Keio Business School

A Green Tea Wholesaler in Makinohara

Questions

1. Read Section 1 of the main text, and summarize the characteristics and current situation of Shizuoka's green tea industry in comparison with those in other areas known for green tea production, searching for the information available on the appropriate websites.

2. Read Section 2 of the main text, choose one issue that you think is most important in the green tea industry of Shizuoka (especially Makinohara) and suggest your solution to the issue, commenting on the management issues of Kawamura Suikoen.

3. Find examples in other industries to which Proposition 1 stated in Section 3 of the main text can be applied. There are several assumptions placed on the mathematical model to derive the proposition. Think intuitively (without using mathematical symbols) whether similar propositions can be obtained when those assumptions are relaxed according to the examples you found.

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The aim of this case

This case provides an overview of the current situation of Shizuoka's green tea industry, studying the management issues of a typical wholesaler in Makinohara. Shizuoka Prefecture still keeps the top share of green tea production but already lost the price leadership, while in this decade it has been faced with the rapid growth of Kagoshima Prefecture which has the second largest share. As was seen in semiconductor-related industries (especially, semiconductor memory), there were some industries in which Japanese companies were completely deprived of their shares by foreign companies, although they had once had overwhelming shares. The goal of this case is to consider the management issues of a green tea wholesaler under the present circumstances surrounding Shizuoka's green tea industry and to help readers find some hints for management decisions of companies including those in other industries in a similar situation. For the study materials on other prefectures known for green tea production and Japanese semiconductor-related companies, please refer to other cases (coming soon).

1 Introduction

Makinohara is, needless to say in Japan, famous for its green tea production, and cultivation of tea leaves in this area dates back to the early Meiji period (1868-1912). After lying unused due to unsuitability for rice farming, the Makinohara Plateau was cleared of by former "samurai" who lost their workplace and returned to farming, and it eventually became the foremost tea-producing region in Japan. Kawamura Suikouen is a wholesaler of green tea located in Makinohara City in Shizuoka Prefecture which was founded in 1912, the first year of Taisho period (1912-1926). In 2014, Naoya Kawamura inherited the family business passed, and then in his 30s he became the 4th president of the company. An overview of Kawamura Suikouen may be found at the following URL of the website (in English), which was renewed in November 2018.

https://en.suikouen.co.jp

This section surveys the current circumstances surrounding the green tea industry in Shizuoka by studying managerial issues Kawamura Suikouen are faced with. This study deals with price leadership, product differentiation, the logistical process from farms to retail outlets via wholesalers, the role of the mediators, and collaborative relationships among firms within the industry. We confine our attention to the most popular Japanese tea, Sencha; the tea leaves are grown under the sunlight (not by shielding them from it like Matcha), the green color and natural scent are kept by arresting the fermentation with steam, and they are kneaded into a needle shape under a brazier covered with thick Japanese paper to dry them up uniformly. Appendix 1 notes a short history of Japanese tea and Appendix 2 describes the traditional production process of Sencha.1 [1]

1.1 Green Tea Industry in Shizuoka

Within the sequence of steps ranging from plucking and processing tea leaves to delivery to the consumer, harvested fresh tea leaves, just after being plucked from tea trees, are known as namaha (literally, “raw leaves”). By farmers, namaha are steamed to arrest fermentation, kneaded and shaped into a form like needles, and dried for preservation. These processes yield ara-cha (“coarse tea”). Wholesalers purchase ara-cha, filter it through sieves to remove stems and other foreign bodies, and roast what remains; tea leaves may be blended. The tea produced at this stage is called shiage-cha (“prepared tea”). After being packaged, shiage-cha is delivered to consumers by retail or direct sale.

According to the report entitled The Present State of the Tea Industry in Shizuoka Prefecture, published in March 2018 by the Tea Industry Development Division, Agriculture Bureau, Economy and Industry Department, Shizuoka Prefectural Government, total production of namaha and ara-cha in Shizuoka amounted to 69.9 billion JPY in 1975 and 30.5 billion JPY in 2016; for Kagoshima Prefecture, for which production had been only 8.8 billion JPY, the number rose to 26.5 billion JPY. [2] For Mie Prefecture, Kyoto Prefecture, and Fukuoka Prefecture, which respectively rank 3rd, 4th, and 5th, production totals were 9.0, 4.9, and 4.1 billion JPY in 1975, and 8.8, 8.9, and 4.5 billion JPY in 2016. At present, Miyazaki Prefecture outranks Kyoto Prefecture in terms of production quantity, but in terms of prices, it remains behind Fukuoka Prefecture and Kyoto Prefecture, which ship the Gyokuro and Tencha that command extremely high ara-cha prices. Grinding Tencha with a millstone yields Matcha. [3] In 2016 in Japan, according to statistics obtained from the Pages for Teas (Ocha

[1] Green tea is produced also in China, although it is not popular compared to oolongtea. Chinese green tea is roasted in a cauldron to arrest the fermentation, and thus the tea leaves are not needle-shaped but rounded. Tea is said to have been brought to Japan at some point between the late Nara period (710-794) and the early Heian period (794-1185) from Tang (618-907, China).

[2] Tea production values are computed by multiplying production quantities by loco prices at wholesales or farms. The report is available at the following URL. https://www.pref.shizuoka.jp/sangyou/sa-340/documents/chagyonogenjo30.pdf (in Japanese) In March 2015, a similar report was published under the name of the Tea Industry Division.

[3] In the production process of Tencha, tea leaves are cultivated by shielding the sunlight from them and are not kneaded when they are dried after being steamed. Tencha is thus technically distinct from konacha (literally, powdered tea), although it is necessary to grind Tencha into powder before drinking as Matcha. Konacha is a by-product derived from the production process of Sencha

no Pēji) maintained by Japan's Ministry of Agriculture, Forestry, and Fisheries (MAFF), Shizuoka accounted for 40% of land area devoted to tea cultivation, 38% of namaha harvests, and 38% of ara-cha production, while Kagoshima accounted for 20%, 25%, and 27%, respectively.[4]

In Shizuoka, tea leaves are harvested four times in a year, and thus they are classified by the time of their harvesting into four categories ranging from first leaves ("ichiban-cha"; from the beginning of April to the beginning of May) through fourth leaves ("yonban-cha"; from mid-September through mid-October).[5] Due to the superior quality, first leaves are sold at premium prices compared to leaves harvested at other times of the year. At present, the average price of first-leaf ara-cha produced in Shizuoka is roughly 2,000 JPY per kilogram; in the mid-1990s, this price hovered near 3,300 JPY. According to MAFF statistics, similar decrease in ara-cha prices have been observed since 2004 for tea produced in other regions as well; it is said that the decrease in the prices attributed to the increasing popularity of inexpensive green-tea beverages packaged in PET bottles. The downward trend in the prices had already settled, and in recent years ara-cha prices remained largely unchanged.

The land area allocated to tea cultivation and the amount of ara-cha produced in Shizuoka have similarly fallen in tandem; 40.300 tons of ara-cha were produced in 1995 but 30.800 tons were produced in 2017. The total amount produced in Japan was also decreasing; from the mid-1970s to the mid-1985 about 100 tons of ara-cha were produced in each year, whereas from 2015-2017 about 80,000 tons were produced in each year. This decreasing trend in quantities had also be settled recently. It is said that the decrease in the amount of production attributed to falling demand due to the changing lifestyle of consumers.

On March 11 in 2011, just before first leaves are harvested, a massive earthquake and an associated sequence of disasters and accidents struck Japan's Tohoku and Kanto regions. A document entitled A Survey of the State of Supply, Demand, and Logistics in the Tea Industry in Fiscal Year 2016 (Summary Version), prepared by Research Institute for Natural Capital at the request of MAFF, includes discussions of the impact of the nuclear-plant accident on production, logistics, and consumption in the tea industry, and concludes that the decrease in average tea prices observed at the Shizuoka Tea Market from 2011 to 2012 is most likely due to a deterioration in the public image of the tea industry caused by the nuclear-plant accident, although it is 400km away from Makinohara to the point where the nuclear accident occurred.[6] The great earthquake and the following confusions appear to have been a trigger for major shifts in the distribution of tea leaves in Japan.

Before the great earthquake, a sizable quantity of the ara-cha produced in other areas was brought by intermediary agents to the Shizuoka Tea Market and subjected to transactions there. This state of affairs seems to have been natural due to the established brand name of Shizuoka tea and the

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[4] http://www.maff.go.jp/j/seisan/tokusan/cha/ocha.html (in Japanese)

[5] The climate of Kagoshima located in the southern part of Japan is warm compared to the other tea cultivation areas, and thus tea leaves are harvested five times in a year there. In Sayama Hills, tea leaves can be harvested only twice in a year, because it is located at the northern limit for large-scale tea cultivation in Japan.

[6] http://www.maff.go.jp/j/seisan/tokusan/cha/attach/pdf/ocha-6.pdf (in Japanese)

overwhelming shares of both ara-cha and shiage-cha produced in Shizuoka. The ara-cha shipped there was roasted, blended, and shipped as shiage-cha produced in Shizuoka. The tea prices determined at the Shizuoka Tea Market exerted significant influence over tea prices in transactions at other areas throughout Japan, due to the wide range and massive scale of these ara-cha shipments,

After the great earthquake, however, the quantities of ara-cha brought from other areas to the Shizuoka Tea Market began to decrease; significantly in 2015.[7] It is not uncommon that the unit prices of shiage-cha (per kilogram) reach a maximum on the order of 10 times those of the ara-cha. During the period of confusion following the earthquake, decreasing average tea prices at the Shizuoka Tea Market resulted in farms and intermediary agents across Japan bringing their ara-cha to other areas; consequently, the profits derived from the price differential between shiage-cha and ara-cha, which had previously been distributed within Shizuoka Prefecture, began to be shared outside of Shizuoka.

The emergence of these profits served as a platform for the entrenchment of new production and logistical structures in various regions around Japan, diminishing the dominant influence of pricing signals from the Shizuoka Tea Market. Meanwhile, due to changes made at the markets to which products are shipped, the decision to bring ara-cha back to the Shizuoka market entails a variety of additional costs, a factor which surely contributes to the lack of growth in shipments from other prefectures arriving at the Shizuoka Tea Market. The decrease of those prices and quantities might be incurred by the rapid expansion of transactions between large-scale farmers and a green tea beverage manufacturer in the South Kyushu region, but the expansion of those trades had already started before the great earthquake.[8]

In contrast, in recent years the Kagoshima Tea Market has been transacting increasing quantities of tea produced outside Kagoshima Prefecture.[9] The climate of Kagoshima ensures that the season for harvesting first leaves arrives earlier there than in other areas. As a result, recently, after transactions for first leaves were completed in Kagoshima, transactions for first leaves were completed in areas lying further north or east, ensuring that prices established in Kagoshima served as reference values for other tea markets. This transition in pricing leadership was a major shift in the landscape of green tea industry in Japan.

The above story still has some hypotheses, and establishing precise causal relationships will require careful acquisition of statistical data from the tea markets in various places. The shift in price leadership from Shizuoka to Kagoshima has been, however, confirmed by off-the-record interviews with multiple individuals familiar with the tea industry in Shizuoka. A rigorous, quantitative data-based analysis is awaited.

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[7] See The Present State of the Tea Industry in Shizuoka Prefecture (March 2018).

[8] Neshi, A. and Fujisima, H. (2012) “Business Relations between Green Tea Bever- age Corporations and Supplies of Tea Ingredients in Japan,” *Nouson Kenkyu (Rural Studies)* 114, 25-34. http://nodaiweb.university.jp/noukei/pdf/NSO114_03.pdf (in Japanese)

[9] http://www.ocha-kagoshima.jp/ (in Japanese)

1.2 Transaction Unique to Shizuoka: Aitai

In Shizuoka, a unique transaction form was developed in the distribution process of ara-cha; it is still kept and prevalent even now. This traditional way of trades is mentioned here in order to better understand the situation where farmers and wholesalers in Shizuoka are currently faced with. Ara-cha that farmers produce are bought by wholesalers via agricultural cooperatives, tea markets, and brokers. There are various types of transactions among them in different regions. For example, electronic bidding was introduced to the Kagoshima Tea Market. In contrast, Shizuoka has a typical distribution channel between small and mediumsized farmers and family-managed wholesalers, which emphasizes quality evaluation with small-lot transactions.

This transactions are taken early in the morning. The farmers entrust their ara-cha to brokers, and the brokers place the samples packed in cans at the eaves of the wholesalers' factories. Wholesalers look for some samples suitable for their own shiage-cha, looking at the shape and color of each sample, touching it with their hand, sniffng and smelling it, then putting the sample in a tea cup, pouring hot water into the cup, and checking the light green color, taste and aroma. This selection of tea leaves is called Haiken in Japanese, literally meaning just seeing. When wholesalers decide trading farmers, they tell the broker to deliver the tea leaves. The payment is often made by bill settlement. In Shizuoka, this way of trades is called Aitai, which means the trades not through markets in Japanese.

When an agricultural cooperative (or an economic association entrusted with it) negotiates the price of ara-cha with a wholesaler, the farmer pays not only the brokerage fee but also some guarantee fee to the cooperative according to the amount of the transaction that has been established. The guarantee fees are charged for credit management of quality to wholesalers. When delivering tea leaves to wholesalers via a broker, credit management is under the responsibility of the producer, and thus there is no need foe farmers to pay any guarantee fee. For this reason, the majority of farmers in Makinohara deliver ara-cha to wholesalers via brokers.

The brokers have a consignment agreement with the agricultural cooperative. Kounosu (2004) reported that there is no discretionary power for price presentation in a certain production area in the vicinity of Makinohara.[10] Makinohara's brokers are, however, given various authority about them. The number of brokers in Shizuoka Prefecture has been decreasing for the past 15 years, and currently it is about 20 people. The brokerage company determines the rate of commission under the management of the Tea Commerce & Industry's Association of Shizuoka Prefecture. Brokers handle ara-cha throughout harvest season and sometimes shiage-cha in the off-season.

In the Shizuoka Tea Market, farmers and wholesalers negotiate with one another under the mediation of the staffs. The wholesalers look at the samples and taste them, looking for ara-cha that

[10] Kounosu, T. (2004) "Functional Changes in the Market of Ara-cha and Issues on its Distribution: Progress of Transactions for Specific Buyers and Response of its Production Areas," *Reports*, Norinchukin Research Institute Co., Ltd., May 2004, 10-16. (in Japanese)

are suitable for their own shiage-cha. Some wholesalers say that negotiating partners are often decided based on the past transaction results. The Shizuoka Tea Market also started trading ara-cha by bidding on a trial basis in parallel with traditional negotiations about 10 years ago, but the transaction volume is not high even now. Currently, auctions for ara-cha are conducted once a month there; the auctions are not for daily trades.

2 Kawamura Suikoen

Kawamura Suikouen is a wholesaler of green tea located in Makinohara City in Shizuoka Prefecture. Notwithstanding the term "wholesaler," the company also have their own products such as tea leaves and powdered tea, although the quantities of tea involved are small, which are primarily sold as gifts through online marketplaces such as Rakuten.

2.1 A Green Tea Wholesaler

- A green tea wholesaler in Makinohara City located in the west of Shizuoka Prefecture, dealing with Sencha.
  - In a broad sense, there are two types of Japanese green tea; One is Sencha (non-powdered tea to be brewed with hot water) and the other is Matcha (powdered supreme-quality green tea to be dissolved in hot water).
  - Green tea is mass-produced on the Makinohara Plateau, where green tea farmers do not do small-scale production of ultrahigh-grade products (e.g., Royal Blue Tea MASA) that sells for 20,000 JPY a bottle.[11]
  - leaves mowed in farmers' tea fields → Cut and steamed immediately to stop fermentation with heat → Rubbing and drying
    → ara-cha ("coarse tea"); it contains stems and other things which are to be removed.
  - (wholesalers' work) Putting through sieves (furui) and roasting. From ara-cha, tea leaves are selected and sorted into uniform groups which meet the standards in size, color quality (rich green), and scent with identification machines and masters' own sense. Items other than tea leaves are removed with foreign body removers.
- Deals in ichibancha (first harvest, April), nibancha (second harvest, June), sanbancha (third harvest, August), and yonbancha (fourth harvest, late September). It was founded in 1912. Current president Mr. Naoya Kawamura is the fourth generation.
- Mainly sells wholesale to retailers in the Kanto region (incl. Tokyo, Saitama, and Yokohama) by itself or sometimes through connoisseurs. Previous president also created a market in the Kansai

[11] Royal Blue Tea MASA is made from tea leaves called Tenryu cha cultivated in Hamamatsu located on the west edge of Shizuoka Prefecture.

region (incl. Kyoto, Osaka, and Kobe).

- In tea leaf transactions, it is common not to write up formal contracts even for forward transactions which are supposed to be made several months later in the future. Dealings are based on “trust” between buyers and sellers. Tea leaves are sold in kilograms and two-part tariffs are not common.
- Kawamura Suikoen once tried to sell tea leaves of their own brand on their website but tentatively stopped in 2012 because of manpower shortage; Direct online sales are currently suspended, although their brands are available at Amazon, Rakuten, etc.. Currently, 99% of their product is sold wholesale to retailers.
- Around 1920 to 1930, the custom of drinking tea by brewing tea leaves in a small teapot reached ordinary households. Until that point, tea had been tasted among upper-class households and monks in Zen Buddhist temples by boiling tea leaves in an iron kettle or similar vessel. Because of this popularization, people started to casually drink green tea before and after meals.
- Recently, people have started drinking green tea from PET bottles. The three major manufacturers are Suntory-Fukujuen (“Iyemon”), Itoen (“Oi Ocha”), and Kirin Beverages (“Namacha”)[12].
- PET bottles enabled us to drink green tea and other beverages without tedious brewing, whereas there is a steady downward tendency of the rate of people who brew green tea in a small teapot; The prices of tea leaves have been continuing to fall these years.
- Tea harvest and processing work had been traditionally seasonal labor. The processing work was, however gradually alleviated and spread throughout the year, because tea leaves do not spoil under appropriate inventory control. It is now possible to realize stable supply throughout the year, which enables to supply tea leaves for PET bottle beverages.
- Shizuoka tea, which is a well-known brand in Japan, has reduced production output and has sluggish prices. The average price of ichibancha was about 3500 JPY per kilogram in 1998, and has since dropped every year; reaching about 2500 JPY in 2013. (JA Shizuoka Keizairen survey); More people prefer tea in cheap PET bottles.

2.2 Management Issues

(1) Domestic demand for Japanese green tea tends to drop. The wholesalers including Kawamura Suikoen are considering overseas exports. This is also a policy of the Tea and Agricultural Products (TAP) division of the Shizuoka prefectural government. Shizuoka Prefecture ’ s basic policy is to make high-quality products and promote overseas exports. Export quantities are growing somewhat. (800 tons in 2003 and 300 tons in 2013, the Ministry of Finance)

(a) As of 2014, the U.S. is the biggest export destination for Japanese tea, followed by Taiwan, Singapore, Canada, and Germany. The targets are China and the Islamic countries.

[12] In 2004, Iyemon was released to market, and it sold explosively.

(b) Arabian countries have many sweets, and there are many potentially diabetic people there. In that sense, there may be demand for green tea, which is considered healthy. However, if we consider exports to those Arabian countries, we must outfit the production process for halal and obtain halal certification.

- GLOBAL G.A.P.: An international certification essential for expanding exports of agricultural products. What is certified is not the quality of the products but the production process management. Kawamura Suikoen is halal-certified.
- Kawamura Suikoen will not wish to sell flavored tea, but traditional Japanese green tea.

(2) Most Japanese tea producers run family operations, and workers are aging on average. Recently the area of "abandoned tea fields" is thus expanding.

- Through crowd-funding, some Japanese tea producers and wholesaler (incl. Kawamura Suikoen) are trying to create an initiative with an arrangement in which each member owns 300 tsubo (991.7 m2) of tea field and farmers take care of cultivation and production. The tea produced would be the "original tea" of the owners of each field. Original teas are also produced by adjusting the fire for roasting.

(3) Young tea producers and wholesalers are promoting Japanese tea through a You tube video called "Ireyo Nihoncha Project" ("Let's Brew Japanese Green Tea" Project).

- President Naoya Kawamura serves as vice representative of the project. When the positive health effects of green tea were featured on a television program, demand increased temporarily in August 2017.

(4) "Joint Tea Plucking" is promoted by the TAP division of the Shizuoka prefectural government are a cost reducing activity.

- The growth of tea leaves differs depending on the placement of the field and sun exposure. The quality of tea leaves is made uniform by using differences in growing periods of tea leaves. Thus, it may be helpful for such quality control to pluck tea leaves by groups of farmers who have different tea fields.

2.3 General Questions

- There are large cost fluctuations for products by the weather conditions, as is other agricultural products. In this case, management consultants usually first consider whether the ratio of fixed costs to sales can be lowered. Bridgestone is able to pass rubber price fluctuations on to the retail price, but what about tea leaves?

- There is no business practice of writing and signing contracts for transactions which are to be made several months later. Taking care of responses to external shocks, the managers of this industry should check the proportion of accounts receivable in B/S.
- What are the main factors that determine bargaining power between farmers and wholesalers, and those between wholesalers and retailers? (Sometimes bid shopping harms the profits of the entire channel.)
  - The tea industry has a transaction type which is not seen anywhere but Shizuoka: Farmers (crude tea) ⇒ Go-betweens ⇒ Wholesalers.
    * In Shizuoka they call it Aitai (literally, “face to face”), but in reality, go-betweens act as price negotiators between farmers and wholesalers. The go-betweens’ commission rate is about 1.8% of the contract value.
    * In Kagoshima, they have started bidding, but in Shizuoka, though they have made some attempts at bidding alongside the go-betweens transactions, the rate of successful bids was only 67%.
- What about joint brands? Recently, Tohoku miso (soybean paste) wholesalers have coordinated with each other to make a shared brand. (The great earthquake disaster in 2011 was the impetus.)
  - (Ans. from President Naoya Kawamura) Shizuoka tea industry suppliers do not have a great sense of unity. No matter how much the TAP division of the prefectural government may try to lead the way, “cooperative dissolution” is not rare. Is this the tragedy of the commons? There are not many leaders among suppliers.
- Related to the great earthquake, according to a study by a major foreign consulting company, the scale of Shizuoka’s first auction of the year has been shrinking since 2011. (Before then, tea had also been brought in from many other regions.) The price-controlling power of Shizuoka tea is slipping.
- Is differentiation (through higher-grade products) the very best thing to do as a way to oppose low tea prices? Of course, many business school textbooks advise making products stand out from those of competitors, but that is the prevailing view. This would be right if the whole process from farming to wholesale to retail were the same company, but when that is not the case, producing identical products can bring higher total profits to the entire channel.
- For high-grade tea, there is an example of raising public awareness by inviting foreign tourists to tea fields and having them spread information on social media. (Wazuka Town, Soraku District, Kyoto Prefecture). What about exports to Europe?
  - (Ans. from President Naoya Kawamura) Recently, we are considering exports to North America. Inspections are strict in Western Europe. For Eastern and Northern Europe, there might be few competitors.
- Regarding becoming owners of abandoned tea fields, transportation is critical. The closest station is Shimada Station (JR Tokai Line), but it takes over 20 minutes in a private car to get from there

to the tea plantation. There are too few buses departing from Shimada Station. (In the afternoon, there is one per hour.)

3 A Theory of Industrial Organization

This section gives some hint or suggestion to product differentiation in the green tea industry from a theoretical viewpoint of industrial organization, based on a mathematical model which is simplest possible.

3.1 A Suggestion

- Differentiation from products of other firms in the same industry and appealing the difference is one of the fundamental issues taught in textbooks. Some people suggest that a new brand should be established for tea leaves in Shizuoka.
- It would, however, be diffcult for small family-managed companies to implement such a policy.
  - lack of personnel (manpower shortage)
  - tight budget constraint

  In the first place, is green tea a product which is easily differentiated among green teas?
- What is the current situation around Japanese green tea industry?
  - A summary of the contents described in Section 1 is as follows.
    (1) Shizuoka was the center for the deals of green tea until 2011 but is currently faced with declining production and sluggish prices of the tea leaves.
    (2) Change in dietary life in Japan. Japanese had a custom that they drink green tea before and after having Japanese food, but young people in their 20s do not necessarily have that custom.
    (3) PET-bottled green tea has gained a large share. There are three major brands: Suntory-Fukujuen, Itoen, and Kirin Beverages. Even Coca Cola Japan has a well-know brand, Ayataka, which is produced with Kambayashi-Shunsho Honten.[13] Neither Fukujuen nor Kambayashi-Shunsho Honten are green tea wholesaler of Shizuoka.[14]

Proposition 1 *Suppose that the number of farmers who produce green tea leaves is suffciently large. Then, there is a threshold of the rate of product differentiation such that if the actual rate of product differentiation is lower than the threshold, then the profits of both farmers and wholesalers increase as the rate of product differentiation decreases.*

[13] Kambayashi-Shunsho Honten is a major grean tea wholesaler with about 450 years of business at Uji in Kyoto. It would present tea leaves of supreme quality to the Tokugawa Shogun in the Edo period (1603-1867).

[14] Itoen has a large factory in Shizuoka; it was established in 1966 in Shizuoka City.

Proposition 1 suggests that when the number of farmers is large, there should be some cases in which it is better for farmers and wholesalers to produce homogeneous products (ara-cha and shiage-cha, respectively) and sell a unified brand of tea leaf to consumers than it is for them to differentiate their products, even if farmers compete one another and wholesalers compete one another. In a situation where the differentiation of shiage-cha is not much achieved, if the same product is sold to consumers, the competition among wholesalers would intensify and the price of ara-cha would fall. At that time, however, consumers' demand for shiage-cha might increase as the price declines, and then profits for both the wholesalers and the farmers could increase. In order for those reactions to successfully occur, the markets for ara-cha and shiage-cha must meet several conditions. Those conditions are shown in the mathematical model described below.

3.2 A Mathematical Model

Proposition 1 is derived from a mathematical model based on Nariu (2017, mimeo.). Theoretical models shed light on some specific parts of actual situations and make assumptions in order to show the results as clearly as possible. The proof of Proposition 1 is here omitted, but more important is to intuitively consider the validity of the model in which some assumptions are made to capture a specific situation. The model is described below.

- There are m manufacturers, and each manufacturer i produces a differentiated commodities and sells it to consumers at price p_i.
- For each manufacturer i, there are n suppliers (farmers) which produce intermediate goods (ara-cha) exclusively for the manufacturer.
  Each farmer j of manufacturer i sells its ara-cha at wholesale price w_{ij}.[15]
- Assume that $3 \leq m < \infty$, $1 \leq n < \infty$, and $n > m - 2$.
- The price of the commodity manufacturer i supplies is determined by
$$p_i = a - q_i - bQ_{-i},$$
where a is a positive constant, q_i is the quantity manufacturer i supplies, Q_{-i} is the sum of the quantity supplied by all the manufacturers except manufacturer i, i.e., $Q_{-i} = \sum_{k \neq i} q_k$ $(= q_1 + \cdots + q_{i-1} + q_{i+1} + \cdots + q_n$ if $2 \leq i \leq n - 1)$, and b is the parameter of product differentiation; $0 \leq b \leq 1$ and $(1 - b)$ represents the "rate of product differentiation". (Products are perfectly homogeneous when $b = 1$.)
- Each manufacturer i maximizes its profit
$$y_i = (p_i - c_i)q_i = (a - q_i - bQ_{-i} - c_i)q_i$$
with respect to q_i, where c_i is the total payment per unit of shiagecha to farmers, i.e., $c_i = w_{i1} + w_{i2} + \cdots w_{in}$.

[15] There are many named tea leaves. Yabukita is most popular not only in Shizuoka Prefecture but also in other production areas, and Yutaka-Midori is prevalent in Kagosima Prefecture.

- Each farmer j of manufacturer i maximizes its profit

$$z_i = w_{ij}\, q_i - C$$

with respect to w_{ij}, where C is the lump-sum cost of producing ara-cha. For simplicity, let $C = 0$. Most important feature here is that farmers' production costs do not depend on their wholesale prices. Note that each farmer receives one unit of demand for its ara-cha when its manufacturer produces one unit of its commodity. This is also an assumption for analyzing this situation with ease.

- The sequence of decision-making consists of two stages. At the first stage, farmers independently and simultaneously determine the wholesale prices of their own ara-cha anticipating the quantity of shiage-cha produced by each manufacturer. At the second stage, manufacturers independently and simultaneously determine the quantities they produce.
- We consider this situation backwardly from the second stage.[16]

The intuitive logic to understand Proposition 1 is as follows.

1. q_i increases as c_i decreases, because q_i decreases as c_i increases. The increment in q_i increases as b increases, because the reduction in q_i with the increase in c_i is further expanded as b increases.
2. For all $i = 1, \ldots, m$ and all $j = 1, \ldots, n$, p_i and w_{ij} decrease as b increases.
3. Then, how does the margin $p_i - c_i = p_i - \sum_j w_{ij}$ for each manufacturer i change as b increases? At that time, how does the quantity q_i demanded for the manufacturer i' commodity change? What happens with the farmers' revenue $w_{ij}\, q_i$?
4. What happens with the farmers' revenue $w_{ij}\, q_i$ as b increases? When q_i increases, $w_{ij}\, q_i$ may increase even if the wholesale price w_{ij} decreases as b increases.
5. When the number n of farmers is suffciently large, there is a threshold $\hat{b}$ with $0 < \hat{b} < 1$ such that (1) if $b < \hat{b}$, then the margin $p_i - c_i = p_i - \sum_j w_{ij}$ decreases as b increases, whereas if $b > \hat{b}$, then it increases; For all $i = 1, \ldots, m$, the trades of intermediate goods is more severely competitive when n is suffciently large than the trades of final commodities. The reduction in w_{ij} is then larger than that in p_i for all $j = 1, \ldots, n$. (When the number n of farmers is not suffciently large, the margin decreases as b increases.)
6. If p_i suffciently decreases, then the quantity q_i demanded for the manufacturer i's commodity increases.
7. Thus, it turns out that for all $i = 1, \ldots, m$ and all $j = 1, \ldots, n$, in some cases, when the number of farmers is suffciently large, both y_i and z_{ij} increase as b increases.

[16] In game theory, the solution concept we use here is called symmetric subgame perfect Nash equilibrium. The symmetry implies that every farmer sets the same wholesale price and every manufacturer sells the same quantity of its commodity at the same price.

Appendix 1: A Short History of Japanese Tea

Any kinds of tea, such as green tea, oolong tea, and black tea, have their roots in the southwest Yunnan in China, and it was called “Cha” in old Cantonese and transmitted mainly overland to some countries, while it was called “Te” in old Hokkien and transmitted mainly by sea to other countries.[17] Tea was originally taken as a medicinal herb. In the mythical world (about 4700 years ago), a Chinese god of agriculture and medicine examined 72 various wild plants and grasses by eating them and selected good ones which people can eat. He was detoxified with tea leaves at each time when he found some plants and grasses poisonous. This story is a myth, but tea leaf has been treated as a medicine since ancient times; even now in Japanese, drinking tea is sometimes expressed as “ippuku suru” (to take a dose).

Tea is said to have been brought to Japan at some point between the late Nara period (710-794) and the early Heian period (794-1185); monks and envoys to Tang (618-907, China) brought back the seeds of the tea plant on their return from Tang. In the Nihon Kouki [Later Chronicle of Japan], an offcially commissioned chronicle of Japanese history compiled in the early Heian period, it is recorded that the Emperor Saga, after being served tea by the Buddhist monk Eichū in 815 (Konin 6), ordered that tea plants should be cultivated in an imperially administered territory of the Kinai region (districts around Kyoto) and that tea should be brought to him as an offering each year.[18] It is speculated that the tea that was sipped by the Emperor Saga would have been prepared by pounding steamed tea leaves with mortar and pestle and then hardening and drying them like rice crackers, which would then be ground into powder and boiled in a kettle before drinking. This is regarded as the oldest recorded style of tea drinking in Japan. In the Heian period, tea drinking was restricted to only a limited class of people, such as monks and aristocrats, and contemporary sources record how it was served at the imperial court and used as an offering in ceremonies at major temples. Tea brought to Japan at the time is thought to have been a red-black fermented tea, rather than a greenish non-fermented tea.

At the start of the Kamakura period (1185-1333), Eisai, founder of the Rinzai school of Zen Buddhism, after returning from studying Zen in Song (960-1279, China), composed the Kissa Yojoki [Treatise on Drinking Tea for Health] and expounded a method of processing tea leaves as well as the effcacy of tea drinking (as a way to combat drowsiness when pursuing ascetic training).[19] Similarly, Dōgen, founder of the Soto school of Zen Buddhism, wrote Eihei Shingi [Pure Standards for (the Temple of) Eternal Peace], in which he set out the ceremonies and etiquette to be observed when Zen monks served tea. Devotion to Zen spread to the worrier class in this period, since the attitude of reaching the realm of enlightenment through self-training and discipline in Zen matched the spirit of the warriors. In this way, the cultivation of tea trees at Buddhist temples and the practice of tea

[17] Cantonese and Hokkien are both local languages in China.

[18] The place of the territory is not recorded in the literature.

[19] They say that Eisai brought back tea seeds from Song that he sowed at the temples of Ryōsen-ji in Chikuzen Province (now, the northern part of Fukuoka Prefecture) and Kenninji in Kyoto.

drinking by the warriors were spreading alongside the propagation of the Zen schools. For example, Enni, the founding priest of Tofukuji temple in Kyoto, also brought back the seeds of the tea plant from Song, and is credited with bringing tea cultivation to Suruga Province (now, the central part of Shizuoka Prefecture). Enni was a disciple of Taiko, and Taiko is known as the abbot of the Rinzai school credited with converting Minamoto-no Yoritomo (Minamoto is his family name; the first Shogun of the Kamakura shogunate, the first worriers' government) and Masako Hojo (Yoritomo's wife) to Buddhism.

In the same period, the priest Myoe, after being entrusted with tea seeds by Eisai, began cultivating tea plants at Kozanji temple in Kyoto's Toganoo district. The tea garden at Kozanji is the oldest in Japan whose location can be identified from contemporary sources.[20] Myoe also went on to plant tea in what is now the southern part of Kyoto Prefecture. This was the origin of Uji tea. The "Koma-no-ashikage-en hi," a monument inscribed with "A Poem on the Hoofprints of the Horse," can be found outside the main gate at Obaku-san Manpukuji temple, describing how Myoe instructed the people of Uji in how to plant tea seeds. The history of the current Japanese tea has begun at Uji.

By the Muromachi period (1338-1573), tea was being produced at Uji under the patronage of Yoshimitsu Ashikaga (the third Shogun of the Muromachi shigunate), and the plantations known as the Uji Shichimeien (seven great tea fields of Uji) were even celebrated in the verses of Japanese waka poetry.[21] In the late Muromachi period, tea cultivators at Uji began the practice of "covered cultivation" (oishita saibai), originally developed as a countermeasure against frost damage, in which tea leaves are grown by shielding them from sunlight for a certain amount of time before harvest. The resulting tea began to be processed as Tencha, characterized by its less astringent taste and sweet flavor.[22]

Grinding Tencha into powder in a stone mill produces Matcha (powdered supreme-quality green tea). Since the production process of Tencha omits the step of kneading the tea leaves after steaming, it is strictly distinguished from the konacha (powdered teas) that results from the process of producing Sencha. Matcha was indispensable to the "way of tea" established by Sen-no Rikyu (1522-1592, Sen is his family name) and others, and accomplishment in the tea ceremony became an important mark of refinement among the warrior and wealthy merchant classes in the Azuchi-Momoyama period (1573-1603).

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[20] Even today, tea plucking is carried out there in the middle of May. Kozanji is also known as the long-established home of the illustrated scrolls known as the Chōjū-giga [Scrolls of Frolicking Animals].

[21] The Okunoyama tea field is the only one of the original seven plantations (Uji Shchi-meien) that remains in existence today. Tea production at Uji enjoyed offcial patronage in the Edo period (1603-1867), as well, when Uji was administered as a tenryō, a region under the direct jurisdiction of the Tokugawa shogunate.

[22] Even in the same covered cultivation, today, Tencha is shaded from the sunlight shielding curtain for as much as a month, Gyokuro (another high-quality green tea) for 2 to 3 weeks, and Kabusecha for 3 to 10 days. In the cultivation of Tencha and Gyokuro, the traditional method of covering entails erecting a trellis around the tea fields over which is stretched a curtain woven of reeds or straw. With Kabusecha, the tea plants themselves are shrouded directly with black cheesecloth or material with a silvered surface. Today, Wazuka Town in Soraku district in Kyoto Prefecture and Nishio Town in Aichi Prefecture are renowned for the production of Tencha, and Yame in Fukuoka Prefecture is a major producer of Gyokuro on par with Uji in Kyoto Prefecture, while Suizawa in Mie Prefecture occupies an overwhelmingly dominant position in terms of the volume of Kabusecha production.

The spread of tea among Japanese commoners was not to begin until the outset of the Edo period (1603-1867). In the early Edo period, whereas the wealthier class of urbanites enjoyed Matcha, commoners drank a boiled red-black (kuro-sei or black-processed) tea.[23] In the mid-Edo period, the so-called ao-sei Sencha seiho (method of producing blue-processed Sencha) was invented by Soen Nagatani, a farmer at Uji Yuyadani (now, a district at Ujitawara Town), who began selling tea through Kahei Yamamoto IV, a merchant purveying Japanese paper, tea ware, and other goods to the huge market of Edo (currently, Tokyo).[24] The tea produced by using this new method of processing tea leaves and named Tenkaichi ("Best under Heaven") came to the market in 1738 (Genbun 3) and spread across Japan after being well received in Edo. This was the Uji Sencha that is still enjoyed in Japan today.

In the conventional process that was prevalent at that time, tea leaves steamed to stop fermentation were kneaded with one's feet (or sometimes hands) on a woven straw mat (mushiro) and dried in the sun; it was not prevalent to dry them up in a kind of brazier called hoiro.[25] It was thus diffcult to achieve delicate quality control with the conventional process, since the degree of drying can end up being uneven depending on the tea leaves. For this reason, tea leaves deteriorated easily, and the lingering scent of the mushiro in the tea leaves detracted from the natural aroma. Soen Nagatani, by drying steamed leaves while kneading them over the brazier, invented a production method that allowed him to control the extent of dryness and the length of drying time, resulting in ara-cha ("coarse tea") that preserved its green-blue color and fresh aroma for a long time. (See the explanation in Appendix 2.)

During the Edo period, Uji was home to specific "tea masters" (ochashi) who enjoyed a monopoly on the production of Tencha by license from the shogunate. Since Soen Nagatani made no secret of his ao-sei Sencha seiho, and indeed passed it on to neighboring farmers, as demand arose, Sencha began to be produced in tea fields all over Japan, such that it became one of Japan's leading teas. Although the tea industry at Uji had been stagnating at the time, as trade channels for Sencha were established in various regions, Uji was revitalized as a tea-producing region (ocha dokoro), and the Yamamoto family, which earned a huge profit selling Sencha, is said to have continued sending an annual

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[23] The etymology of the Japanese word chairo (meaning "brown" but literally "tea-colored") is said to derive from the color of a dye made by boiling tea leaves. This dye began to be produced from the Muromachi period, and was apparently used widely by commoners during the Edo period.

[24] Soen Nagatani was an ancestor of Yoshio Nagatani, and Yoshio Nagatani founded Nagatanien (a Japanese food company) after World War II. Kahei Yamamoto I came to Edo from Uji Yamamoto (now, a district of Uji City) to start trading in 1690. After several transitions, the trading name (yago) of the family firm became Yamamotoyama in 1941, after the brand of tea leaves plucked in the family's private tea fields.

[25] The hoiro is a kind of work table for arranging the shape of tea leaves while drying them with gentle heat from below. In the old days, a fire would be kindled in a wooden frame, into which charcoal covered in ash would be placed. This would be covered with a lattice or a basket made of bamboo or a similar material, which in turn would be covered with a thick sheet of Japanese paper called hoiro-gami, on which the tea leaves would be handled. An account left by the Portuguese Jesuit missionary João Rodrigues in his Historia da Igreja do Japaõ [History of the Japanese Church] (English translation by Michael Cooper published by the Hakluyt Society, 2001) describes how hoiro brazierss like these were used in the production of Uji Tencha. Today, it is more typical for a metal box to be heated directly using electricity or gas, or else to apply heat by circulating hot water inside a box.

gift of 25 gold coins (koban) as a token of their gratitude to the Nagatani family until 1875 (Meiji 8).

In the late Edo period, the Yamamoto family left sizeable footprints in the tea industry, even after it began selling Uji Sencha, as well. Kahei Yamamoto V is known for reviving Sayama tea. In the Sayama Hills (which straddle the western part of Saitama Prefecture and the western part of the Tama area in Tokyo), tea plants are bred to have thicker leaves because of the cool climate, which occasionally experiences winter frosts.[26] In 1802 (Kyowa 2), a method of producing Sencha with a rich, sweet flavor by preparing these leaves on a high-temperature hoiro was devised by farmers and sericulturists.[27] In 1835 (Tenpo 6), Yamamoto Kahei VI came up with the idea of roasting tea leaves grown under covered cultivation at Uji into a rounded form, which he began selling under the name Tama no Tsuyu ("Bead of Dew"). This characteristically sweet tea, now known as Gyokuro, comes in the shape of needles, and the methods used to cultivate the tea plants and process the tea leaves were perfected by the tea wholesaler Tsujiri in the early Meiji period. The founder of this establishment, Rihei Tsuji (known in his later years as Riemon), also invented a kind of tea chest (chabitsu) with tin plating on the inside of a wooden box, which made it possible to transport tea leaves in large volumes. Until the appearance of these tea chests, tea had been stored in tea urns (chatsubo).

After the Meiji Restoration, tea plantations were passed from warrior class to farming families, and trade channels consisting of tea merchants (wholesalers) and go-betweens were established as the industry gradually took shape in its current form. For the tea industry in Shizuoka, this is as it was described in the introduction to this material. It is also worth noting that the custom of pouring hot water over tea leaves in a small tea pot (kyūsu) instead of boiling it in an iron kettle, and of drinking tea around mealtimes, spread to ordinary families from the late Taisho period (2012-1926) into the early Showa period (1926-1989). This fact should be kept in mind when thinking about the nature of the tea industry in recent years.

[26] At the time, cultivation of tea trees began on the Sayama Hills as a crop encouraged to grow for the development of new fields in the Musashino Plateau; the tea leaves plucked and processed to ara-cha there were refined as shiage-cha ("prepared" tea) in Kawagoe and shipped as Kawagoe tea. It was after the Meiji period (1968-1912) began that the name Sayama tea was established. Kawagoe was known for its Tencha among the warrior class in the Kamakura period, but Tencha was hardly produced there in the Edo period, since Kawagoe declined at the time of the major conflict between the North and South Courts in the early Muromachi period. It is speculated that tea leaves processed to something like red-black rice crackers were powdered and boiled in a kettle before drinking at temples in the Kamakura period as well.

[27] Hoiro braziers were once also used in the sericulture industry for drying silkworm cocoons. In the Sayama Hills, urbanization progressed from the 1960s as the area was developed as a bedroom community for Tokyo, and while large tea plantations can still be found in the western and southern sections of Iruma, in other areas, tea fields have declined to the extent that only a scattered handful remain. While harvesting tea five times a year is possible in temperate Kagoshima Prefecture (by including an autumn or winter plucking after the first to fourth tea-pluckings during the growing season), the fact that Saitama Prefecture is cold for a tea-planting region means that tea can only be harvested twice a year, and thus production volumes cannot be high.

Appendix 2: Production of Hand-kneaded Tea Leaves

After the Meiji Restoration, in Shizuoka, master tea craftsmen (hoiroshi) were invited from places such as Uji and Ise (now, Mie Prefecture), which were advanced regions in Sencha production, to instruct locals in the art of tea production. This resulted in the emergence of many different schools of hand-kneaded production of ara-cha. In 1905 (Meiji 38), an attempt was made to integrate more than 20 different such schools, leading to the formulation of the "Year 38 Method," which incorporated the Momikiri kneading style of Uji and the Denguri rolling style from Kawasaki in Haibara district (now, an eastern suburb of Makinohara City in Shizuoka Prefecture). Today, the Year 38 style remains the basic method used by various hand-kneaded tea production preservation societies across Japan. Currently, a standard kneading practice has been established based on the Year 38 Method, and this standard is often stipulated in offcial competitions and tastings. However, passing on the traditions of the various schools is growing more diffcult as the standard kneading method becomes more popular, to the extent that some schools, such as the Sagara school, have already lost leaders that might carry on the tradition.

The Processes

Harvested tea leaves are steamed immediately to stop fermentation with heat. Up to this point, this is the same as the process of machineprocessed tea leaves. For machine-processed tea leaves, which are prevalent currently, the following steps are emulated by machines.

(1) Haburui (leaf shaking): Tea leaves are shaken and dropped on a heated hoiro brazier many times, and the moisture content is brought down by 30%.

(2) Kaiten-momi (rolling and kneading): The leaves are rolled from side to side and kneaded on the hoiro brazier to reduce the moisture content that remain in the interior and veins. The tea craftsmen have to continue through three levels of pressure put on the leaves; light, heavy, and kneading. In this process, the cell walls of the leaves are broken so that the tea leaf components are easily oozed out when hot water is poured in brewing.

- In Haburui, the surface of the leaves dries, but moisture remains in the interior and veins. If the craftsmen continued to shake the leaves as they are, the outside of the leaves will dry too much and break up. Suffcient rotation squeezes to exude moisture inside the leaves.

(3) Momi-kiri (rubbing): The leaves are rubbed together back and forth many times in hands. Eventually, the leaves come in the shape of strings. This process requires delicate adjustment of the fingertips.

- After Kaiten-momi, the upper surface of the hoiro brazier is dirty with tea juice and tea astringents, and thus the tea leaves are once taken out before proceeding to Momi-kiri in the middle of the production process (Nakaage) and the surface of the upper part of the hoiro brazier is cleaned.[28] The tangled leaves are unraveled (Tamatoki) in parallel with the cleaning.

(4) Denguri-momi (shaping and stretching): The leaves are gathered up with both hands and they are adjusted and stretched into a needle shape. There is a positive correlation between the shape and the taste. Tea leaves return to their original shape when brewed with hot water. At last, there is an additional process called Kokuri to improve the shape, gloss, and aroma of leaves. At Uji, the side of the leaves in the shape of needles is rubbed against a wooden plate.

It takes about five hours to complete steps (1) to (4) to produce ara-cha. After those processes, ara-cha is put through sieves and roasted. Only a small amount of hand-kneaded tea can be produced, although it takes a whole day from plucking and steaming tea leaves to kneading and roasting. The production by hand-kneading is thus not profitable. The hand-kneaded tea production is preserved for better understanding the characteristics of Japanese green tea and the traditional skills are shown at the offcial competitions.

[28] The upper part of a hoiro brazier is a tray (jotandai) on which the leaves are handled. Jotandai is a lattice-shaped fence made of bamboo which is covered with a thick sheet of Japanese paper (hoirogami). There are some styles of cleaning the tray. At the end of the cleaning, glue is applied to the surface and dried to make it slippery.

sample

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