

Product Differentiation in Food-Product Markets: Evidence from the Asian Instant Noodles Industry

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Abstract

This study investigates product differentiation, both in vertical and horizontal dimensions, in the instant noodles industry. It first presents theoretical models that predict firms' product differentiation behaviour before testing the theories using the case of instant noodles industries in three Asian countries: Indonesia, India, and Japan. The vertical differentiation behaviour is examined using the ANOVA test followed by the Bonferroni correction to investigate which brands exhibit the most evident vertical differentiation behaviour. The horizontal differentiation strategy is explored using a descriptive analysis method. Using information on the selling prices and product variants of instant noodles leading brands in each country, the empirical findings confirm the models' predictions. The study claims that companies apply the principles of 'minimum differentiation' as their vertical differentiation strategy and 'maximum differentiation' when differentiating horizontally. These strategies are implemented by choosing prices close to each other and producing distinguishable variants from competitors. These findings bring the theories of product differentiation into a real-life application and provide insights into how firms in the food products industry behave in differentiating their products.

Keywords

Firm behaviour, food-product industry, horizontal differentiation, instant noodles market, product differentiation, quality differentiation.

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Introduction

Throughout its nearly 4000 years of history, noodles have experienced many changes in quality and variety. Noodles have undergone a long history in Asian civilisation, dating back as far as the Chinese Han dynasty, all the way to the mass production using machinery during the Industrial Revolution, to the invention of instant noodles as fast food by Taiwanese–Japanese Momofuku Ando in 1958 (Zhang and Ma, 2016). The last discovery has since created a revolution in the world's eating habits, such that people worldwide accept instant noodles as an economical energy food. The popularity of instant noodles can be attributed to their characteristics such as flavour, nutritional value, convenience, safety, extended shelf life, and affordability (Gulia et al., 2014). Not only in Asia, but instant noodles are also widely consumed in countries in which noodles were not part of their traditional diet, such as the United

States, Russia, Brazil, Nigeria, and Mexico, proving that the wheat-based product continues to stimulate international trade beyond Asia (Hou, 2010). The globalisation of noodle products and other wheat-based foods continues to drive international trade in the world's most cultivated grains, measured by harvested acreage (McKee, 2009).

In its continent of origin, instant noodles play a significant importance in the Asian diet as the product is consumed massively and considered part of the staple food. Noodles make up a significant portion of their wheat flour consumption, ranging from 20% to 50% (Hou, 2010). The industry is considered a fascinating business in Asia due to its ubiquitous presence and high demand. According to the World Instant Noodle Association (WINA), Asian countries are the primary consumers of instant noodles. The data from WINA (2023) suggests that in 2022, China has the highest instant noodles consumption,

with a total demand of 45,070 million servings (MS), followed by Indonesia (14,260 MS), Vietnam (8,480 MS), India (7,580 MS), and Japan (5,980 MS).

Given the importance of instant noodles in society, comprehending the industry's market landscape is arguably essential for various stakeholders. It aids market participants within the instant noodles industry in devising optimal competitive strategies and assists prospective entrants in gaining insights into the market dynamics before making entry decisions. Most importantly, understanding the issue provides policymakers with valuable information for implementing suitable measures within an oligopolistic market setting.

Like other products with a significant presence in the market, instant noodle producers behave strategically to secure a market share, one of which is by differentiating their products. Various kinds of instant noodles can be observed with different flavours, packaging, and prices. This study explores the product differentiation behaviour of instant noodles companies, focusing on three Asian countries with substantial instant noodles consumption: Indonesia, India, and Japan.

This study uses economic theoretical models to predict the empirical outcomes with a particular application in the processed food industry. Theoretically, the primary purpose is to predict how firms behave in their product differentiation strategy to maximise their profits and strengthen their market positions. The theoretical part presents the models of the principles of minimum and maximum differentiation. The former shows how firms produce products that are as similar as possible and compete aggressively, while the latter claims the opposite, that firms ease competition by producing goods that are distinct from each other. The theoretical analysis is then tested empirically by exploring the product differentiation behaviour of instant noodle leading firms in the three Asian countries using survey data of their selling prices and product variants.

Product differentiation can be implemented along two dimensions: vertical and horizontal differentiation (Mérel and Sexton, 2012). Vertical differentiation aims to create products that differ from competitors' brands in terms of quality, while horizontal differentiation refers to attempts to create or add unique features to a product. Differentiation can be achieved through Research and Development (R&D). Vertical and horizontal differentiation are elaborated theoretically

by the models in this paper and related to its application in the Asian instant noodle industry using both empirical and descriptive methods.

Imperfect competition is formed by the type of market model, which subsequently affects product price and profit margin (Severová et al., 2011; Choi, 2019). Typically dominated by only a few big firms owning significant market shares, the instant noodles industry can be classified as oligopolistic (e.g., Ueda and Watanabe, 2023; Dewi, 2016; and Kesavayuth, 2001). Nevertheless, the industry exhibits some features of a monopolistic competition market, characterised by high product differentiation (e.g., Chen and Zhen, 2022; Shim et al., 2019; and Wareewiboon, 2004).

Firms conduct product differentiation to soften competition and gain a larger market share by making their products distinguishable from and preferred to other similar products. Differentiation strategies play a crucial role in monopolistic competition markets, as firms attempt to attract consumers to purchase their products instead of other similar products available in the same industry. Product differentiation benefits consumers by providing more available options through the increased variety and producers by increasing their competitiveness and easing competition in the market. This paper discusses the underlying theories of product differentiation using the Hotelling model and applies the model to the context of the processed food products industry, taking the specific case of the instant noodles industry in Asia.

The central proposition of our study suggests that businesses tend to follow a particular strategy when making choices regarding the quality and features of their products. Specifically, it hypothesises that companies often opt for minimal differentiation in quality while pursuing maximum differentiation in product features. The minimum differentiation principle in quality implies that companies aim to offer a certain level of quality that is competitive with other products in the market but does not go significantly beyond that level. The maximum differentiation principle for features suggests that companies focus on differentiating their products through unique and distinctive features. This hypothesis primarily draws its support from the research findings of Economides (1989), which will be discussed in the next section.

While many economic models have been developed, few have considered their applicability in the food-product industry. Among the limited

number of studies, Kostovčík et al. (2020) applied the oligopoly model with a dominant company in the viticulture industry to explain market dominance and price leadership in the sparkling wine market in the Czech Republic. Also using the model of oligopoly with a dominant company featuring competitive fringe firms, Šrédľ and Mikhalkina (2014) used the model to explain the role of changes in consumer preferences in the context of the oligopolistic multinational chains of fast-food restaurants in the country, particularly when a new company enters the market. They also examined further the presence of market dominance in the industry. In contrast to those papers that focus on the nature of the market structure of the relevant food products, this paper highlights the role of product differentiation in a food product market.

Another study by Severová et al. (2011) briefly discussed the oligopoly model with differentiated products characterised by competition in price and non-price dimensions. They empirically studied the food product market in the Czech Republic and claimed that competition among chain stores is rather intense so that there is no market dominance by an individual chain store. However, product heterogeneity in oligopoly was not the focus of the analysis, so product differentiation was not discussed extensively in the paper. Yet on the empirical side, similar to the method used in this paper, Prášilová et al. (2011) used the ANOVA method to analyse the price behaviour of several agricultural products in the Czech Republic and showed that duopolistic reactions are apparent among leading chain stores. Svoboda and Kopecká (2017) applied the Sweezy model to explain the price rigidity of private labels, particularly pork meat, among chain stores in the Czech Republic. They provided evidence of some chain stores that reciprocated the price decreases of their competitors while keeping their prices unchanged when the competitors increased their prices. In contrast to the above papers, this present study looks at the innovative side of processed food production and focuses on the instant noodles industry.

In the context of international trade, Soukup et al. (2014) applied the framework of monopolistic competition to show how entry by firms through international trade of agricultural products leads to the expansion of the market, an increase in the variety of available products, and a decrease in farmers' cost as the government subsidises more for farming.

Saitone and Sexton (2010) gathered recent studies on food product quality and differentiation and reviewed modelling approaches for studying competition in the agricultural-product markets. They then investigated the role of collective action and self-regulation in influencing product quality and differentiation. Dong et al. (2023) have also associated the differentiated nature of food products with the unusual relationship between market concentration, market power, and market prices in the industry. In particular, using the Dixit-Stiglitz model of monopolistic competition, they provided a theoretical explanation of a rising market concentration without being followed by greater market power and higher prices, which is against the common assumption. This finding was confirmed by empirical evidence in the food retail industry in the US. Market concentration and competition in the food industry have also been discussed by, among others, Bredahl (2019), Cotterill (2019), Clapp (2021), Wood et al. (2021), and Distanont and Khongmalai (2020).

Turning to the purely empirical stream, Jati and Premaratne (2017) used the Multivariate BEKK-GARCH Model to examine the volatility behaviour of the global price of several kinds of staple food. The study shows that a staple food's own-volatility spillover is relatively significant for all food prices, with sugar exhibiting the largest own-volatility spillover effect. It also investigates the price behaviour of those groups of staple foods around the food crisis. In the context of the Israeli food industry, Reiss (2014) explores the possible channels and explanations behind the decreasing profitability of the food industry in the country.

The economic literature on staple food is admittedly underexplored. Moreover, existing research appears outdated and drawn to the African context. For example, Tschirley et al. (1996) explore the various factors that influence the impact of providing yellow maize food assistance on the cultivation of maize as the primary crop in Mozambique; Jayne and Jones (1997) discuss grain marketing and pricing policy in Eastern and Southern Africa; and Haggblade and Dewina (2010) focus on staple food prices in Uganda. Yet, in the African setting, more recent studies relate the staple foods market and trade policy, such as Badiane and Odjo (2016) and Fabinin (2022). Among the few in the Asian context include Ellis (1993) with the case of rice in Indonesia, Huang and Bouis (2001) with the Taiwanese food case, and Dawe (2002) in a broader context of the world rice market. None of the above studies discusses staple

food in relation to the oligopolistic market structure and product differentiation behaviour, giving an avenue to this paper to fill in the sparse gap.

Several studies have investigated the presence of instant noodles and their roles in present-day societies. For example, Errington et al. (2013) conducted a thorough study on the social aspects of noodles and the industry in Japan, the United States, and Papua New Guinea. As a food product with a significant role in society due to their practicability and affordable prices, instant noodles have also been debated whether they are good for health. Like other ultra-processed foods, instant noodles usually contain artificial food colours, flavourings, and certain preservatives (Sikander et al., 2017), high calories, added sugar, sodium, and unhealthy fats, while being poor in fibre, protein, and micronutrients (Popkin et al., 2021), all of which may have adverse effects on health in the long term. Much innovation has been conducted in the industry, especially in improving product quality and nutrition levels. Researchers are currently making diligent endeavours to enhance the composition, prolong the storage capability, and advocate for the widespread fortification of instant noodles (Gulia et al., 2014). As discussed later in this paper, instant noodle companies, both incumbents and new entrants, have also attempted to optimise the potential of instant noodles by enhancing their nutritional attributes. While substantial attention has been devoted to studying instant noodles' social and health aspects, there appears to be limited attention on the economic side of the industry. This study fills in the gap in the literature by exploring the behaviour of instant noodle companies in managing the market competition by differentiating their products strategically.

Material and methods

The research question of this study is how firms in the food industry behave strategically in managing market competition by differentiating their products. This section first provides the theoretical models based on which the hypotheses on the empirical approach are formulated. Then, it elaborates on the method used in testing the hypotheses.

Product differentiation models in an oligopoly

We mainly use the Hotelling model to explain product differentiation in this study. The Hotelling model is developed in the framework of a physical spatial model but is well adjustable to fit

a non-spatial framework of product differentiation. The model derives a claim that duopolistic firms agglomerate at the centre of a line market segment. In the non-spatial framework, this result is interpreted as firms producing homogeneous goods. In other words, according to the Hotelling model, under certain assumptions, competing firms produce goods that are as similar as possible, which is known as 'the principle of minimum differentiation.' This claim was challenged by d'Aspremont et al. (1979), who use a quadratic transportation cost and show a contrasting result that firms locate as far away from each other as possible, which implies the prevalence of 'the principle of maximum differentiation.' We show the relevance of both results to the specified food product industry in the next section.

Hotelling's model of product differentiation is summarised as follows. Two firms, A and B, are located separately somewhere at a line market segment of unit length, along which consumers are uniformly distributed. Firm A is located at a distance of a from the line starting point, and Firm B is at a distance of b from the endpoint. Firms' locations represent the type of products they produce, and consumers' locations represent their product preferences. Consumers incur a disutility cost for every purchase from any firm, which, in the spatial framework, is referred to as a transportation cost. A marginal consumer \hat{x} , who is located between the two firms, is indifferent between purchasing from either firms A or B, such that:

$$p_A + t(\hat{x} - a) = p_B + t(1 - b - \hat{x}) \quad (1)$$

where p_A and p_B are prices offered by firms A and B, respectively, and t denotes the disutility cost. The marginal consumer is, hence, defined by:

$$\hat{x} = \frac{1}{2} \left[\frac{p_B - p_A}{t} + 1 + a - b \right] \quad (2)$$

Since consumers are uniformly distributed along the line segment, \hat{x} represents the demand for firm A's product, and $1 - \hat{x}$ for firm B's. We assume that the marginal production costs for both firms are zero. The profit functions of the firms are, thus, as follows:

$$\pi_A = p_A \hat{x} \quad (3.1)$$

$$\pi_B = p_B (1 - \hat{x}) \quad (3.2)$$

The game structure consists of firms choosing locations in the first stage and competing on price in the second stage, which is solved using

backward induction. In the second stage, solving the profit maximisation problems simultaneously with respect to prices gives the equilibrium prices as follows:

$$p_A^*(a, b) = t \left(1 + \frac{a-b}{3} \right) \quad (4.1)$$

$$p_B^*(a, b) = t \left(1 + \frac{b-a}{3} \right) \quad (4.2)$$

Turning to the first stage, substituting the equilibrium prices in (4) into the profit functions in (3), we obtain the reduced profit functions as follows:

$$\pi_A^*(a, b) = p_A^*(a, b) \hat{x}(p_A^*(a, b), p_B^*(a, b), a, b) \quad (5.1)$$

$$\pi_B^*(a, b) = p_B^*(a, b) (1 - \hat{x}(p_A^*(a, b), p_B^*(a, b), a, b)) \quad (5.2)$$

It is easy to show that the first derivatives of the reduced profit functions with respect to their location are greater than zero, that is, $\frac{\partial \pi_A^*(a, b)}{\partial a} > 0$, $\frac{\partial \pi_B^*(a, b)}{\partial b} > 0$. It implies that firms benefit by moving

closer towards the center of the line market segment. There are two countervailing effects in the firms' location decisions: the hinterland effect and the competition effect. The hinterland effect pulls the firms toward the centre of the line market segment to increase their market shares, whereas the competition effect pushes them to move far away from each other to reduce competition. The hinterland effect is stronger than the competition effect, so the firms move toward the centre of the line to increase their hinterland and eventually agglomerate at the middle-of-the-line market segment. In the product differentiation framework, this result is interpreted as the firms producing products that are as similar as possible and capturing the consumers whose preferences fall within their own hinterlands. This agglomeration equilibrium is known as the 'principle of minimum differentiation.' This theory becomes the basis for the formulation of one of the hypotheses of the empirical analysis, that is, that firms choose product qualities that are as close to their rival as possible.

D'Aspremont et al. (1979) challenge Hotelling's finding and claim that agglomeration cannot be sustained in equilibrium as firms undercut each other. Instead, using a quadratic disutility (transportation) cost, they find the opposite result, that firms locate as far away from their rival

as possible to reduce the intensity of competition. When the disutility cost is quadratic in the distance, the marginal consumer is characterised by:

$$p_A + t(\hat{x} - a)^2 = p_B + t(1 - b - \hat{x})^2 \quad (6)$$

$$\hat{x} = \frac{1}{2(1-a-b)} \left[\frac{p_B - p_A}{t} - a^2 + (1-b)^2 \right] \quad (7)$$

Following the same procedure as in the Hotelling model, we find that the equilibrium prices under quadratic disutility cost are as follows:

$$p_A^*(a, b) = \frac{t}{3} [(2-b)^2 - (1+a)^2] \quad (8.1)$$

$$p_B^*(a, b) = \frac{t}{3} [(2-a)^2 - (1+b)^2] \quad (8.2)$$

We substitute these equilibrium prices into the firms' profit functions to obtain the reduced profit functions as before. Deriving the reduced profit functions with respect to each firm's location, we find that a firm's profit is decreasing in its location, that is, $\frac{\partial \pi_A^*(a, b)}{\partial a} < 0$ and $\frac{\partial \pi_B^*(a, b)}{\partial b} < 0$.

Therefore, an increase in a is not beneficial to firm A, nor is an increase in b to firm B. At optimum, firms A and B choose $a = 0$ and $b = 0$, respectively, so that firm A is located at the starting point and firm B at the endpoint of the line segment. The use of quadratic transportation cost generates the so-called 'principle of maximum differentiation', under which firms produce products that are as distinguishable as possible to reduce the competition in the market. This theory is the ground for the second null hypothesis of the empirical approach, that firms differentiate their products to be as distinguishable from their rivals' products as possible in terms of product characteristics.

Economides (1989) combines horizontal and vertical differentiation in a model by integrating quality dimension into Hotelling's model to analyse the impact of quality variations on the choices of the varieties produced. The result shows that the principles of minimum differentiation prevail for quality choice and maximum differentiation for features. We adopt this proposition as the hypothesis of our study, that is, competing firms produce products that are similar in quality but differ in characteristics. As confirmed by the following empirical analysis in this study, both the principles of minimum and maximum differentiation are valid in the context of the Asian instant noodles industry, depending on the measures used to define product differentiation.

Soukup and Šrédľ (2011) is related to this paper in the use of the Space Model. However, we employ the model for a completely different purpose. Although they mentioned how the model could be used to analyse product differentiation, their discussion contexts were mainly in the physical space. In contrast, we apply the model to a non-spatial framework to explain product differentiation, especially horizontal differentiation, as reflected by the product variety in the instant noodles industry.

Research method and data collection

We analyse the cases of product differentiation of instant noodles in three Asian countries: Indonesia, India, and Japan. Apart from data availability reasons, these three countries are chosen to be the subject of this study due to their positions as among the countries with the highest production and consumption of instant noodles in Asia. Recalling the data from WINA (2023) in 2022, Indonesia is placed as the second country with the highest instant noodles consumption with a total demand of 14,260 million servings (MS), India is the third with a demand totalling 7,580 MS, and Japan in the fourth position with a total demand of 5,980 MS. Not to mention, these countries are also among the leading exporters of noodles with a significant presence in the global market: Indonesia with its Indomie and Mie Sedaap, India with its Maggi, and Japan with its Nissin noodles. According to Volza's Instant Noodles Exporters and Suppliers directory in 2023, as of June 6, 2023, 181 active instant noodles exporters in Indonesia were exporting to 528 Buyers. As of August 9, 2023, India has 307 active instant noodle exporters supplying their products to 826 buyers. In the same year, there were 502 active instant noodles exporters in Japan, exporting to 650 Buyers.

The data is obtained mainly through the official website of each brand, leading e-commerce platforms in each country, statistic agencies, research papers and newspaper articles. Data for variants and net weights are readily available on each brand's official website. We consider five market leaders in terms of market share in each of the three countries, making a total of fifteen brands. In Indonesia, the brands include Indomie, Mie Sedaap, Sarimi, Supermi, and Mie Gaga. In India, the considered brands are Maggi, Sunfeast Yippee, Wai Wai, Patanjali, and Top Ramen. In Japan, we have Nissin, Toyo Suisan, Sanyo Foods, Myojo, and Acecook. Each company

owning the brand mentioned has official websites on which detailed information on the company profile and their products can be learned.

Nearly all these companies classify their instant noodle products, list all available variants, and provide details of each variant. The information available typically includes the net weight, main features, ingredients, nutritional and allergen information, and sometimes, the recommended retail price of each variant. The information on variants is then used to do an online search on the average retail price of every variant during the survey period of this study, between January 2021 and July 2022, on leading online marketplaces in each country. At least one marketplace typically provides a reference for the retail price of each variant. When more than one marketplace provides different price references, we take the average of the prices. The data for market shares of each brand in each country is obtained from various sources, such as research papers, newspapers, websites, and local statistics agencies, which are stated explicitly in the corresponding parts. Obtained from various sources, the market share data projects each brand's approximate market dominance in each country with relative accuracy.

We narrowly define instant noodles as pre-cooked or dried noodles characterised by flavouring powder and/or seasoning oil included in the package. We use the hierarchy of instant noodles in this study to classify the products. First, at the country level, we select five leading brands that dominate the instant noodles market in each country based on their market shares. Those brands may belong to the same or different companies. Each brand has several variants, which we also call products or flavours. We then perform the analysis at both the country and brand levels. Two dimensions of product differentiation are explored: vertical and horizontal differentiation. Vertical differentiation refers to product quality, and horizontal differentiation refers to product characteristics or features other than quality. The measure for each variable will be explained in more detail below.

The main claim is that both the principles of minimum and maximum differentiation discussed in the theoretical models above are valid, depending on the dimension used to measure differentiation. The primary hypothesis of the empirical analysis is that companies implement the principles of minimum differentiation for quality choice and maximum differentiation

for feature choice. This hypothesis is mainly based on the findings of Economides (1989), discussed in the previous section.

One of the challenges of measuring vertical differentiation is that product quality can be subjective. Key quality aspects for instant noodles typically include their colour, taste, texture, cooking performance, rehydration rates during final preparation, and whether they develop a rancid taste after prolonged storage (Gulia et al., 2014). These characteristics, however, are hard to measure. Price is readily available information and can be a good proxy for quality as they tend to go proportionally. Companies need a higher marginal cost to produce a better-quality product, leading to a higher product price in the market. The use of price as a signal of quality has also been advocated by several studies in the literature, both theoretically (e.g., Wolinsky, 1983; Bagwell and Riordan, 1991; and Chen et al., 2020) and empirically (e.g., Verma and Gupta, 2004; and Hwang et al., 2006). In this study, we use net price and price-weight ratio measures to quantify the degree of vertical differentiation. Net price is the average net price of products belonging to each brand in each country. This information is obtained by gathering the prevailing retail price of each variant within a specific brand, and the total retail prices of variants of the brand are then averaged over the number of variants in that brand within the observation period. Meanwhile, the price-weight ratio is the average net price per gram of products belonging to each brand in each country. Accordingly, this information is presented by dividing the prevailing retail price of a variant by its net weight, totalled with variants of the same brands, and averaged over the number of variants within the specific brand during the observation period.

The null hypothesis for the vertical differentiation analysis is that companies produce instant noodles with similar quality; that is, the average prices and prices per gram across brands of instant noodles in a country are equal. In other words, the price differences across instant noodles are insignificant. We expect this result to hold especially for the two leading brands in each country in its relevance to the duopolistic model we use in the theoretical analysis. For this purpose, we apply the one-way Analysis of Variance (ANOVA) test to compare the means of prices and prices per gram across brands.

ANOVA is a statistical technique used to compare the means of more than two groups under the same underlying assumption as the *t*-test.

ANOVA examines how much variation exists between the means of different groups (referred to as between-group variance) compared to the average variation within each group (within-group variance). ANOVA focuses on the positions of the distributions represented by these means. Rather than directly comparing many groups' means when dealing with a large number of means, ANOVA analyses the variance among these group means, making it a more convenient way to assess their relative positions (Kim, 2014).

After the ANOVA test, we perform the *Bonferroni correction* to investigate price differences between brands to examine which brands exhibit the largest price difference. We only provide the *Bonferroni correction* results for prices per gram, which drives most of our findings. The Bonferroni correction is employed to adjust probability (*p*) values in response to the increased risk of having a type I error when conducting multiple statistical tests. This correction finds common usage in various scenarios, with its primary applications being the adjustment of experiment-wide error rates in the case of multiple *t*-tests or as a *post-hoc* procedure to rectify the family-wise error rate after conducting an analysis of variance (ANOVA). The Bonferroni correction should be considered when: (1) one needs to assess a single test for the 'universal null hypothesis' (H_0) that all tests are not significant, (2) it is crucial to minimise the risk of a type I error, and (3) one is dealing with a substantial number of tests without pre-established hypotheses (Armstrong, 2014).

We use *Stata* in conducting the statistical analysis. For the groups to be comparable, we focus on 'pack' instant noodles as the most common type in the market in the vertical differentiation analysis. Hence, in the meantime, we eliminate 'cup' (bowl) noodles from the analysis, which have different characteristics and may result in unparalleled comparison.

For horizontal differentiation measures, we use various features, including flavours (varieties), nutrition facts, and ingredients. Flavours refer to the variants produced by each brand listed on their website within the observation period. Nutrition facts correspond to how healthy and nutritious a variant is labelled by the producing brand, usually indicated by its main ingredients. Ingredients refer to the inputs used in producing a particular variant, often associated with whether it contains substances that could adversely affect health, such as MSG and preservatives.

In this case, size (weight) is not considered a form of differentiation, as it does not change substantially a brand's features. Hence, a brand's products with the same flavour but different sizes (weight) are considered one variety. Due to the complex nature of firms' behaviour when differentiating horizontally in the instant noodles' context, the problem associated with horizontal differentiation is explored descriptively using a qualitative method for each of the three countries. The qualitative method is proven useful in exploring the aspects of the problem that cannot be captured by econometrics and economics theory, which are often insufficient to provide a plausible explanation behind certain social phenomena. Economists generally understand qualitative research methods to refer to data gathering, which subsequently takes not a numerical but a verbal form and cannot be analysed econometrically but only with the help of other techniques (Starr, 2014).

Results and discussion

This section explores product differentiation in the instant noodle industry in vertical and horizontal dimensions. As will be presented next, the instant noodles market appears to be highly concentrated, with only a few firms holding significant market shares in each country, resembling oligopoly characteristics. Other than the top five brands mentioned in each country, some smaller firms form a competitive fringe, typically holding insignificant market shares. Due to data unavailability, however, these competitive fringe will not be discussed here. The analysis results for each of the three countries are discussed separately for vertical differentiation and combined for horizontal differentiation.

Vertical differentiation

Indonesia

Generally, Indonesian instant noodles have a moderate aroma and a mouthfeel of salty, umami and spicy taste. The favourite spices include curry flavours, white pepper, garlic, and onion, while vegetable, chicken, seafood, beef, and shrimp flavours with chilli condiments or sweet soy sauce are in favour. Regardless of the brand, fried noodles called "Mie Goreng" are the most popular among Indonesian consumers. Since the majority of the population is Muslim, most products are halal (Guo, 2020).

According to Top Brand Award, as cited in Roisah et al. (2021), based on the share of sales, the instant noodles industry in Indonesia

in 2020 was dominated by Indomie with a market share of 72%, Mie Sedaap (18%), Sarimi (4%), Supermi (3%), and Mie Gaga (3%), rounded into integers. Indomie, Supermi, and Sarimi belong to the same company, Indofood Sukses Makmur; Mie Sedaap is a brand of Wings Food; and Mie Gaga is owned by Jakarana Tama. Although Indomie is the market leader in the Indonesian instant noodles market in terms of market share, the first mover in the country's instant noodles industry is Supermi. According to Anggraeni (2023), Supermi was first introduced in 1968, followed by Indomie two years later, which instantly captivated consumers with its chicken broth soup flavour. Sarimi entered the industry as a new player in 1982, and the three companies established a joint venture under the name PT Indofood Interna Corporation in 1984, which later became PT Indofood Sukses Makmur in 1994. Mie Sedaap, which comes second in market leadership in market share, was introduced twenty years ago by WingsFood, a subsidiary of Wings Group (Oswaldo, 2022). In the same year, Mie Gaga started its market penetration under PT Jakarana Tama by Djajadi Djaja, the inventor of Indomie, but no longer owned the company share (Sabandar, 2023).

On the vertical dimension, since their establishments, these brands have competed fiercely to protect their market segments by choosing their product prices strategically. Table 1 compares product prices across instant noodles brands in Indonesia using the ANOVA test and Bonferroni correction. According to the ANOVA test, using net price as a quality measure, the differences in the means of product prices across brands are insignificant. This result implies that the firms set their average prices close to their rivals, so the principle of minimum differentiation prevails.

Using the price-weight ratio measure, however, the analysis shows that the means of prices per gram across brands are not equal at the 5% significance level. Performing the Bonferroni correction reveals that a significant price difference arises between Indomie and Sarimi. Sarimi targets a different market segment by enlarging its product sizes, resulting in a lower average price per gram than its rivals. The brand managed to secure around 4% market share using this strategy. Focusing on the two market leaders, Indomie and Mie Sedaap, we show that the difference in the means of prices per gram is insignificant. Therefore, we can conclude that the principle of minimum differentiation is valid for vertical differentiation in the Indonesian instant noodles industry, especially for the two largest market leaders.

Analysis of Variance (ANOVA)				
Source			F	Prob > F
Between groups (Net Price)			1.00	0.416
Between groups (Price per Gram)			2.97	0.025**
Bonferroni correction (Price per Gram)				
Row Mean-Col Mean	Indomie	Mie Gaga	Mie Sedaap	Sarimi
Mie Gaga	-1.281 (1.000)			
Mie Sedaap	-2.661 (1.000)	-1.380 (1.000)		
Sarimi	-6.262** (0.027)	-4.981 (0.446)	-3.601 (1.000)	
Supermi	-5.790 (0.444)	-4.509 (1.000)	-3.129 (1.000)	0.471 (1.000)

Notes: *** denotes significance at the 1% levels, ** at the 5% levels, and * at the 10% levels

Source: Analysis output based on Instant Noodles Prices Survey in Indonesia conducted by authors

Table 1: ANOVA test and Bonferroni correction for the Indonesian Instant Noodles Industry.

India

According to Guo (2020), India's most popular instant noodle flavours include curry (masala) and chicken tikka. Approximately 60% of the Indian population adheres to a vegetarian diet for religious purposes. As a result, Indians have a preference for vegetable and tomato-based soups as their most commonly consumed soup noodles.

Various reports consistently place Maggi and Sunfeast Yippee noodles as the market leaders in the Indian instant noodles market. According to Nielsen data, as cited by Anand (2017), the Indian instant noodles market was led by Nestle with its Maggi product, accounting for around 60% of the market. The leading competitor was ITC, with its Sunfeast Yippee noodles commanding a 22% market share (Malviya, 2018). More recent reports, such as by Gill (2021) and Buildd (2022), also appear to support the market leadership of these two brands. The market shares of smaller competitors were rather inconclusive; however, Statista (2020) suggests that other brands that managed to catch up include CG's Wai Wai noodles, Patanjali by Patanjali Ayurved, and Top Ramen by Nissin. Other sources, such as Madhukalya (2017), Dsouza (2021) and George (2023), also report that Wai Wai noodle has grown to above 20%, overtaking Sunfeast Yippee. However, for the analysis, we will assume that the former holds.

Maggi is the first mover in the Indian instant noodles market, introduced in 1983 by Nestlé, the renowned Swiss multinational. With some repositioning after its launch, Maggi dominated India's instant noodles market with over 90%

market share, which persisted for 25 years (Buildd, 2023). The ban on the product due to alleged lead content and labelling issues in 2015 changed the monopoly power, paving the way for new entrants and market share growth for existing players. The clear standout in this scenario appears to be ITC's Sunfeast Yippee (Anand, 2017), which entered the market in 2010, creating a notable disruption in the country's instant noodles industry. Wai Wai, introduced in India in 2003 and jointly owned by the Thai Preserved Food Factory and Nepal's Chaudhary Group, also appeared as a formidable rival to Maggi (Market Feed, 2021). Another significant player in the Indian instant noodles market is Patanjali's Atta Noodles, introduced after the ban and achieved a remarkable growth of 1.3% in just under two years (Anand, 2017). Indo Nissin Foods made its foray into the Indian market in 1991 by introducing its instant noodle brand, Top Ramen, which initially struggled to establish a significant presence in the industry and went on a nearly eight-year hiatus in 2002 and later embarked again on a fresh attempt to compete in the expanding instant noodles sector (Bhattacharyya, 2011).

Over the years, these brands have also used various strategies to secure a market share in the highly concentrated industry. Price comparison of the products under these brands is presented by the results of the ANOVA test and Bonferroni correction for the Indian instant noodles industry illustrated in Table 2.

Similar to the result for the Indonesian case, using net price as a measure of quality shows the prevalence of the principle of minimum differentiation

Analysis of Variance (ANOVA)				
Source			F	Prob > F
Between groups (Net Price)			0.27	0.893
Between groups (Price per Gram)			5.42	0.001***
Bonferroni correction (Price per Gram)				
Row Mean-Col Mean	Maggi	Patanjali	Top Ramen	Wai Wai
Patanjali	-0.100*** (0.003)			
Top Ramen	-0.034 (1.000)	0.066 (0.207)		
Wai Wai	-0.078*** (0.007)	0.022 (1.000)	-0.044 (0.727)	
Yippee	-0.035 (1.000)	0.065 (0.152)	-0.001 (1.000)	0.043 (0.558)

Notes: *** denotes significance at the 1% levels, ** at the 5% levels, and * at the 10% levels

Source: Analysis output based on Instant Noodles Prices Survey in India conducted by authors

Table 2: ANOVA test and Bonferroni correction for the Indian Instant Noodles Industry.

in the quality choice of instant noodles companies in India. When using the price-weight ratio, it also replicates Indonesia's result, significant differences in the means of prices per gram across brands at the significance level of 1%. The Bonferroni correction suggests that the differences do not come from the two biggest companies but rather from Patanjali and Wai Wai. In particular, Patanjali and Wai Wai differentiate their qualities from Maggi by lowering their average prices to target the lower market segment. This finding confirms that the two most prominent companies adopt the principle of minimum differentiation in their quality choices, while the smaller competitors implement the opposite strategy to secure market positions.

Japan

Citing Guo (2020), Japanese instant noodles are renowned for their subtle, natural scent and delicate flavour. Emphasis is often placed on the quality of the soup base, frequently featuring a white broth. Pork bone soup, chicken stock soup, seafood soup, and other varieties commonly incorporate soy sauce and flavour enhancers. Traditional Japanese noodle types include Udon, Soba, and Miso. Japan boasts diverse noodles, including those crafted in partnership with local ramen establishments and renowned dining venues, and health-conscious options low in calories, salt, and fat for discerning consumers.

Data from Piece of Japan in 2021 indicates that among the market leaders in the Japanese instant noodles market are Nissin, which took around 44% of the market and made a revenue of 3.13 billion USD, and Toyo Suisan, with its

Maruchan noodles, commanding a quarter of the market share and making a revenue of 2.56 billion USD. The list is followed by Sanyo Foods with its Sapporo Ichiban Noodles (15%), Myojo (8%), and Acecook (8%).

Being the first world's instant noodles, instant ramen by Nissin is both the first mover noodle brand globally and the market leader in terms of market share in the Japanese instant noodles industry. The invention by Momofuku Ando in 1958 was motivated by the food shortage after the Second World War, urging the need for nutritious, inexpensive, and easy-to-prepare ramen dishes (Zelazko, 2023). Surprisingly, despite being the pioneer of instant noodles, Nissin did not appear to monopolise the country's instant noodles market as other players swiftly followed suit with the innovation. Maruchan expanded from its fish storage and distribution venture and ventured into the instant ramen noodle industry three years later, debuting its Toyo Suisan noodles (Maruchan, 2023). According to Sanyo Foods' official website, Sanyo Foods was established in the same year, manufacturing instant noodles and dried noodles at the same time, and the first original Sapporo Ichiban noodles were introduced in 1966. The early 1960s appeared to be a period in which the Japanese instant noodles industry germinated as the industry was deemed lucrative to new and existing business players. According to the company's website, the release of Myojo Flavored Ramen in 1960 by Myojo Foods marked its entry into the instant noodles industry, expanding from dried noodles production that it started ten years earlier. Acecook Japan began its instant

noodles production and introduced 'Beijing Ramen' one year earlier, initially under the company name of Umeshin Seika, focusing on selling soft biscuits.

The Japanese instant noodles industry analysis is not as simple as that for the previous two countries due to the complexity of instant noodles differentiation in the country. Being the origin of instant noodles, the noodles market in Japan is characterised by a distinctively wide variety of instant noodles, which differ not only in the standard dimensions, such as flavour, nutrition, packaging, and price, but also in nature. Several unavailable variants in other countries, such as chilled/frozen ramen and rice noodles combinations, are relatively common in Japan. Moreover, there is substantially more variety of cup instant noodles than pack ones. Consequently, focusing the analysis on the family of pack instant noodles alone may not suffice to explain firms' product differentiation behaviour in the instant noodles industry in the country. Hence, for the Japanese case, we consider both pack and cup noodles and analyse them separately, but we focus on price per gram as the measure of vertical differentiation.

In comparing the price strategies, for the ANOVA test on the family of pack noodles, we include chilled/refrigerated pack instant noodles but exclude frozen ones. While adding to the observation number, this inclusion inevitably leads to less accurate analysis, as chilled instant noodles also seem to exhibit features that are rather different from the regular ones. Moreover, there are very few observations for the Acecook brand since the company mainly produces cup noodles.

The ANOVA test reveals significant differences across the prices per gram of instant noodles in Japan. According to the Bonferroni correction, Toyo Suisan differentiates itself from competitors. Additionally, there is weak evidence that Acecook differentiates from Myojo and Toyo Suisan. The results of the ANOVA test and the Bonferroni correction for the pack noodles category in Japan are not presented here but can be provided on request. Given how imprecisely the products are defined, we turn to cup instant noodles.

Analysis of the family of cup noodles in Japan shows more reasonable results, similar to those of the Indonesian and Indian cases. Table 3 provides the results of the ANOVA test and Bonferroni correction for the Japanese instant noodles industry, with cup noodles as the category of interest. Overall, the ANOVA test shows significant differences in the means of prices per gram across brands. The Bonferroni correction suggests that Sanyo Foods and Acecook differentiate against Toyo Suisan and Nissin, which indicates maximum differentiation. Interestingly, in contrast to the cases of Indonesia and India, the smaller competitors in Japan produce instant noodles of higher quality and aim to attract consumers in the upper market segment, as indicated by their higher average prices per gram. However, the two leading brands, Nissin and Toyo Suisan, appear to implement the principle of minimum differentiation against each other in determining their product qualities, supporting our findings for the Indonesian and Indian cases.

In summary, using prices as the quality measure, we find consistent results regarding firms' vertical

Analysis of Variance (ANOVA)				
Source			F	Prob > F
Between groups (Net Price)			3.39	0.010***
Between groups (Price per Gram)			14.42	0.000***
Bonferroni correction (Price per Gram)				
Row Mean-Col Mean	Acecook	Myojo	Nissin	Sanyo
Myojo	-0.224 (0.122)			
Nissin	-0.453*** (0.000)	-0.229** (0.045)		
Sanyo	0.035 (1.000)	0.259 (0.318)	0.488*** (0.000)	
Toyo Suisan	-0.441*** (0.000)	-0.217 (0.111)	0.012 (1.000)	-0.475*** (0.000)

Notes: *** denotes significance at the 1% levels, ** at the 5% levels, and * at the 10% levels

Source: Analysis output based on Instant Noodles Prices Survey in Japan conducted by authors

Table 3: ANOVA test and Bonferroni correction for the Japanese Instant Noodles Industry.

differentiation strategy for the three countries. In particular, the principle of minimum differentiation prevails in the vertical differentiation of instant noodles, especially for the two leading brands in each country. Brands with smaller market shares appear to strategically discriminate their qualities reflected in product prices to enter and gain a position in the market.

Horizontal differentiation

In the remainder of this section, we discuss descriptively the behaviour of instant noodle companies in horizontally differentiating their products. Most of the information in this section is obtained from each brand's official website. We claim that the principle of maximum differentiation prevails for horizontal differentiation, such that instant noodle companies tend to produce instant noodles with features that are as distinguishable from those of their rivals as possible. Several pieces of evidence support this claim. First, very few to no instant noodle companies produce precisely the same flavour in each country. Second, each brand has at least one unique variant which the brand is famous for, that is completely distinguishable from the products of other brands. Third, many companies attempt to introduce new variants featuring healthier ingredients and higher nutritional content. We discuss this evidence for each of the countries considered above. A table for the summary of the result of horizontal differentiation analysis and the list of the evaluated features for each market is provided in Table 4.

We start with the Indonesian case. Around the execution of this study for this particular part of horizontal differentiation analysis, between January and June 2022, the number of variants listed

on the website of each of the brands considered in the Indonesian case is as follows. Indomie, as the market leader in terms of market share, produced 43 flavours consisting of 28 pack variants and 15 cup variants. Mie Sedaap, as the main competitor, had 21 flavours, seven variants of which are cup noodles. Sarimi and Supermi specialised in pack noodles, with Sarimi producing 15 and Supermi 6 variants. Mie Gaga owned 14 flavours, two of which are cup noodles.

These incumbents strive to maintain their market positions by continually introducing new variants to meet consumers' preferences. Many variants imitate the ingredients of local cuisines, such as Indomie Soto Medan, Indomie Empal Gentong, Mie Sedaap Salero Padang, Mie Sedaap Tasty Ayam Geprek, etc. Meanwhile, some embrace famous international flavours, such as Mie Sedaap Korean Spicy Soup, Indomie Taste of Asia Mi Goreng Bulgogi ala Korea, Indomie Mi Kuah Tom Yum ala Thailand, and Indomie Laksa ala Singapura. Meanwhile, new entrants such as Lemonilo and Fitmee attempt to promote healthier options, often featuring non-MSG, low-caloric, and organic instant noodles as an entry strategy. Clearly, both incumbents and new entrants innovate their variants to be as distant from their rivals as possible.

In India, firms appear to horizontally differentiate relatively less aggressively than those in the Indonesian case, at least for the incumbents. According to each company website during the study analysis, Maggi, even with the largest market share, only had 13 flavours, three of which were cup noodles, while Sunfeast Yippee produced 11 variants, including two cup noodles. Nissin seemed to produce the most variants, totalling

Country/Brand	Differentiation Strategy	Features	Highlighted products
Indonesia Incumbents: 1. <i>Indomie</i>	Imitate the ingredients of local cuisines and/or adopt famous international flavours.	Local and international flavours	Indomie Soto Medan, Indomie Empal Gentong, Indomie Taste of Asia Mi Goreng Bulgogi ala Korea, Indomie Mi Kuah Tom Yum ala Thailand, Indomie Laksa ala Singapura.
2. <i>Mie Sedaap</i>		Local and international flavours	Mie Sedaap Salero Padang, Mie Sedaap Tasty Ayam Geprek, Mie Sedaap Korean Spicy Soup,
3. <i>Supermi</i>		Local-cuisine flavours	Supermi Extra Soto Daging, Supermi Opor Ayam, Supermi Sop Buntut
4. <i>Sarimi</i>		Local-cuisine flavours	Sarimi Goreng Ikan Teri Pedas, Sarimi Instan Gulai Ayam
5. <i>Mie Gaga</i>		Local-cuisine flavours	Gaga Bakmi, Gaga 1000 Soto Mi, Gaga 100 Extra Pedas Kuah Soto
Selected New Entrants: 6. <i>Lemonilo</i>	Promote healthier options.	Made without frying, contains vegetable essences; no additives, preservatives, or artificial food colouring.	Lemonilo Mie Instan Goreng Konjak, Lemonilo Mie Instan Rasa Rendang, Lemonilo Mie Instan Kuah Soto Koya
7. <i>Fitmee</i>		Low-caloric, cholesterol-free, low in sugar, and high in fibre.	Instant Korean Fried Shirataki, Instant Shirataki Soto Flavour, Instant Spinach Noodles Soto Flavour, Instant Shirataki Garlic Chicken

Source: Companies' websites analysed by authors

Table 4: Summary of the Horizontal Differentiation Analysis in each country. (To be continued).

Country/Brand	Differentiation Strategy	Features	Highlighted products
India Incumbents: 1. Maggi 2. Sunfeast Yippee 3. Wai Wai 4. Top Ramen 5. Patanjali Selected New Entrants: 6. Marico 7. Naturally Yours 8. Slurp Farm	Produce several variants resembling local and international cuisines with similar flavours but observable distinguishing features.	Local and international flavours, preparation practicability (served in 3 minutes)	Special Masala Noodles, Maggi Nutrilicious Atta Masala, Maggi Fusian Singaporean Tangy Pepper, Fusian Hongkong Spicy Garlic
		Local flavours and vegan options	Yippee Noodles – Classic/ Magic/Mood/ Saucy/ Masala, Power Up Atta Noodles, My Crazy Chow Noodles Vegetarian, Quik Mealz Veggie Delight
		Local and international flavours, vegetarian options	Atta Noodle Masala Flavor, 1-2-3 Noodles - Veg Masala Flavour, X-PRESS Noodle Masala Delight, Wai Wai Chinese Hakka Veg Noodles
		Local and international flavours, vegetarian options	Top Ramen Noodles - Curry Veg, Top Ramen Noodles – Atta, Vegetarian Masala Noodles, Cup Noodles Italiano, Scoopies Mad Masala
		Local-cuisine flavours	Patanjali Atta Chatpataa Instant Noodles, Atta Classic Instant Noodles, Atta Noodles Chatpata, Atta Noodles Yummy Masala, Green Chilli Atta Noodles, Veggie Atta Noodles, Atta Noodles Dal Tadka
	Introduce healthier options.	Wholegrain oats and wheat ingredients; no maida; not containing preservatives	Saffola Oodles Ring Noodles Yummy Masala
		High in protein, dietary fibre, and calcium; no maida and chemicals; made with 100% whole grains; suitable for vegans; jain friendly (no onion and garlic); no preservatives, artificial flavours, colours, and MSG; Gluten-free variants	Multi millet noodles, Red rice noodles, Gluten Free Spinach Noodles, Gluten Free Grain Noodles, Gluten Free Multigrain Pasta, Quinoa Noodles, Soya Noodles
		Made from natural ingredients (millets); maida-free, no refined sugar, palm oil, preservatives, saturated and trans fat, artificial colours and flavours; not fried.	Instant Millet Noodles: Yummy Masala, Mild Masala, Curry Masala; Foxtail Millet Noodles, Little Millet Noodles
	Japan Incumbents: 1. Nissin 2. Toyo Suisan 3. Myojo 4. Sanyo 5. Acecook Selected New Entrants: 6. Momotaro Shokuhin 7. Kibun Healthy Noodles	Massive numbers of variants; low calorie and reduced sugar content	Vegetable-rich Tanmen Soy Sauce, Nissin Ramen Shop Flavored Vegetables Shio, Nissin RAOH Tanmen soy sauce with plenty of vegetables
		Massive numbers of variants	Maruchan Noodle Making Chicken Gala Soy Sauce, Vegetables are so good!, Wild vegetable random cut soba,
		Lesser known flavours, unique and colourful vegan noodles	Low Carbo Noodles Vegetable Tanmen, Myojo Rocabo Noodles Tanmen with plenty of vegetables, Myojo Delicious Marutto Onion Ramen filled with the flavour of vegetables
		Shorter shelf life and preparation practicability (served in 3 minutes)	Salt Ramen Topped with Vegetable Dashi
		Noodle-less ramen using seaweed; "mochichi" type of Ramen and Yakisoba	Dense Vegetables (Salt Tanmen), Ramen Mottich Vegetable Tanmen Shio
		Production of halal noodles; fresh, safe-to-consume, delicious and additive-free noodles; Gluten-free options	Healthy Ramen, Healthy Inaniwa Style Udon, Healthy Zaru Soba, Halal Nama Ramen With Shoyu Soup, Halal Zaru Chasoba, Gluten Free Ramen
	Strategise on other dimensions.	Sugar-free; only 25 calories per portion; made of tofu lees (soybean fibres), plant-derived cellulose, sodium alginate, konjac yam powder; fat & cholesterol free, gluten-free, dairy-free; free from preservatives; diabetic and vegan friendly; neutral flavour and smell, and smooth mouth feeling	Kibun's Sugar-Free Noodles, Kibun's Tofu-somen—healthy noodles, Isokobachi

Source: Companies' websites analysed by authors

Table 4: Summary of the Horizontal Differentiation Analysis in each country. (Continuation).

29 flavours with only 7 Top Ramen pack noodles. Wai Wai had 18 variants, two of which are cup noodles. Patanjali focused on pack noodles production, owning eight flavours.

Although the market leaders appear to produce several variants with similar flavours, such as masala, horizontal differentiation is still clearly observable. For example, Maggi has Special Masala Noodles, Top Ramen has Vegetarian Masala Noodles, and Sunfeast Yippee has Power Up

Masala. The horizontal differentiation behaviour of new entrants in the Indian instant noodles industry exhibits a similar pattern to those in the Indonesian case. Marico, India's market leader in edible oils, launched its Saffola Oodles in early 2021, pitching it as a healthier option among the existing brands for being made of wholegrain oats and wheat and not containing artificial preservatives. Another new brand, Naturally Yours, promoted several variants of gluten-free noodles, incorporating three

main criteria of their products: no maida (white flour), no chemicals, no junk, and the use of whole grains as the main ingredients. Slurpp Farm, a brand started in 2016, offers similar features.

The Japanese instant noodles industry exhibits a slightly different pattern. Being the origin of instant noodles, massively diverse instant noodle varieties are produced in the country. During the analysis, the two market leaders, Nissin and Toyo Suisan, had 262 and 292 variants, respectively; half of Nissin's listed variants were pack noodles, whereas Toyo Suisan had 171 pack variants. These two companies also produce not a small number of frozen noodles. Sanyo Foods had 50 flavours with only 13 pack variants; Myojo had 98, out of which 24 were pack noodles; and Acecook had 48 with only five pack noodles.

The market is also characterised by the strong market power of a few large companies, which continually innovate and diversify their products. Unsurprisingly, new variants are introduced mainly by the competing incumbents instead of new entrants. Apparently, healthy instant noodles are narrowly defined in the country as those with low calorie and reduced sugar content. While nearly all brands produce varieties featuring such quality, they are evidently presented in different flavours. For example, Nissin RAOH has Vegetable-rich Tanmen Soy Sauce, Myojo has Low Carbo Noodles Vegetable Tanmen, Acecook produces Dense Vegetables (Salt Tanmen), Toyo Suisan produces Maruchan Noodle Making Chicken Gala Soy Sauce, and Sanyo Foods has Salt Ramen Topped with Vegetable Dashi. New entrants, realising the market demand, strategise on another dimension instead. For example, Momotaro Shokuhin, established in 2004, started its production of halal noodles in 2015. Kibun went as far as initiating Sugar-Free Noodles, containing only 25 calories per portion in 2013.

Based on the analysis of horizontal differentiation in the instant noodles industries in the three countries above, we conclude that companies indeed produce variants that are distinguishable from their rivals' products. New entrants typically perform market penetration by introducing healthier alternatives to existing instant noodles in the market, while incumbents often promote variants that embrace the tastes of local cuisines. While, in some cases, incumbents produce variants with similar features, there are always apparent differences among the products, such that horizontal differentiation is always exercised. Thus, the principle of maximum

differentiation indeed prevails along the horizontal differentiation dimension in the Asian instant noodles industry.

Summarising the findings of this study, firms are shown to apply the principle of minimum differentiation when differentiating products vertically by choosing quality levels, as measured by prices, that are similar to one another. They may focus on providing a baseline level of quality to meet customer expectations without overinvesting in quality features that might not provide a significant competitive advantage. When differentiating horizontally, they apply the principle of maximum differentiation by offering features that set their products apart from competitors. Companies seek to create a competitive advantage and attract customers based on these unique attributes. The possible intuition behind these findings is that it may be more cost-effective for companies to compete on features (maximum differentiation) rather than quality (minimum differentiation) because consumers often have various preferences regarding product features. Additionally, achieving significantly higher quality levels may be more challenging and expensive than creating or adding new product features.

Adopting a minimum differentiation strategy in quality choice might be associated with what Shim et al. (2019) discovered by studying how consumers perceive premium and low-priced food items, with particular representations of premium instant noodles and premium yogurt. They show that adding premium to food items increased negative emotions, such as suspicions about quality and price. This notion might discourage firms from competing using price and quality strategy and focus on a variety strategy instead.

Our finding that minimum differentiation strategy in quality choice is especially valid for the two leading brands in each country, however, is different from what Ueda and Watanabe (2023) show. Their evidence on the Japanese data indicates that firms with larger market shares exhibit more frequent and larger price changes than those with smaller market shares. This discrepancy could be attributed to the fact that our study observes prices and, hence, draws an inference on firms' quality strategy only at a particular time, whereas Ueda and Watanabe (2023) made a multiple-period observation.

Our result on the application of maximum differentiation in the horizontal dimension also aligns with Kesavayuth (2001), who studies

the marketing strategies of MAMA as a leading brand in Thailand's instant noodles market in maintaining its leadership position. In Kesavayuth's (2001) study, it is demonstrated that MAMA places relatively less emphasis on pricing due to the stability of its pricing. Instead, the company primarily relies on promotional tactics to compete with rivals by highlighting its brand awareness through social activities. Within the marketing mix, MAMA prioritises product strategies as the most crucial element, as taste holds the utmost significance. Thus, the company ensures consistent taste quality in each production to sustain consumer loyalty.

Conclusion

This study explores the product differentiation behaviour of instant noodles companies in Asian countries. Based on a research question of how firms in the food industry behave strategically in differentiating their products, the analysis produces several novel findings that bring economic theories into real-life applications. Both theoretical predictions, the principles of minimum and maximum differentiation, are proven true depending on the differentiation dimension. In particular, firms apply the principles of minimum differentiation when differentiating products vertically and maximum differentiation when differentiating horizontally. This result is based on the evidence showing that instant noodle companies choose quality levels, as measured by prices, that are close to one another, especially for the two leading brands in each country. It further reveals that brands with smaller market shares in each country tend to exhibit more evident vertical differentiation behaviour. Meanwhile, when determining the variants to produce, companies tend to introduce variants that are distinguishable from their competitors' products. In addition to bringing the product differentiation theories into a real-life application, this study helps explain how firms in the food products industry behave strategically in differentiating their products.

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Understanding such behaviour is arguably necessary for different parties, such as for existing market players in the instant noodles industry in determining the best strategy to deal with their competitors, for potential entrants in learning the market landscapes before deciding on whether or not to enter, and for policymakers in imposing relevant intervention in an oligopolistic market environment. The findings also highlight the importance of the existing theories in the literature as they are proven true in the context of the processed food industry, a barely explored topic in the Economic literature. While providing a rich insight into the industry and the literature, this paper is also subject to some limitations, especially in the limited data used. For future research, it is recommended that a larger and more complete dataset is employed, ideally covering at least the top ten countries with the highest instant noodles consumption worldwide. Moreover, it admittedly uses the information on market share readily available in the respective source instead of processing raw data of each brand's sales in each country and calculating the market share accordingly. A more accurate market size could be redefined, more specifically, using a better-quality dataset. Finally, the reference to Economides (1989) suggests that the hypothesis is grounded in economic theory and previous research, providing theoretical support for these principles of differentiation in the context of business strategy or industrial organisation. However, it is important to note that this hypothesis should also be tested through empirical analysis in other contexts to determine whether it holds across different industries and markets.

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