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(Citation)
Asia Pacific Journal of Marketing and Logistics,33(8):1709-1722

(Issue Date)
2021-08-09

(Resource Type)
journal article

(Version)
Accepted Manuscript

Asia Pacific Journal of Marketing and Logistics, 33(8), 1709-1722, 2021.

Coevolution of a premium segment and product innovation: a case study of the Japanese rice cooker market

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Structured abstract

Purpose— This study aims to provide a comprehensive explanation of the linkage between premium segments and product innovation. While previous literature confirms that product innovation triggers premium segment emergence, and vice versa, there is no satisfactory explanation regarding the underlying mechanisms that drive the mutual shaping of premium segments and product innovation. This paper attempts to address this gap in literature.

Design/methodology/approach— This study employs a cognitive model of technology trajectories and empirically examines the Japanese rice cooker market using a mixed methods approach. The methods used consist of content analyses of newspaper articles and press releases, and case analyses of manufacturers' new product development.

Findings— Content analyses show the emergence of a premium segment within the Japanese rice cooker market as well as a simultaneous change in technology trajectories. Case analyses subsequently reveal the mechanisms that link the premium segment emergence and technology trajectory changes. The analyses also explore this linkage in detail; market actors' technological frames and interpretation processes mediate the mutual shaping of the premium segment and product innovations.

Originality— This study presents quantitative evidence indicating the emergence

of a premium segment and changes in technology trajectories. It provides a qualitative explanation for the linkage between these two phenomena, which may serve as a viable foundation for future research in premium strategy.

Keywords

premium segment; technology trajectory; technological frame; cognitive perspective; pricing strategy; product innovation

1. Introduction

The existence of a premium segment within a product market is an important element for firms to develop and implement marketing strategies. Products within the premium segment, or premium products, are offered at a price that is noticeably and sustainably above the market average (Caldieraro *et al*., 2015; Quelch, 1987; Simon and Fassnacht, 2019; Sultan *et al.*, 2018). Just as Lexus differs from Toyota, or organic foods differ from their conventional counterparts, premium products differ from regular products in terms of quality, technology, design, and service experience (Jonas and Roosen, 2005; Randall *et al*., 1998). However, premium products are not luxury items. They are mass-produced and, hence, are less expensive than luxury products which are characterized by limited production and extremely high prices (Ko *et al.,* 2019; Seo and Buchanan-Oliver, 2015; Simon and Fassnacht, 2019). When a company introduces premium products successfully, it can generate sufficient revenue from mass-marketing higher-priced products (Simon and Fassnacht, 2019).

The existence of a premium segment also shapes strategic opportunities for producers in a target market; it enables them to differentiate their products and avoid price wars (Rangan and Bowman, 1992; Son and Jin, 2019). This phenomenon has motivated strategic management scholars to investigate the triggers of premium

segment emergence (Katz and Boland, 2000; Matthyssens and Vandenbempt, 2008; Quelch, 1987; Rangan and Bowman, 1992). Their research has pointed to product innovation as one of those triggers (Heil and Helsen, 2001; Kim and Mauborgne, 2005; Silverstein *et al.,* 2005).

It is also known that the existence of a premium segment triggers product innovation. The existence of a premium segment signals the existence of quality-sensitive consumers (Dolan and Simon, 1996; Randall *et al.,* 1998; Simon and Fassnacht, 2019). Producers can attract such consumers by improving the perceived quality of products rather than lowering prices (Katz and Boland, 2000; Matthyssens and Vandenbempt, 2008; Silverstein *et al.*, 2005; Widjojo *et al.*, 2019). Thus, producers can invest in technology development based on the expectation of future returns from premium prices.

As shown above, on the bidirectional relationship between the premium segment and product innovation, the research thus far has only focused on each of the directions of the relationship independently but paid less attention to their reciprocal interactions. To understand the coevolution of the premium segment and product innovation, we must not only combine the two-way effects between them but also develop a comprehensive model that explains the mechanisms underlying their relationship. The present study aims to fill this gap.

This study examines an empirical case by applying a cognitive model of technology trajectories (Kaplan and Tripsas, 2008). The cognitive perspective explains the mutual process in which shared cognitive frames shape actors' behaviors, and vice versa (Kaplan, 2011). Given this, Kaplan and Tripsas (2008) developed a model to explain the mutual shaping of a collective technological frame and technology trajectories. The present study employs their model and incorporates the premium segment as part of the technological frame. Then, the

model is illustrated by studying the emergence of a premium segment within the Japanese rice cooker market. It explains the mechanisms underlying the relationship between premium segment emergence and product innovation.

2. Theoretical Background: Cognitive Model of Technology Trajectories

Kaplan and Tripsas (2008) developed a cognitive model of technology trajectories that explains the reciprocal relationship between technological frames and technology trajectories. Technology trajectories, as phenomena, imply that technology has its own direction and imperative of development (Bye and Chanaron, 1995; Dosi, 1982). As the word "technology" is conceptualized as being embedded in a physical product (Kaplan and Tripsas, 2008). Technology trajectories represent the direction of product innovations within the market (Orihata and Watanabe, 2000; Werfel and Jaffe, 2013). Kaplan and Tripsas intended to explain the directions of product innovations by utilizing the interactions between the technological frames of multiple actors and a collective technological frame. A technological frame is the knowledge that actors use to make sense of technology and solve technological problems (Bijker, 1995; Kaplan and Tripsas, 2008; Orlikowski and Gash, 1994). Technological frames shape market actors' behavior toward technology development and product innovations. At the same time, product innovations also affect market actors' recognition of technologies in the market. Thus, technological frames shape technology trajectories and vice versa.

A theoretical foundation of the cognitive model of technology trajectories is the cognitive model of organization, which goes back to March and Simon (1958). The cognitive model of organization assumes that people in organizations have certain cognitive frames by which they understand their environment, make decisions, and act. This model was first applied to explain organizational dynamics in strategy-

making (Porac *et al*., 1995), followed by product category emergence (Rosa *et al*., 1999), and technology evolution (Theoharakis and Wong, 2002). Kaplan and Tripsas (2008) developed the cognitive model of technology trajectories in line with this theoretical foundation (Kaplan, 2011).

Figure 1 is an illustration of the cognitive model of technology trajectories. First, the technology trajectory enables or constrains individual actors' technological frames (Arrow [a]). Actors' technological frames and their interpretations shape the technological frames of others that eventually result in a collective technological frame (Arrow [b]). Simultaneously, the collective technological frame shapes individual actors' technological frames (Arrow [c]), which helps the actors to recognize a specific technology and solve technological problems. Based on these technological frames, actors decide to invest in, develop, or adopt a particular technology. These actions shape the technology trajectory (Arrow [d]). Thus, the collective technological frame and technology trajectory are indirectly and mutually shaped through individual actors' interactions and actions (Arrow [e]). In other words, the indirect relationship between the collective technological frame and technology trajectory (Arrow [e]) is mediated by the direct relationships between the individual actors' technological frames and the other two factors (Arrow [a] – Arrow[d]).

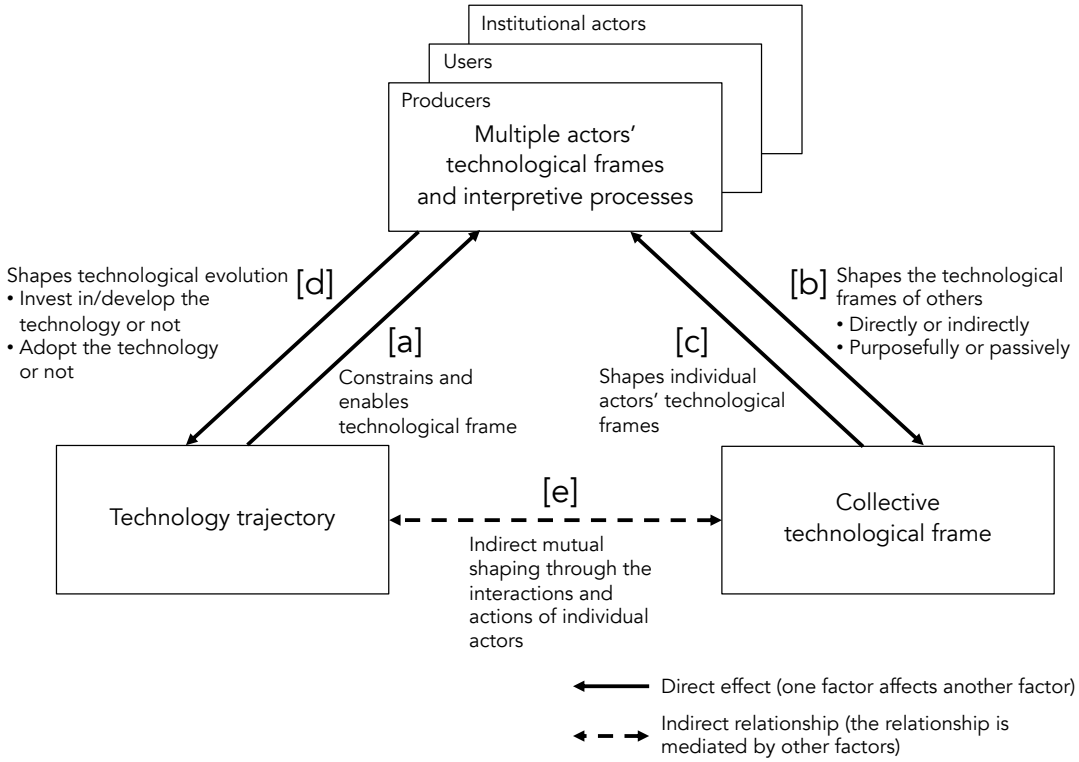

Figure 1 Cognitive model of technology trajectories by Kaplan and Tripsas (2008)

Given the cognitive model of technology trajectories, this study considers price segments as part of the collective technological frame. A technological frame consists of several elements by which the actors categorize a certain technology relative to other technologies and construct criteria to evaluate technologies (Kaplan and Tripsas, 2008). Possible elements of technological frames include goals, key problems, problem-solving strategies, problem solutions, current theories, tacit knowledge, testing procedures, design methods and criteria, users' practice, perceived substitution function, and exemplary artifacts (Bijker, 1995, p. 125). These elements suggest that price segments affect technological frames. The quality and design of each element and their combinations depend on the target price of the technology and the product being developed. For example, when the target price of the product is high, the technology development goal would be superior product

quality, product design would be excellent, and comparable products would be considered as premium products within the market. These considerations raise the following assumption: price segments, particularly the existence of a premium segment, have the potential to work as part of the collective technological frames that shape multiple actors' technological frames and interpretation processes. The remaining sections of this paper examine this assumption.

3. Method

3.1. Research design

This study aims to explain the mechanisms involved in the mutual shaping of a premium segment and product innovation in the market. To this end, a case study method was employed as it is considered the best way to examine complex mechanisms linking multiple phenomena (Yin, 1994). In particular, this study illustrated a theoretical model using an empirical case to consider the underlying mechanisms; it is one of the advantages of using a single case (Siggelkow, 2007).

In this study, the emergence of a premium segment in the Japanese rice cooker market was selected as the case. The rationale for this selection can be explained as follows. First, it appropriately addresses the study objective; that is, it examines the mechanisms of the coevolution of a premium segment and product innovation. As described later, the emergence of the premium segment within the Japanese rice cooker market was a significant event clearly identified through analyses. The study also identified various innovations introduced by Japanese firms to the rice cooker market.

Second, the rice cooker case is an exception and presents an extreme example of price segment dynamics (Flyvbjerg, 2006). In general, products within a competitive market tend to decline in price (Heil and Helsen, 2001). This is

particularly true in the case of Japanese home appliances, which experienced price declines from 1998 to 2006 (Nobeoka *et al.*, 2006). However, within the rice cooker market, products rose in price following the premium segment emergence. Thus, the rice cooker case is a deviant example.

While the above two reasons justify the use of a single case study, the validity of a single case study is often criticized in terms of suitability and generalizability. To address this problem, this paper analyzed the case using a mixed methods approach: quantitative content analyses and qualitative analyses of interviews and documents (Creswell, 2003). The content analyses provided quantitative evidence of the premium segment emergence and technology trajectory change. Simultaneously, qualitative analyses of the interviews and documents were conducted to reveal causal mechanisms linking the premium segment emergence, multiple actors' technological frames and their interpretations, and technology trajectories. Analyzing multiple data sources using both quantitative and qualitative methods increases the trustworthiness and validity of the single case used in the present study (Onghena *et al.*, 2019).

As part of the qualitative analyses of the interviews and documents, this study analyzed two cases of new product development (NPD) by rice cooker manufacturers: *Honsumigama* (model NJ-WS10) by Mitsubishi Electric and *Healsio Rice Cooker* (model KS-PX10A) by Sharp. To select these two cases, the author conducted a pilot study involving multiple case analyses of NPD by four rice cooker manufacturers (Miyao, 2014). Based on the pilot study, Mitsubishi Electric and Sharp were identified as the representatives of the first mover and followers in the premium rice cooker segment, respectively.

3.2. Data collection and analysis

For content analysis of newspaper articles, online newspaper databases were used, including four major Japanese publications: *The Nikkei*, *Asahi Shimbun*, *Yomiuri Shimbun*, and *Mainichi Shimbun*. A search for newspaper articles that mentioned "rice cooker" from 2000 to 2010 resulted in 203 articles. The content analysis of these articles revealed the number of articles mentioning "a premium rice cooker."

For content analysis of the manufacturers' press releases, those announcing the launch of a new rice cooker were collected from the Nikkei Telecom 21 Database. The search for press releases from 2003 to 2010 that included the term "rice cooker" yielded 229 articles. The articles were shortlisted to include only those in which a manufacture announced the launch of a new rice cooker, including both new and improved products. The final dataset included 95 articles. Next, word frequencies from all 95 articles were determined and counted using KH Coder (http://khcoder.net/), a text analysis software application. KH Coder is one of the most reliable text analysis tools for processing Japanese text which has been extensively used (e.g. Onishi and Manchanda, 2012). A bottom-up coding approach (Miles *et al.*, 2014) generated 18 codes divided into three groups that described the features of the new rice cookers. Then, KH Coder counted the sentences complying with the codes and calculated their ratio in the text.

For NPD case studies, primary data were collected through face-to-face interviews with people involved in the NPD projects at Mitsubishi Electric and Sharp. The interviewees were project managers, engineers, and marketing managers. Four people from Mitsubishi Electric and two people from Sharp were interviewed in 2011 and 2012, respectively. The interviews lasted between 60 and 90 minutes and were recorded using IC Recorder and subsequently transcribed. To address the downside of having a small number of participants (Woodside, 2016), the following

approaches were adopted based on previous studies (Bunduchi, 2017; Ven and Verelst, 2012). First, selection criteria were established in order to confirm that the participants had sufficient knowledge of the development of the focal product. I asked a contact person from each firm to select participants who satisfied the criteria. Specifically, a project leader was included as one of the participants for each case. Then, at the beginning of each interview, the participants were asked about their background to confirm their suitability based on the selection criteria. This approach ensured that the interviewees had appropriate competencies and were closely linked to the focal product's development (Kumar *et al.*, 1993). Furthermore, newspaper articles and firms' press releases were collected and used for triangulation.

The case analyses were conducted following Eisenhardt's (1989) procedure. First, the careful reading and coding of interview transcripts yielded the elements of the technological frames (Bijker 1995, p. 125) found in each firm. Then, the similarities and differences between the technological frames of each firm were examined by juxtaposing the two cases. This analysis revealed that two cases can be compared according to their technological frames, including their goals, key problems, problem-solving strategies, and exemplary artifacts. The detailed data and their analyses are shown in Sections 4.2. and 4.4.

4. Findings

4.1. Coevolution of a premium segment and product innovation

An electric rice cooker is one of the most popular kitchen appliances in Japan. A typical electric rice cooker consists of the main unit and an inner pot. The main unit includes heating devices, control boards, and operation buttons. The inner pot, which is generally made of aluminum, is set in the main unit, and used to cook rice.

Japanese manufacturing firms have introduced various innovations to the rice cooker industry. However, market growth reached a saturation point in the 2000s, causing severe competition as well as price wars among rice cooker manufacturers.

The situation changed drastically in 2006. Mitsubishi Electric released a new rice cooker, *Honsumigama*, at a price of 110,000 yen. Considering that the most expensive rice cooker at that time cost approximately 60,000 yen, the market actors were surprised by the price set by Mitsubishi Electric. However, consumers responded to it positively, and the sales of the product surpassed Mitsubishi Electric's expectations. Several firms followed Mitsubishi Electric and introduced their own high-priced rice cookers. One of the newspapers reported these products to be premium rice cookers (the article was not an advertisement or backed by the manufacturer):

> Mitsubishi Electric's IH rice cooker (*Honsumigama*) is a product that utilizes an inner pot made of pure carbon material. The company claims that this reproduces the taste of the traditional *Kamado* stove. While the average price of a rice cooker is usually around 20,000 yen, the product, which was released in March 2006, costs more than 100,000 yen. The product has captured the hearts of baby boomers who value the taste of rice and became a hit exceeding the firm's expectations. The product has sparked the premium rice cooker boom. [Yomiuri Shimbun, 7 August 2007, p. 11]

As the article argued, the product was identified as a premium rice cooker not only because of its high price (more than 100,000 yen) but also its unique inner pot (made of pure carbon material).

The content analysis of the newspaper articles revealed the emergence of the premium rice cooker segment. Figure 2 shows that the number of articles mentioning a "premium rice cooker" has significantly increased since 2006. It is

known that references to a new category reflect the category's stability in the product market (Rosa *et al.*, 1999). The increased references to the premium rice cooker indicate the emergence of the premium segment in the rice cooker market after 2006.

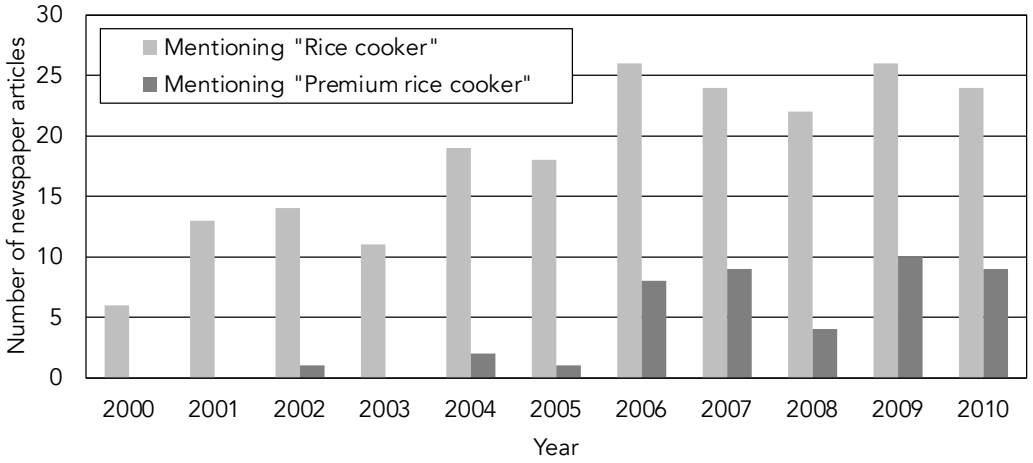

Figure 2 Frequency of newspaper articles mentioning "Rice cooker" and "Premium rice cooker"

At the same time, the technology trajectories also changed after 2006. Table I shows the frequency of manufacturers' press release sentences that described the technological features of rice cookers before and after the launch of *Honsumigama*. The results show that the manufacturers focused on different technological features of the rice cookers before and after the launch of *Honsumigama*. Before the launch, manufacturers highlighted the "multifunctionality" (useful for multiple purposes) of the rice cookers (22.4% of press release sentences mentioned this feature). Afterward, they began to focus on the products' "technical characteristics" (technologies with which the product was equipped) (29.7%), "unique inner pot" (21.7%), and "rice taste" (20.8%). These findings indicate a shift in the product innovations from multifunctionality to specific differentiating factors.

Topics	Number (proportion) of sentences which included category-related words						*p*-value
	Total number		Before Honsumigama's launch		After Honsumigama's launch		
Technical characteristics	344	(25.4)	130	(20.4)	214	(29.7)	< .01
Pressure cooking	155	(11.4)	64	(10.0)	91	(12.6)	.13
Controlling steam exhaust	18	(1.3)	2	(0.3)	16	(2.2)	< .01
Vacuuming	12	(0.9)	0	(0.0)	12	(1.7)	< .01
Steam	64	(4.7)	21	(3.3)	43	(6.0)	.02
Super sonic	36	(2.7)	25	(3.9)	11	(1.5)	.01
High heating	72	(5.3)	14	(2.2)	58	(8.1)	< .01
Water absorption	79	(5.8)	29	(4.6)	50	(6.9)	.06
Rice taste	252	(18.6)	102	(16.0)	150	(20.8)	.02
Multifunctionality	247	(18.2)	143	(22.4)	104	(14.4)	< .01
Cooking different types of meals	90	(6.6)	62	(9.7)	28	(3.9)	< .01
Sprouted brown rice	30	(2.2)	20	(3.1)	10	(1.4)	.03
Cooking different types of rice	82	(6.0)	44	(6.9)	38	(5.3)	.21
Keeping rice warm	92	(6.8)	42	(6.6)	50	(6.9)	.80
Unique inner pot	212	(15.6)	56	(8.8)	156	(21.7)	< .01
Unique materials	139	(10.2)	24	(3.8)	115	(16.0)	< .01
Multi-layered pot	48	(3.5)	25	(3.9)	23	(3.2)	.47
Unique shape	58	(4.3)	17	(2.7)	41	(5.7)	.01
Even cooking	62	(4.6)	30	(4.7)	32	(4.4)	.82
Easy to clean	43	(3.2)	23	(3.6)	20	(2.8)	.38
Number of sentences	1,357	(100)	637	(100)	720	(100)	

Table I Frequency of sentences in manufacturers' press releases mentioning the technological features of rice cookers (2003–2010).
Notes: The ratio of the sentences containing these categories to the number of the total sentences was compared for the periods before and after the launch of Honsumigama; *p*-values show the results of the Z tests comparing the two periods.

The data show that Mitsubishi Electric's launch of *Honsumigama* triggered the premium segment emergence in the Japanese rice cooker market. Simultaneously,

the technology trajectories of the rice cookers changed. The following analyses examine the mechanisms linking these two phenomena by employing Kaplan and Tripsas's (2008) cognitive model of technology trajectories.

4.2. Development of the manufacturer's technological frame to create a premium product

Mitsubishi Electric, the first mover in the premium rice cooker segment, developed its technological frame under the technological trajectories present when appliance multifunctionality was dominant (see Table I). First, it set its goal of creating a premium product. Until 2006, Mitsubishi Electric was not successful on the rice cooker market. Although, in 2004, it introduced a multifunctional rice cooker that could cook rice and various other meals (e.g., soup or stew), the sales were lower than expected. In particular, its rice cooker business was almost operating in a deficit due to constantly being forced to decrease prices amidst the severe competition in the market. Therefore, people at Mitsubishi Electric began to explore ways to sell its product at higher prices.

Second, Mitsubishi Electric explored a new technology that potentially provided its customers with added value for the high price. The firm decided not to follow the technology trajectories of that time and instead began to explore innovations. An engineer of Mitsubishi Electric stated:

> I often say, "Let's review things taken for granted." Recently, it's been very difficult to know what consumers want. Thus, we had to go beyond them and make propositions. [The engineering manager from Mitsubishi Electric on 16 November 2011]

The engineers explored new materials for the inner pot and found that the

carbon pot boils rice at a higher heat which results in tastier rice. Mitsubishi Electric then decided to introduce a new rice cooker as a premium product by claiming a significant improvement in the rice taste. In other words, the firm considered the ability to produce better-tasting rice as a key problem. Moreover, the new technology raised another reason for the high price: the high manufacturing cost of the carbon pot.

This case showed that Mitsubishi Electric developed its technological frame as follows: the goal was to "create a premium product," the key problem was to "cook better-tasting rice," and the problem-solving strategy was to "explore new technology" (Table II). Mitsubishi Electric developed this technological frame because its rice cooker business was unsuccessful under the technology trajectories of that time. It intended to change the situation by introducing a high-priced product. Furthermore, the new technology development resulted in high manufacturing costs which required the firm to sell the product at a higher price. These analyses derive the following proposition:

Proposition 1: Unsuccessful business lines under current technology trajectories lead firms to discontinue following them and develop its new technological frame. In particular, the unprofitability of the business and the cost of new technology development compel the firms to set premium product creation as its goal (Arrow [a] in Figure 1).

Elements of a technological frame	First mover's technological frame (Mitsubishi Electric)	Followers' technological frame (Sharp)
Goal	Creating a premium product	Entering the premium category
Key problem	Cooking tasty rice	Cooking healthy and tasty rice
Problem-solving strategy	Innovation: Exploring new technology	Imitation: Implementing some of the ideas used for the premium products (unique inner pots) Innovation: Exploring new technology (stirring device)
Exemplary artifact	-	Competitors' high-priced rice cookers

Table II Elements of the first mover's and followers' technological frames

4.3. Market actors' reactions and the emergence of a premium segment

Mitsubishi Electric's introduction of the *Honsumigama* model caused other market actors to react and led to the emergence of a premium segment. First, other manufacturers followed Mitsubishi Electric's marketing strategy. In 2006 and 2007, the major rice cooker manufacturers, namely Tiger, Toshiba, Hitachi, Sanyo, and Matsushita, also released high-priced rice cookers. Each of these products had a unique inner pot made of different materials, including copper, iron, silver, or diamond. Second, home appliance retailers began to promote these cookers as premium products. Lastly, the consumers rushed to purchase these premium rice cookers. A newspaper reported this trend as follows:

> Premium rice cookers costing around 70–120 thousand yen have now become popular among home appliance shops. At Yodobashi Camera Multimedia in Akiba (Tokyo, Chiyoda-ku), a man in his 50s purchased a rice cooker costing around 100,000 yen. He noted, "One of my friends said, 'Since you use a rice cooker every day, you should buy the best one possible even if it is a little expensive.'" [The Nikkei, 13 December 2008, p. 12]

Kaplan and Tripsas (2008) proposed a model describing these market actors' reactions as their interpretation processes. In this case, market actors, such as manufacturers, retailers, and consumers, interpreted Mitsubishi Electric's *Honsumigama* introduction and gauged the reactions. The manufacturers introduced their high-priced rice cookers, the retailers presented these products as the premium segment, and the consumers rushed to purchase these products. These market actors' reactions collectively constructed a shared technological frame, which included the premium segment, and a new technology trajectory, which included the unique inner pots. This course of analyses derives the following proposition:

Proposition 2: When other market actors adapt to the first mover's premium product introduction, their reactions shape the premium segment as part of the collective technological frame (Arrow [b] in Figure 1) and simultaneously create a new technology trajectory as a result of imitating the first mover's product (Arrow [d] in Figure 1).

4.4. NPD under the existence of a premium segment

Next, the establishment of the premium segment had an effect on the manufacturing firms' NPD. This effect presented itself as a change in technology trajectories. After the introduction of *Honsumigama*, the rice cooker manufacturers began to incorporate a unique inner pot and various technical characteristics into their products (Table I). This trend indicated that that the rice cooker manufacturers followed Mitsubishi Electric by imitating (incorporating a unique inner pot) and differentiating (incorporating different technical characteristics).

To reveal the mechanisms that construct this trend, the next step examined a

representative case of NPD under the existence of a premium segment. In 2012, Sharp introduced the *Healsio Rice Cooker* costing around 70,000 yen. Sharp intended to enter the premium rice cooker market through this product. The project manager said the following:

> Mitsubishi Electric created the market with an innovative product. Seeing them, we were sure of the opportunity and decided to enter the market. [The project manager from Sharp on 10 December 2012]

Sharp used a differentiation strategy to enter the premium segment. The *Healsio* cooker had a mechanical device that stirred the rice and water in the pot to prevent nutritional loss and uneven heating. For Sharp, the key problem considered when developing a new product was to cook better-tasting rice, which was derived from the collective technological frame and the premium segment. Sharp recognized that the other manufacturers had developed unique inner pots, so it developed a new rice cooker equipped with a unique inner pot made of glass and iron. At the same time, however, Sharp intended to take a different approach: mechanical stirring. The project manager said:

> [O]ur competitors focus on their inner pots to highlight the taste of the rice. Instead, we focused on even heating. We tried various approaches and finally achieved the best way, stirring directly. [The project member from Sharp on 10 December 2012]

Additionally, Sharp intended to add a health benefit to its product. This meant that Sharp redefined the key problem as cooking superior-tasting and healthy rice. Sharp's engineer found that washing the rice using the stirring device prevented nutritional loss. The project manager stated:

> [W]e definitely had to pursue the taste. And, healthiness was another dimension (of value propositions). So, we explored innovation that realizes both these benefits; we did brain-storming and then narrowed our goal, together with engineers. [TAMURA, Naoki 10 December 2012]

The comparison of Mitsubishi Electric's and Sharp's technological frames is shown in Table II. Sharp set "entering the premium segment" as its goal, considered "cooking better-tasting and healthy rice" as the key problem, and regarded "competitors' high-priced rice cookers" as its example. Then, Sharp defined the problem-solving strategy as both "imitation" and "innovation."

Two reasons underlaid Sharp's technological frame. First, as the interviewee said above, Sharp intended to enter the premium segment. Hence, it imitated the other premium products by pursuing the taste and utilizing the unique inner pot. Indeed, the *Healsio Rice Cooker* came equipped with a unique inner pot made of glass and iron. At the same time, however, it differentiated its new product to grab a market share in the premium segment. Sharp added the health-benefit aspect to its product and developed the new stirring device. These analyses suggested that the technological frame of the follower firm was likely to include the bidirectional problem-solving strategies of imitation and innovation.

As multiple actors' technological frames showed bidirectional problem-solving strategies, technology trajectories also became bidirectional. In the present case, Sharp developed a rice cooker with a unique inner pot and a new stirring device. Much like Sharp, other followers also adopted bidirectional problem-solving strategies. The technology trajectories in the rice cooker market began to take two development directions: unique inner pots and various technical characteristics (see Table I). Thus, we argue the following propositions:

Proposition 3: A collective technological frame, including a premium segment, shapes the manufacturing firms' technological frame to adopt bidirectional problem-solving strategies: imitation and innovation (Arrow [c] in Figure 1).

Proposition 4: The follower firms' technological frames that follow bidirectional problem-solving strategies are likely shape technology trajectories to have two development directions (Arrow [d] in Figure 1).

4.5. Mechanisms linking the premium segment emergence and product innovation

The combination of the four propositions above explained the linkage between the premium segment emergence and change in technology trajectories. First, under the technology trajectories of the past, the potential first mover was unsuccessful. Then, the firm developed its own technological frame to create a premium product and explore new technologies (Arrow [a] in Figure 1). Second, when the firm successfully introduced a premium product, the other market actors adapted to the first mover's technological frame. These reactions collectively constructed a premium segment (Arrow [b] in Figure 1) and changed the technology trajectories through technological imitation (Arrow [d] in Figure 1). Third, the established premium segment affected the followers' NPD and shaped their technological frames to have bidirectional problem-solving strategies (Arrow [c] in Figure 1). Then, as the follower firms' technological frames adopted bidirectional problem-solving strategies, technology trajectories began to take two development directions (Arrow [d] in Figure 1).

As a result, the emergence of a premium segment and a change in the technology trajectories occurred simultaneously. In the early stage of the premium

segment emergence, the manufacturing firms imitated each other. However, after the premium segment was established, they differentiated their products. As shown in Table I, the retrospective data supported these inquiries; the technology trajectories changed to include both imitation (unique inner pot) and differentiation (technical characteristics). These analyses provide the following proposition:

Proposition 5: The premium segment emergence and technology trajectories change occur simultaneously. In particular, imitation is dominant in the early stage of the emergence but differentiation occurs after the establishment of the premium segment.

5 Discussion

5.1. Contributions of this study

Many authors have investigated the relationship between innovation and product categories from both a theoretical (Grodal *et al.*, 2015; Lee *et al.,* 2018) and an empirical point of view (Ozcan and Gurses, 2018; Suarez and Grodal, 2015). However, the relationship between innovation and price segments, even though price segments are a part of product categories, has been less examined. This study filled this gap by investigating the coevolution of the premium rice cooker segment and product innovation. In particular, by employing a mixed methods approach, this study provided quantitative evidence indicating that premium segment emergence and technology trajectories change and explained the mechanism linking these two phenomena. This comprehensive study provides provable propositions regarding the linkage between price segments and product innovation through objective quantitative arguments and a detailed qualitative explanation. These propositions can be a viable foundation for future research in the premium strategy. Moreover,

these findings and conclusions are potentially applicable to other industries through theoretical generalization (Yin, 1994).

This study also showed the potential application of Kaplan and Tripsas's (2008) cognitive model of technology trajectories. The current case study showed that the premium segment works as a part of a collective technological frame in their model. Expanding the previous model and providing empirical evidence to support the model are both key contributions of this paper.

The findings of this study also showed that product price segments serve a function similar to other cognitive frames possessed by market actors. Socio-cognitivists have argued that rivalry and product category structures are knowledge shared by market actors, and in turn, constrain and enable market actors' behaviors (Porac *et al.*, 1995; Rosa and Spanjol, 2005). In this study, we observed similar functions relevant to the premium segment; the emergence of a premium segment drives manufacturing firms to imitate and/or innovate within the segment. This finding implies that researchers can conceptualize various cognitive frames at different levels and examine their effect on innovation and firm strategy.

5.2. Practical implications

This study also provides implications for managers who intend to implement a premium segment strategy. When a firm intends to create a premium segment, it should look at the technology trajectories and develop high-quality products to trigger premium segment generation. From the emergence to the stabilization of the premium segment, the firm should maintain significant similarities with the premium segment. However, if the firm intends to develop a premium product and enter a stable premium segment, the firm should differentiate the product from others in terms of technical features. In sum, when managers intend to implement a

premium strategy, they must understand the relationship between the premium segment and product innovation, and they must also consider their firm's technological frames.

Moreover, this study suggests that managers should observe the premium segment carefully because what constitutes a premium product varies with time (Quelch, 1987). When the premium segment emerged in the rice cooker market, the primacy of the products arose from their unique inner pots. With the maturation of the premium segment, the meaning of "premium" changed because the follower companies introduced both imitation and innovation. Imitation enforced the early meaning of the premium products, but innovation brought a different meaning through technical characteristics. Managers who intend to implement a premium strategy should be aware of this shift in meaning and adjust their strategies accordingly.

5.3. Limitations and future research opportunities

This study has some limitations which mainly arise from its single-case design. For example, this study was unable to consider certain factors affecting product category emergence recognized in the literature (Rosa and Spanjol, 2005), such as the role of institutional actors (e.g., the government), because the intervention of these actors was not identified in the rice cooker market during the study period. Another factor that was not considered, was the effect of design. Although the design of products influences their price (Kumar *et al.*, 2015) and design thinking is a powerful tool for product innovation (Brown, 2008), the present study focused on the technological aspect of product functions to avoid over-complexity of the theoretical model used. These factors are potential opportunities for future research.

6. Conclusion

This study employed the cognitive model of technology trajectories by Kaplan and Tripsas (2008) and applied this model to an empirical case study in order to examine the linkage between premium segment emergence and product innovation. The study revealed a set of mechanisms that explain the relationship between premium segment emergence and product innovation. Multiple actors' technological frames and interpretation processes interacted with the premium segment and technology trajectories and mediated the linkage between them. This study provided a comprehensive understanding of the phenomena and their practical implications.

Acknowledgments

The author would like to thank Dr. José Antonio Rosa and Dr. M.V. Shyam Kumar for their helpful comments regarding the early drafts of this paper. An earlier version of this paper was presented at ISPIM Innovation Forum Boston 2018 and shortlisted for the ISPIM 2018 Innovation Management Impact Award. This work was supported by JSPS KAKENHI Grant Numbers 11025694, 15K17113, 15H01964, and 18K01755.

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This paper is an author accepted manuscript published by Emerald Publishing.

Please see the published paper from the following DOI:

https://doi.org/10.1108/APJML-07-2020-0536 .