine whether an outlet is running for 24 hours, or provides wireless internet services. However, such services provided by staffs like drive-through and playground management are hard to supervise, making them unobservable

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5 The HHI is measured by: $\sum \left(\dfrac{\text{SubOutlet}_i}{\text{SubTotal}} \right)^2$, while SubOutlet$_i$ is outlets number of firm i in each administration district, and is the total outlets number in each administration district.

Table 3　Distance-related Variable Definitions and Descriptive Statistics

Variable Definition		Mean	Standard Deviation	Maximum
MOS_Dist	The distance to the nearest MOS outlet from a McDonald's outlet (kilometers).	2.559227	7.668527	82.07724
Area_km2	The area of each administration district (km^2)	39.55716	32.83766	258.6556
HHI[5]	Herfindahl-Hirschman Index of each district	.4747382	.2030043	1.0000
Diff_Dis	A dummy variable which equals to 1 if the McDonald's outlet and its nearest MOS outlet are located at different administration district.	.291358	.4549501	1
Dist_k5	A dummy variable which equals to 1 if the distance to nearest MOS outlet from a McDonald's outlet is greater than 5,000 meters.	.1135802	.3176932	1
Dist_k4	The same as above, while distance is greater than 4,000	.1407407	.348184	1
Dist_k3	The same as above, while distance is greater than 3,000	.1802469	.3848684	1
Dist_k2	The same as above, while distance is greater than 2,000	.2419753	.4288091	1

Sources: MOS_Dist, Area_km2, and Dist_kn variables are measured by ArcGIS.

services. Table 4 shows the descriptive statistics of all 405 McDonald's outlets' franchising variables used in the second model.

After describing the variables, the empirical models are presented in the next part.

V. Model

In order to estimate the three different dependent variables, **Total**, **MOS_Dist**, **Ownership**, three different models are used to estimate them respectively. For the "demographic factors" model, *zero-inflated Poisson* regression is used to estimate the total amount of outlets in a specific district. For the "distance to nearest competitor" model, the

Table 4   Franchising Variable Definitions and Descriptive Statistics

	Variable Definition	Mean	Standard Deviation	Maximum
Ownership	A dummy variable which equals to 1 if the outlet is franchised, and equals to 0 if company-owned.	.1333333	.3403551	1
24Hrs	A dummy variable which equals to 1 if the outlet provides 24-hours service.	.5901235	.492419	1
WIFI	A dummy variable which equals to 1 if the outlet provides wireless internet service.	.9037037	.295362	1
Drivethru	A dummy variable which equals to 1 if the outlet provides drive-through service.	.3432099	.4753681	1
Playground	A dummy variable which equals to 1 if the outlet provides a children playground.	.6444444	.4792734	1

Sources: Ownership variable are collected from questionnaire of telephone survey. Auxiliary
services variables are collected from official websites of each fast-food company.

robust OLS model is used to estimate the distance from a McDonald's outlet to its nearest
MOS outlet. Finally, for the "franchising" model, *probit* model is used to estimate the
ownership of a McDonald's outlet, since the dependent variable is a dummy of 1 and 0.

1. Demographic factors

The dependent variable of the first part in this paper is the number of outlets in each
administration district. However, since the count data of outlets in each district includes
excess zeros, *zero-inflated Poisson* (ZIP) regression is used, for handling zero-inflated
count data (Lafontaine, 1992). Table 5 shows the distribution of fast-food outlets numbers.

The zero-inflated Poisson (ZIP) assumes that the events,

$Y = (Y_1, Y_2, \ldots, Y_n)$ are independent and

$Y_i = 0$ with probability

$Y_i = y$ with probability $\dfrac{(1-p_i)\exp(-\lambda_i)\lambda_i^y}{y!}$, y=1,2, ... ,

where y is the natural number of fast-food outlets in every administration district.
Maximum Likelihood Estimation (MLE) is used to estimate the coefficients of zero-
inflated Poisson (ZIP) regression model.

To test the fitness of using the zero-inflated Poisson model rather than the basic
Poisson model, this paper uses Vuong's statistics for the model (Vuong, 1989). Vuong's
statistics is determined by computing,

Table 5　Total outlets of each administration district frequency

Total	Count	Percentage
0	213	58.04%
1	46	12.53%
2	23	6.27%
3	14	3.81%
4	18	4.90%
5	10	2.72%
6	3	0.82%
7	5	1.36%
8	4	1.09%
9	4	1.09%
10	4	1.09%
11	3	0.82%
12	2	0.54%
13	2	0.54%
14	1	0.27%
15	1	0.27%
17	1	0.27%
19	4	1.09%
20up	9	2.45%
Total	367	100.00%

$$m_i = \left(\frac{f_1(y_i \mid x_i)}{f_2(y_i \mid x_i)} \right),$$

where $f_1(y_i \mid X_i)$ is the probability density function of the zero-inflated model and $f_2(y_i \mid X_i)$ is the probability density function of the Poisson distribution. Vuong's statistics for testing the zero-inflated model is opposed by the traditional model is (Lee and Mannering, 2002),

$$V = \frac{\sqrt{n}\left[\frac{1}{n}\sum_{i=1}^{n} m_i \right]}{\sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(m_i - \overline{m} \right)^2}} = \frac{\sqrt{n}\,\overline{m}}{S_m},$$

where $\bar{m}$ is the mean, S_m is the standard deviation, and   is a sample size. Vuong's value is asymptotically standard normally distributed. The zero-inflated model is favored if the V value is greater than 1.96 (the 95% confidence level for t-test) (Greene, 2011).

In this model, **Population** is the independent variable to explain the inflated-zero count data, since most of districts without fast-food outlets are rural or remote areas.

Therefore, rewriting the estimated model as below:

Total = $(Total_1, Total_2, \dots , Total_{367})$ are independent and

$Total_i = 0$ with probability $p_i+(1-p_i)\exp(-\lambda_i)$

$Total_i = y$ with probability $\dfrac{(1-p_i)\exp(-\lambda_i)\lambda_i^y}{y!}$, y=1,2, ... ,

The parameters λ and p satisfy

$\log(\lambda)=\alpha_1+\beta_i X_i+\varepsilon_1$

$$\text{logit}(p)=\log(\frac{p}{1-p})=\alpha_2+\gamma_i Population_i+\varepsilon_2 \dots\dots\dots (1)$$

2. Distance to the nearest competitor

The dependent variable of this model is **MOS_Dist**, which is the distance to the nearest MOS outlet from a McDonald's outlet. This paper uses a simple reduced form robust OLS regression to estimate:

$$MOS\_Dist_i=\alpha+\beta_j X_j+\gamma_i Diff\_Dis_i+\delta_i Dis\_Kn_i+\varepsilon_i \dots\dots\dots (2)$$

Where α is an intercept, X_j is the vector of jth district's demographic variable. $Diff\_Dis_i$ is the dummy of whether the jth outlet is located at the different district with its nearest MOS outlet. Dis_kn_i is the dummy whether the distance of the ith outlet between its nearest MOS outlet is greater than n kilometers, where n = 2,3,4,5

3. Franchising

As in Lafontaine (1992) and Maruyama and Yamashita (2010), this paper uses a Probit estimator in the regression since there is only one firm to be researched, and the dependent variable is a dummy which equals to 1 or 0. This paper tries to make a similar empirical analysis with Lafontaine (1992), Scott (1995), and Maruyama and Yamashita (2010), using Taiwanese data. The estimated model is:

$$Ownership_i=\alpha+\beta_j X_j+\gamma_{ki} Z_{ki}+\varepsilon_i \dots\dots\dots (3)$$

Where Ownership$_i$ is the ownership structure of outlet i, α is an intercept, X$_j$ is the vector of the jth district's demographic variable. Z$_{ki}$ is the vector of the kth auxiliary service dummy variable which is provided by outlet i. β_j and γ_{ki} are the vectors of parameters of corresponding independent variables.

The results of all the models mentioned above are reported in the next part, while some of them might not be consistent with the literature. This paper will also briefly analyze the results and conclude in the final part.

VI. Results

Briefly speaking, the "demographic factors" model is consistent with the past studies mentioned in the literature review. Only **Pct_Men** shows a different sign compared to the literature. As for the "distance to the nearest competitor" model, this paper finds an interesting result about the percentage of children, which is less mentioned by past literature. Finally, in the "franchising" model, service variables are not significant enough to explain the ownership of outlets.

1. Demographic factors

Results obtained under zero-inflated Poisson regression are given in Table 6. The Vuong statistic (4.57) indicates that zero-inflated model is quite suited. The significantly positive coefficient of **Density** variable indicates that fast-food outlets tend to be set up in densely populated areas. Also, the signs of the coefficient of **TRA_rank** and **HRS_rank** are positive and significant, which shows that transportation hubs have great effects on the entry decision of fast-food firms. The **Pct_Men** variable is significantly negative, which means an area with higher male population has relatively less fast-food outlets. This result is quite different from that of the literature. It might because of different preferences of people in Taiwan and the US. The **Avg_Age** variable is significant, showing a negative sign. It indicates that if the area is averagely younger, there would be more fast-food outlets. The result is consistent with the literature, showing that fast-food is more popular with children and youths.

In addition, the **Edu_year** variable is significantly negative. Since the model has controlled the age and income factor, this variable can be considered the independent effect of educational level. The negative sign means that if people of specific district have had little schooling, there are more fast-food outlets in that district. **Avg_Income** and

Attractions are control variables, making other independent variables explained better.

The **Population** in the inflation logit model is significantly negative, meaning that the population can explain the inflated zero observations well. In addition, the negative sign means that in those sparsely populated district, there are more likely no fast-food outlets.

Table 6   Zero-Inflated Poisson Estimation Results of Demographic Factors

Variable	Dependent Variable	
	Total	Inflate
Density	0.2223***	
	(0.0521)	
Pct_Men	-0.5987***	
	(0.0503)	
Avg_Age	-0.1577***	
	(0.0229)	
Edu_year	-0.2449***	
	(0.0604)	
Avg_Income	0.8215***	
	(0.2028)	
Attractions	-0.0034	
	(0.0036)	
TRA_rank	0.0578***	
	(0.0126)	
HRS_rank	0.0369**	
	(0.0255)	
Airport_rank	-0.0262	
	(0.0371)	
Population		-0.1258***
		(0.0262)
Constant	39.2054***	4.0873***
	(3.1623)	(0.7986)
Log-likelihood at convergence	-412.7992	
Number of observations	367	
Vuong statistic	4.75	

Significance levels: ***=0.01, **=0.05, *=0.12. Distance to nearest competitors

2. Distance to nearest competitors

The Results of the robust OLS estimation are shown in Table 7. By using **Diff_Dis** and **Dis_kn** dummies to control the effect of those outlets far from their competitors, the coefficient of the market size variable **Area_km2** is significantly positive. The result is consistent with several studies, for example, Thomadsen (2007) and Chan et al. (2007), proving that if the market is geographically large enough, MOS would prefer to keep away from McDonald's to avoid competition. Also, locating at two opposite sides would create an environment similar to local monopoly, allowing both firms to gain higher profits.

The **Dis_kn** variable is used to control the fixed effects of competitors which are far from McDonald's outlets. As the controlled distance becomes greater, the coefficient becomes greater. This means that when higher distance is controlled, the explanatory power of the **Dis_kn** variable becomes greater.

The **HHI** variable shows a positive sign but is less significant if the controlled distance is too long. HHI is considered an index measuring the degree of market concentration and competition. As a weaker firm, MOS tends to move further away from McDonald's in the district with high HHI.

Finally, by controlling the educational variable, the **Pct_Child** and **Pct_Elder** variable can better explain the effect of age factor. The **Pct_Child** variable shows a significantly positive sign regardless of the controlled distance, meaning that in those districts with more children, MOS tend to keep away from McDonald's.

Table 8 shows the results of the probit estimation of the franchising model. The coefficient of the demographic variable, such as **Population**, is significantly negative, which means that if the location of an outlet is sparsely populated, it costs much more for firms to monitor the agents, making the outlet more likely to be franchised.

As for the service dummies, the coefficients on the auxiliary service variables needs more unobservable effort to be significantly positive, which means that the more auxiliary services an outlet provides, the more likely it is to be franchised. On the other hand, those coefficients on other services that need more observable efforts should be negative.

However, according to the results, both variables are not significant. In fact, since over 90 percent (90.37%) of McDonald's outlets provide wireless internet services, it may be the reason that the **WIFI** variable cannot be a good proxy for observable service.

The **Drivethru** variable is significantly positive, which is consistent with the past literature. The positive sign means that if an outlet provides drive-through service, it is

Table 7   Robust OLS Estimation Results of Distance to Nearest Competitor

Variable	MOS_Dist				
	(1)	(2)	(3)	(4)	(5)
Area_km2	0.0696***	0.0631***	0.0620***	0.0590**	0.0511**
	(0.0257)	(0.0252)	(0.0246)	(0.0235)	(0.0222)
Diff_Dis	2.9067***	1.7509***	1.3364**	0.9518*	0.9781*
	(0.6921)	(0.6473)	(0.5866)	(0.5185)	(0.5199)
Dist_k2		3.8715***			
		(0.5012)			
Dist_k3			5.9749***		
			(0.8827)		
Dist_k4				8.7361***	
				(1.3933)	
Dist_k5					10.1846***
					(1.7247)
HHI	7.2807**	6.2535**	5.5843*	5.3436*	4.2212
	(3.490)	(3.4311)	(3.3731)	(3.2094)	(3.1518)
Pct_Men	-1.5167	-1.6896**	-1.9982**	-2.1951**	-1.8097**
	(0.9438)	(0.9406)	(0.9598)	(0.9633)	(0.9094)
Pct_Child	0.4631***	0.4261***	0.3844***	0.3134**	0.2426**
	(0.1506)	(0.1494)	(0.1423)	(0.1245)	(0.1104)
Pct_Elder	0.3899***	0.3924***	0.2922**	0.1315	-0.0092
	(0.1348)	(0.1304)	(0.1296)	(0.1258)	(0.1278)
Edu_Year	-2.9457**	-2.7064*	-2.6026*	-2.6639*	-2.5064*
	(1.6218)	(1.6098)	(1.5681)	(1.4944)	(1.4667)
Income	-0.00004**	-0.00004**	-0.00005***	-0.00005***	-0.00004**
	(0.00002)	(0.00002)	(0.00001)	(0.00001)	(0.00002)
Population	0.0084**	0.00975**	0.0115***	0.0108***	0.0065*
	(0.00403)	(0.0039)	(0.0041)	(0.0040)	(0.0035)
Attractions	-0.0312*	-0.0231	-0.0134	-0.0031	0.0009
	(0.0178)	(0.0171)	(0.0171)	(0.0172)	(0.0172)
Constant	94.9112	100.9050	116.8463*	130.2110**	113.0011*
	(62.6765)	(62.4531)	(62.9633)	(62.5741)	(60.0435)
Observation	405	405	405	405	405
R-square	0.3508	0.3765	0.3891	0.4236	0.4334

Significance levels: ***=0.01, **=0.05, *=0.13. Franchising

likely that it would be franchised. Moreover, the marginal effect shows that if an outlet provides drive-through service, the possibility of this outlet to be franchised increases about 6 percent.

Table 8　Probit Estimation Results of Franchising

Variable	Ownership	
	Coefficients	Marginal Effects
Population	-0.0025***	-0.0004***
	(0.001)	(0.0001)
24Hrs	-0.2616	-0.0412
	(0.1993)	(0.0331)
WIFI	-0.1066	-0.0172
	(0.3253)	(0.0556)
Drivethru	0.4109***	0.0687***
	(0.2070)	(0.0379)
Playground	-0.3748**	-0.0617**
	(0.2191)	(0.0384)
Pct_Men	0.3088***	0.0471***
	(0.1055)	(0.0166)
Attractions	-0.0141	-0.0021
	(0.0131)	(0.0019)
Log-likelihood at convergence	-124.82228	
Model χ^2	68.42***	
Pseudo R-square	0.2151	

Significance levels: ***=0.01, **=0.05, *=0.1

The final part will conclude and give some extensions and suggestions that can improve this research.

VII. Conclusions and Extensions

Taiwanese chain fast food industries have long been considered as a type of important growing food outlets and trendy symbolization. However, rare research has been done on the outlet choices as well as the franchise decision due to the data limitations. This

research, thus, investigates the outlet choices as well as the franchise decision of chain fast food restaurants by utilizing our hand collected dataset composed of first-hand survey data and published secondary data. Our result contributes to the current understanding by showing that both locations and distances to the major competitors would be the concern for branding players in the market. Players like MOS would choose to follow its major competitor, McDonald's to show MOS' brand by having its outlets close to McDonald's store while MOS would keep away from McDonald to stay profitable with a sustainable market zone in a larger size of market. Our innovation revealed in the research results also shed light on franchising decision maintained by major chain fast food players. The concern on asymmetric information would force the major brand to forgo the direct control over the outlets by franchising to the local store owners. The local store owners would have a better local attachment that facilitates the services hard to be monitored by headquarters (i.e. Drive-through order). The headquarters would maintain a balance between customized service supply and cost concerns. Those results would improve our understanding of chain fast food industry by aligning the western country facts with the Taiwanese industry features.

This paper, in methodology, utilizes the regression analyses that requires heavily on the data access. Our data features the cross-sectional pattern that assumes the demographic and service variables are unchangeable in the short-term. However, by using this method, this paper ignores the fixed effect of different firm's properties, which might cause biased results. Panel data can deal with the fixed-effect problems easily and efficiently. On the other hand, for more comprehensive research on the fast food industry, it is suggested to obtain details of sales and brand values for each outlet. Finally, the reduced-form regression analyses might cause possible causality issues and thus a structural model is needed to overcome these issues.

Appendix: Questionnaire 1

Questionnaire of McDonald's Outlet Franchising Information

Background Information

Outlet's Name:_____

Interview Time:

_____

Successful Interview: ☐First-time　☐Second-time　☐Over Third-time

Introductory Remarks

Hello! This is the Department of Economics of National ChengChi University. Would you mind if we ask you some questions for academic purposes? Could you put me through the manager if he is available now? Thank you.

(If the manager is not available)

When is the manager on duty?

_____

1. Is your outlet franchised or owned by company?

    (Franchised→2. Company-owned→8.)

    ☐Franchised　☐Company-owned

2. Do you own other McDonald's franchised outlets? (Yes→3. No→5.)

    ☐Yes, _____outlets.　　　☐No

3. Can you tell us the names of other outlets?

_____

4. Do you decide on different strategies for each of your franchised outlet?

_____

5. What kind of job have you had before you joined the McDonald's?

    ☐Public Employees ☐Finance ☐Business ☐Construction ☐Electronics ☐Services

    ☐Information ☐Manufacturing ☐Communications ☐Transportations

    ☐Agriculture and Animal Husbandry ☐Freelance ☐Homekeeper

    ☐Human Health and Social Work Services

    ☐Student ☐Retired ☐Unemployed ☐Others_____

6. Can you briefly describe your motivation of joining McDonald's?

_____

7. How did you acquire the outlets you owned now?

□Self-owned □Rent □Distributed by company

8. Are there any features of your outlets different from other franchisees?

_____

 ---------------------------------End of the franchised section----------------------------------

9. How many outlets have you managed totally?

(Over two outlets→10.)

_____outlets.

10. Can you tell us the names of other outlets?

_____

11. How did the headquarter arrange your transferring between different outlets?

_____

12. Compared to the franchisees, are there any restrictions for company-owned outlets management?

_____

 -------------------------------End of the company-owned section-------------------------------

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