

Original Research



A study on the relationship between purchases of meal kits and home meal replacements

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ABSTRACT

BACKGROUND/OBJECTIVES: Meal kits and home meal replacements (HMRs) are rapidly growing segments in the convenience food industry. Consequently, numerous studies have examined consumer perceptions of HMR and meal kits, respectively. HMR is an established segment, while meal kits are a recent category. Both segments offer convenience compared to home-cooked meals. However, meal kits offer a wider variety of recipes with fresh ingredients, requiring simple cooking steps to prepare the meal rather than merely heating the food. Despite the commonalities and differences, previous studies have only examined the purchasing behavior and influencing factors of either the meal kits or HMR. However, changes in the purchasing patterns of both segments may be correlated. This study investigates the relationship between consumer purchasing trends of meal kits and HMR and presents practical recommendations regarding the need of consumers for convenience foods.

MATERIALS/METHODS: We conducted a panel regression analysis of consumer purchase data obtained from shopping receipts, spanning the 2019, 2020, and 2021 waves of the Korean Rural Development Administration.

RESULTS: The results show that the purchases of meal kits and HMR increased during the period, suggesting a complementary relationship between the 2. We also found significant increases in purchases within 2 sub-categories of HMR, namely, ready-to-prepare and ready-to-cook, alongside meal kits. These findings were further supported by the results of the sub-regression analysis.

CONCLUSION: The simultaneous growth of meal kits and HMR indicates that convenience foods continue to play a crucial role in meeting consumer needs in the food industry.

In addition, considering the significant growth of the HMR sub-categories with fresh ingredients and cooking, we suggest that companies should aim to satisfy the desire of consumers for both convenience as well as freshness and culinary aspects.

Keywords: Convenience foods; food industry; secondary data analysis

INTRODUCTION

A meal kit is a box of pre-proportioned ingredients, sauces, and step-by-step instructions to enable the consumer to easily prepare the meal at home [1,2]. The kit is a product or service

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Conflict of Interest

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Author Contributions

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that can be purchased from an online or offline store and delivered to the doorstep. These services enhance cooking convenience by providing precise ingredient measurements, reducing housework, and providing a healthy alternative. For these reasons, and due to changes in the family structure, the meal kit market has witnessed rapid growth [3]. “Linus Matkasse,” a startup company in Sweden, introduced meal kits in 2008 with the intention of reducing food waste. Since then, the sale and preference for meal kits have expanded throughout Europe and the United States, and, today, meal kits have become common worldwide [4]. In Europe and the United States, meal kits can be delivered online, or purchased at grocery stores or restaurants. However, an online subscription form is most commonly used, and the kit is distributed as a combination of products and delivery services [5]. In Korea, startup companies began offering meal kits around 2016. Later, the meal kit market's size expanded as large companies entered this segment [6]. In Korea, meal kits can be purchased online or offline like traditional grocery purchases.

In Korea, the demand for meal kits has increased due to shifting demographics and changes in social factors. The former includes an increase in the number of single-person households and dual-earner working couples [7]. Recently, Koreans have also become more aware of the paucity of time, time costs, and the fact that they have less time to do housework due to long working hours. They are therefore opting for more convenience items [7,8]. Social changes include the desire to enjoy self-realization and the freedom of a single life [9,10]. These social changes have driven further shifts in demographics and consumption.

The growth of the meal kit industry accelerated during and after the coronavirus disease 2019 (COVID-19) pandemic. As social distancing and a non-face-to-face lifestyle became commonplace due to COVID-19, consumer behavior was restricted, and demand for meal kits soared [11]. The global revenue of the meal kit industry was 12.47 billion dollars in 2022 and is predicted to reach 19.52 billion dollars in 2028 [12]. The meal kit market saw a revenue of 7.64 billion dollars in 2022 in the US alone. This is expected to reach 11.76 billion dollars in 2027 [13]. The size of the meal kit market in Korea was about 300 billion won in 2022 and is predicted to grow to about 700 billion won by 2025 [14].

Home meal replacements (HMRs) refer to products manufactured, processed, and packaged in a complete or semi-cooked form that can be consumed after a simple cooking process or even without this. Based on convenience and cooking methods, HRMs have been classified as ready-to-eat (RTE), ready-to-heat (RTH), ready-to-cook (RTC), and ready-to-prepare (RTP) fresh convenience foods [15]. RTE foods include lunchboxes, *gimbap*, and salads that can be consumed without heating or cooking. RTH foods need to be heated for a short time and include items such as frozen pizza, refrigerated hamburgers, and refrigerated spaghetti. Examples of RTC foods include meatballs and hamburger patties that require a cooking process such as simple heating [14]. RTH and RTC meals both have something in common, namely heating. However, with RTC meals, the preparation and cooking processes before food consumption are more complicated than those of RTH meals [16]. RTP fresh convenience foods include salads and sprouted vegetables that have undergone simple processing such as washing and cutting. The HMR market has continued to grow with the global revenue of the HMR industry at 564.5 billion dollars in 2022, and it is predicted to reach 839.7 billion dollars in 2028 [17]. The global revenue of the HMR market segment is also expected to increase at a compound annual growth rate per year of 5.1% from 2013 to 2027. In particular, the RTE sub-category has generated the highest revenue in the HMR market [17].

Meal kits are distinguished from general HMR as they include main ingredients, sub-materials, seasonings, sauces, and detailed recipes for preparation, as compared to ready mixes in RTE and RTH [4]. Recent studies have examined meal kits as a segment distinct from HMR [4,18]. Consumers perceive meal kits and HMRs as 2 different food sectors, choosing meal kits for distinct healthier attributes [19]. Studies on meal kits have focused on their utilitarian and hedonic value for consumers. The utilitarian aspect is the convenience of cooking and the time saved when consumers cook with meal kits. The hedonic aspect is the confidence that allows consumers to cook using the readily available ingredients in the meal kit, which helps them learn how to cook and enjoy the act of cooking [18,20]. For HMR, the focus has been on their utilitarian aspects based on the classification criteria. Based on earlier studies, there is a need to examine meal kits, which are growing rapidly, as distinct from HMR.

Previous studies on meal kits and HMR identified the differences in cooking convenience, preparation level for consumption [16], freshness of ingredients [21,22], and the hedonic value between meal kits and HMRs [20]. Meal kits are characterized by lower cooking convenience and require more preparation before consumption compared to HMR. Thus, they are perceived to be fresh and have a high hedonic value. On the other hand, RTE meals have high cooking convenience but require a lower level of preparation hence, a low hedonic value. RTH and RTC meals require a medium level of cooking convenience and preparation for consumption, but have low perceived freshness compared to the other products. RTP meals, on the other hand, have high cooking convenience and freshness, low levels of preparation, and hedonic values.

The rapid growth of the meal kit market has prompted many studies focusing on the consumption of meal kits and HMR. These studies have focused on the size of the meal kit market and comparisons with other types of foods, and consumer purchase behavior such as the consumer purchase intention and their attitudes towards meal kits [22-25]. Studies have also examined weight loss in terms of the nutrient composition or the nutritional aspects of meal kits [26-28], and the impact of packaging and food waste from meal kits on the environment [29-31].

Research on meal kit consumers has been conducted based on their purchase status, purchase intention, preferences, characteristics, and the usefulness of meal kits, as well as other consumer factors that affect meal kit purchases. Studies have found that meal kit purchase and consumption differ according to demographic characteristics, such as age, gender, income, occupation, education level, and household composition [18,22]. Of these factors, personal characteristics such as income and education levels are the main factors that affect the consumer use of meal kits [18]. The number of household members eating together is another factor that influences the purchase of home convenience meals [32]. The frequency of eating out increased as the number of household members dining together increased, and the frequency of eating out affected the probability of purchasing home convenience meals, indicating that the number of household members participating in meals can indirectly affect the purchase of HMR. Recently, a study [8] identified additional factors relating to consumers' intention to purchase meal kits. These factors were associated with household characteristics such as the household income, the presence of children, residence area, and the employment status of the wife.

Food choice attributes are the most important characteristics that consumers consider when purchasing food and these include food quality, safety, and price. These are the

same factors that affect meal kit purchases, purchase intention, and satisfaction with meal kits [18,33]. In addition, consumers reported that they focus on nutritional quality, price, health, convenience, sustainability related to the environment, and package attributes when selecting meal kits [22,24,34].

Although many studies have compared consumer needs and their perceptions regarding meal kits and HMR [18,20,35], little is known of the relationship between meal kits and HMR in terms of whether they complement or substitute one another, and whether one category cannibalizes the other. Studies on product cannibalization demonstrated its negative impact on the market and companies when such a new product or service is introduced [36]. There is a need to examine cannibalization concerns since meal kits are a new product in the food market, similar to HMR in some ways and different in others. Examining the balance between meal kits and HMR can provide meaningful insights into how meal kits could be strategically positioned to cultivate a new segment in the food market.

Furthermore, research on consumer behavior related to the purchase of meal kits has largely relied on utilizing the primary data obtained from consumer surveys or interviews. While this approach offers the advantage of allowing the researcher to explore the intrinsic characteristics of consumers obtained in their own words, it could suffer from potential bias due to self-reporting and recall issues, which affect the validity of the responses. To overcome this limitation, recent studies have started utilizing data from real settings, collected during business operations, such as transaction data, promotion data, and web log data [37,38]. For this study, we analyzed consumer purchase data obtained from shopping receipts and applied panel regressions to reduce the endogeneity issues.

The objective of this study was to investigate the competitive relationship between meal kits and HMR using consumer purchase data. Additionally, we analyzed the sub-categories of HMR to investigate how consumer perceptions and needs for both products interact. Thus, this research could offer valuable insights for professionals on ways to stimulate and expand the markets for meal kits and HMR.

MATERIALS AND METHODS

Data and sample

This study used consumer panel data from the 2019, 2020, and 2021 waves of the Korean Rural Development Administration. The data were compiled from purchase records gathered from household receipts across the country, including detailed information on purchase behavior, such as purchase date, items, amount, and location. The items were categorized into food groups such as grains, meat, and fruits. The purchase records were organized into panel data according to the purchase date. The HMR market was classified into 11 main categories and 41 sub-categories. The 11 main categories of HMR included instant noodles, Korean-style meatballs (*Wanja*), RTE rice, RTE soup and stews, fried foods, dumplings, instant porridge-soup, sauces for RTE rice, other instant foods, salads, and meal kits. The 41 sub-categories were more specific and took into consideration the ingredients of the products and the cooking methods. Specific information about the HMR classification is provided in **Supplementary Table 1**.

For this study, we selected 1,100 households who submitted receipts monthly for 3 years. The daily purchase data of these households were aggregated monthly. As the data for December 2021 was not yet available, only 11 months of data were included in 2021. In total, 35 months of data were used for the analysis. Considering the missing values, 38,313 observations from 1,095 households out of the total of 38,500 observations from 1,100 households were utilized for the analysis.

Variables

The dependent variable was the monthly amount of meal kit purchases. A logarithmic transformation was performed on the purchase amount data. The independent variable was the monthly amount of HMR purchases and did not include meal kits. The amounts were then divided into the following 2 categories: First, the monthly purchase of all HMR, excluding meal kits, was used as the independent variable. The second case took into account the classification of HMR suggested in a previous study [15] and divided them into 4 categories: RTE, RTP, RTH, and RTC. The monthly purchase amounts of each category were used as independent variables.

Demographic characteristics such as age, occupation, and education level have been associated with consumer perceptions and purchase behaviors with respect to HMR [18,39]. The attributes of food products such as price and quality that consumers consider important while purchasing food are also relevant to their purchase intention and behavior regarding HMRs [18,22]. Given that this study examined the purchase behavior for HMRs at the household level, the demographic characteristics of the respondents were treated as their household characteristics. These characteristics included age, number of household members (household size), the presence of children, household income, the employment status of wives, and the place of residence. The presence of children, the employment status of wives, and the place of residence were categorical variables. Cases with no children were coded as 0, and those with children were coded as 1. The employment status of wives was coded as 0 for cases reporting no occupation, and 1 for cases reporting an occupation. For categorizing the place of residence, 7 regions were reclassified into non-metropolitan regions, coded as 0, and metropolitan regions coded as 1.

In addition, the consumer panel data provided information regarding factors influencing purchase decisions, such as the perceived importance of the price and quality of the products in terms of their relative importance. Respondents rated the relative importance of these factors using a scale ranging from 0 to 100. Among these factors, the perceived importance of quality was included in this study.

Data analysis

The statistical analysis in this study included descriptive statistics, panel regression analysis, and robustness checks. First, an analysis of the descriptive statistics was conducted for all the variables in this study. The original values of variables related to purchase amounts were used to compute descriptive statistics. For the panel regression analysis, the variables were log-transformed for incorporation into the models. Second, panel regression analysis was conducted to examine the relationship between the purchase behavior of meal kits and HMR. Lastly, sub-regression was conducted to check the robustness of the results. The models for the panel regression analysis were as follows:

$$Y_{it} = \beta_0 + \mathbf{B}X_{it} + \mathbf{\Gamma}C_{it} + \varepsilon_{it}$$

where Y_{it} is the monthly purchase amount of meal kits for the i^{th} household in year t ($t = 2019, 2020, 2021$); X_{it} is a vector of independent variables. Specifically, in Model 1, X_{it} represented the monthly purchase amounts of all HMR, excluding meal kits. In Model 2, it represented the monthly purchase amounts of the 4 categories of HMR, i.e., RTE, RTP, RTH, and RTC, excluding meal kits. C_{it} is a vector of control variables, and ε_{it} is the error term.

RESULTS

Descriptive statistics of the sample

Table 1 presents the descriptive statistics of the whole sample by survey year. The average monthly purchase amount for meal kits over the 3 survey years was 1,820 KRW. For HMR, the figure was 258,080 KRW. For the 4 categories of HMR (i.e., RTE, RTP, RTH, and RTC), the average monthly purchase amount was 29,780 KRW, 5,760 KRW, 86,060 KRW, and 136,480 KRW, respectively. The majority of the respondents were female (1,050 out of 1,095, 95.89%; male: 45, 4.11%). The average age of the respondents was about 55 years. The average household size was 3. Approximately 40.4% of the sample had children. The average monthly household income was 5,011,890 KRW. Wives in 36.9% of the households were employed, and about 43.7% of the subjects resided in a metropolitan region. The average score of the perceived importance of quality was 54.7 out of 100.

The overall purchase of both meal kits and HMR showed an increasing trend across the 3 years (note that the purchase dates for 2021 included only 11 months). Over this period, the household characteristics and the scores of the perceived importance of quality remained at similar levels. Among the household characteristics, the presence of children, the employment status of wives, and the place of residence remained constant over this period.

Table 1. Descriptive statistics of the whole sample and each survey year

Variables	Overall	2019	2020	2021
Purchase amounts of meal kits ¹⁾	0.182 ± 2.140	0.082 ± 1.138	0.174 ± 2.175	0.301 ± 2.824
Purchase amounts of HMR ¹⁾	25.808 ± 30.464	23.585 ± 27.963	25.657 ± 31.346	28.393 ± 31.874
Purchase amounts of RTE ¹⁾	2.978 ± 8.165	2.481 ± 7.278	2.566 ± 7.794	3.971 ± 9.308
Purchase amounts of RTP ¹⁾	0.576 ± 3.043	0.340 ± 2.136	0.613 ± 3.236	0.790 ± 3.599
Purchase amounts of RTH ¹⁾	8.606 ± 14.268	8.733 ± 14.200	8.677 ± 14.651	8.389 ± 13.913
Purchase amounts of RTC ¹⁾	13.648 ± 18.047	12.031 ± 16.413	13.801 ± 18.251	15.243 ± 19.330
Age ²⁾	55.293 ± 10.095	55.298 ± 10.074	55.288 ± 10.107	55.293 ± 10.106
Household size	2.896 ± 1.171	2.898 ± 1.170	2.896 ± 1.171	2.896 ± 1.171
Household income ¹⁾	501.189 ± 282.805	501.331 ± 282.838	501.115 ± 282.799	501.115 ± 282.800
Perceived importance of quality ³⁾	54.737 ± 12.983	54.745 ± 12.983	54.733 ± 12.983	54.733 ± 12.983
Child				
Has child	15,470 (40.378)	5,304 (40.402)	5,304 (40.365)	4,862 (40.365)
No child	22,843 (59.622)	7,824 (59.598)	7,836 (59.635)	7,183 (59.635)
Wife's occupation				
Employed	14,140 (36.907)	4,848 (36.929)	4,848 (36.895)	4,444 (36.895)
Unemployed	24,173 (63.093)	8,280 (63.071)	8,292 (63.105)	7,601 (63.105)
Residence				
Metropolitan	16,753 (43.727)	5,736 (43.693)	5,748 (43.744)	5,269 (43.744)
Non-metropolitan	21,560 (56.273)	7,392 (56.307)	7,392 (56.256)	6,776 (56.256)
Observations	38,313	13,128	13,140	12,045

Values for continuous variables are presented as mean ± SD. Values for categorical variables are presented as frequency (percentage).

HMR, home meal replacement; RTE, ready-to-eat; RTP, ready-to-prepare; RTH, ready-to-heat; RTC, ready-to-cook.

¹⁾Unit of purchase amounts and household income: 10,000 KRW.

²⁾Unit of age: year.

³⁾Perceived importance of quality was measured using a scale ranging from 0 to 100.

In 2019, the average monthly purchase amount for meal kits was 820 KRW and 235,850 KRW for HMR. The average monthly purchase amount was highest for RTC meals: 24,810 KRW for RTE, 3,400 KRW for RTP, 87,330 KRW for RTH, and 120,310 KRW for RTC meals. The average age of the respondents was around 55 years. The average household size was around 3 people. The average monthly household income was 5,013,310 KRW. The average score of the perceived importance of quality was 54.7.

In 2020, the average monthly purchase amount for meal kits per household more than doubled compared to 2019 (1,740 KRW). For HMR, it was 256,570 KRW. The average monthly purchase amount was still the highest for RTC meals: 25,660 KRW for RTE, 6,130 KRW for RTP, 86,770 KRW for RTH, and 138,010 KRW for RTC. The average age of the respondents was still around 55 years. The average household size also remained the same, around 3 people, but the average monthly household income dropped slightly to 5,011,150 KRW. The average score of the perceived importance of quality was 54.733.

In 2021, the average monthly purchase amount for meal kits per household increased to 3,010 KRW. However, the corresponding amount for HMRS decreased slightly overall to 283,930 KRW with the largest decrease observed in RTH meals. The average monthly purchase amount was 39,710 KRW for RTE, 7,900 KRW for RTP, 83,890 KRW for RTH, and 152,430 KRW for RTC meals. The other factors remained the same: average age of the respondents (55 years), average household size (3), average monthly household income (5,011,150 KRW), and average score of the perceived importance of quality (54.733).

A similar trend in purchase amounts was observed when household characteristics were taken into account. These characteristics include the employment status of wives (employed, unemployed), household size (small: 1–2 members, large: 3 or more members), age (under 40, 40s, 50s, 60 and above), household income (4 quartiles), and place of residence (metropolitan, non-metropolitan). The descriptive statistics of annual purchase amounts by household characteristics are presented in **Supplementary Table 2**.

Panel regression

We conducted a panel regression analysis to examine the relationship between the purchase behavior of meal kits and HMR. An appropriate model was selected using the Hausman test and the Breusch-Pagan Lagrangian multiplier test. For both models, the results of the Hausman test (Model 1: $\chi^2 = 13.56$, $P > 0.05$, Model 2: $\chi^2 = 22.37$, $P > 0.05$) and the Breusch-Pagan Lagrangian multiplier test (Model 1: $\chi^2 = 27,969.84$, $P < 0.001$, Model 2: $\chi^2 = 27,685.80$, $P < 0.001$) supported the random effect panel regression model.

Table 2 shows the results of the panel regression. The results for Model 1 and Model 2 indicated that both the purchase of meal kits and HMR increased. In Model 1, the relationship between the purchase behavior of meal kits and HMRS was positive, which indicated that both meal kits and HMR purchases increased over the 3 years. Using Model 2, which classified HMR into 4 categories as suggested in previous studies, we examined the categories of HMR purchases that increased along with the meal kits. The results showed that the purchase of the RTP and RTC meals showed a positive relationship with the purchase of meal kits, which indicated that purchases in these HMR categories increased along with the increase in meal kits.

Table 2. Panel regression result

Variables	Model 1 ¹⁾			Model 2 ²⁾		
	Coefficient	Robust SE	P-value	Coefficient	Robust SE	P-value
log(Purchase amounts of HMR) ³⁾	0.004	0.001	0.000			
log(Purchase amounts of RTE) ³⁾				0.001	0.001	0.279
log(Purchase amounts of RTP) ³⁾				0.020	0.007	0.007
log(Purchase amounts of RTH) ³⁾				0.003	0.001	0.067
log(Purchase amounts of RTC) ³⁾				0.006	0.001	0.000
Age ⁴⁾	-0.003	0.018	0.849	-0.003	0.018	0.855
Age ^{2 4)}	-0.000	0.000	0.760	-0.000	0.000	0.752
Household size	0.038	0.026	0.149	0.038	0.026	0.144
Child (Has child)	0.012	0.076	0.877	0.014	0.076	0.850
log(Household income) ³⁾	-0.079	0.087	0.363	-0.082	0.086	0.344
Wife's occupation (Employed)	0.060	0.081	0.461	0.057	0.082	0.481
Residence (Metropolitan)	0.183	0.080	0.022	0.177	0.080	0.027
Perceived importance of quality	0.005	0.004	0.201	0.005	0.004	0.196
Observations		38,313			38,313	
No. of respondents		1,095			1,095	
Prob > F-value		0.000			0.000	

The categorical variables are all binary, including: Child (No child = 0, Has child = 1), Wife's occupation (Unemployed = 0, Employed = 1), and Residence (Non-metropolitan = 0, Metropolitan = 1).

HMR, home meal replacement; RTE, ready-to-eat; RTP, ready-to-prepare; RTH, ready-to-heat; RTC, ready-to-cook.

¹⁾Model 1: A model examining the relationship between the monthly purchase amounts of all HMRs, excluding meal kits, and the monthly purchase amounts of meal kits.

²⁾Model 2: A model examining the relationship between the monthly purchase amounts of the 4 categories of HMRs, excluding meal kits, and the monthly purchase amounts of meal kits.

³⁾Unit of purchase amounts and household income: 10,000 KRW.

⁴⁾Unit of age: year.

Robustness checks

To check robustness, we conducted a sub-regression analysis that considered household characteristics, including the employment status of wives (employed, unemployed), household size (small: 1–2 members, large: 3 or more members), age (under 40, 40s, 50s, 60 and above), household income (4 quartiles), and place of residence (metropolitan, non-metropolitan). The results of the sub-regressions were generally consistent with the results of the main panel regression, indicating that the main regression results were robust.

The sub-regression results of Model 1 showed that the relationship between the purchase behavior of meal kits and HMR was significantly positive in both the employment statuses of wives (unemployed: coefficient [coef.] = 0.005, $P < 0.001$; employed: coef. = 0.004, $P < 0.01$), both household sizes (small: coef. = 0.005, $P < 0.05$, large: coef. = 0.004, $P < 0.001$), all age groups (under 40: coef. = 0.005, $P < 0.05$; 40s: coef. = 0.005, $P < 0.01$; 50s: coef. = 0.006, $P < 0.01$; 60 and above: coef. = 0.002, $P < 0.05$), all levels of household incomes (1st quartile: coef. = 0.005, $P < 0.05$; 2nd quartile: coef. = 0.004, $P < 0.01$; 3rd quartile: coef. = 0.005, $P < 0.05$; 4th quartile: coef. = 0.005, $P < 0.01$), and both residence categories (metropolitan: coef. = 0.005, $P < 0.001$; non-metropolitan: coef. = 0.004, $P < 0.001$).

The sub-regression results of Model 2 were as follows: With respect to the employment status of wives, both groups showed a significant positive relationship between the purchase behavior of meal kits and RTP (employed: coef. = 0.020, $P < 0.05$; unemployed: coef. = 0.021, $P < 0.05$), as well as RTC meals (employed: coef. = 0.006, $P < 0.001$; unemployed: coef. = 0.006, $P < 0.01$). With regard to household size, large households (3 or more) demonstrated a significant positive relationship between the purchase behavior of meal kits and RTP (coef. = 0.026, $P < 0.01$), as well as RTC meals (coef. = 0.006, $P < 0.001$). Regarding age groups, a significantly positive relationship between the purchase behavior of meal kits and RTP

meals (50s: coef. = 0.039, $P < 0.05$; 60 and above: coef. = 0.026, $P < 0.05$), as well as RTC meals (40s: coef. = 0.006, $P < 0.01$; 50s: coef. = 0.008, $P < 0.01$) was observed. Regarding the level of household incomes, the meal kit purchase behavior exhibited a significantly positive relationship with RTP (4th quartile: coef. = 0.029, $P < 0.01$), as well as RTC meals (1st quartile: coef. = 0.005, $P < 0.05$; 2nd quartile: coef. = 0.005, $P < 0.05$; 3rd quartile: coef. = 0.007, $P < 0.05$; 4th quartile: coef. = 0.008, $P < 0.01$). With respect to the place of residence, a significantly positive relationship was observed between the purchase behavior of meal kits and the following categories: RTE (non-metropolitan: coef. = 0.003, $P < 0.05$), RTP (metropolitan: coef. = 0.023, $P < 0.05$; non-metropolitan: coef. = 0.015, $P < 0.05$), and RTC (metropolitan: coef. = 0.006, $P < 0.001$; non-metropolitan: coef. = 0.005, $P < 0.01$).

DISCUSSION

The current study investigates how the purchases of meal kits by consumers are related to HMR purchases. Previous studies have explored the different factors affecting the purchases of consumer meal kits, but most of these relied on primary data from consumer surveys or interviews. We examined the relationship between the purchases of meal kits and HMR by analyzing consumer purchase data retrieved from shopping receipts through panel regressions.

The results showed that the purchases of both meal kits and HMRs have increased together, suggesting a complementary relationship. This also implies that the consumer need for convenience foods has intensified. The purchase and consumption of convenience foods has grown significantly due to the paucity of time among the current generation and their demand for convenience [8]. This suggests a consumer's tendency to seek timesaving and convenience options which was exhibited in their food choices [40]. Therefore, meal kits, RTP, and RTC meals can all be considered convenient compared to traditional food groups.

We also found that purchases in 2 sub-categories of HMR, namely RTP and RTC, significantly increased along with the increase in the purchases of meal kits. These findings were also supported by the results of the sub-regression. There are various dimensions to the specific features provided to consumers [16,20,21,35]. The significant increase in the purchases of 2 sub-categories of HMRs, RTP, and RTC, as well as of meal kits, reflects consumer preferences for products within the convenience food market that excel in either freshness [21,22], hedonic value [20], or both. This finding is consistent with a previous study that reported a shift in the meaning of cooking activities, evolving from household responsibilities to a perceived hedonic value in the HMR and meal kit markets [41].

This study provides valuable insights for professionals in the market who develop and promote new convenience foods and recommends that they should prioritize serving the consumer's need for freshness and the hedonic value of cooking. Therefore, in addition to convenience, companies need to differentiate their product positioning by taking into account the features of the meal kits, as well as the sub-categories of HMR.

SUPPLEMENTARY MATERIALS

Supplementary Table 1

Home meal replacement classification in the Rural Development Administration consumer panel data

Supplementary Table 2

Descriptive statistics of annual purchase amounts by household characteristics

REFERENCES

1. Lee EY, Kim YM, Choi MK. Meal kit purchasing behavior and relationship with the nutrition quotient of young adults in Chungnam. *J Nutr Health* 2021;54:534-46. [CROSSREF](#)
2. Costa AI. Conceptualization and measurement of personal norms regarding meal preparation. *Int J Consum Stud* 2013;37:596-604. [CROSSREF](#)
3. Bizeau D. COVID-19 and Consumer Eating Patterns: Analysis of the Impact on the Meal Kit Industry in the United States [thesis]. Winter Park (FL): Rollins College; 2022.
4. Rha JY, Nam Y, Yoon J, Lee B. Korean consumers' use and concerns about food delivery service. *Nutr Res Pract* 2023;17:583-96. [PUBMED](#) | [CROSSREF](#)
5. Korea Agro-Fisheries & Food Trade Corporation (aT). Current State of the Home Meal Market in the U.S. 2017. Naju: aT; 2018.
6. Erevelles S, Fukawa N, Swayne L. Big Data consumer analytics and the transformation of marketing. *J Bus Res* 2016;69:897-904. [CROSSREF](#)
7. Yi NY, Choi JH. A study of the consumer perception of meal kit using big data analysis. *Foodserv Ind J* 2019;15:211-22.
8. Khan SA, Sowards SK. It's not just dinner: meal delivery kits as food media for food citizens. *Front Commun* 2018;3:39. [CROSSREF](#)
9. Cho M, Bonn MA, Moon S, Chang HS. Home chef meal kits: product attributes, perceived value, and repurchasing intentions the moderating effects of household configuration. *J Hosp Tour Manage* 2020;45:192-202. [CROSSREF](#)
10. Wade A, Gupta K, Holben DH. Field notes: people, programs, & policies: exploratory evaluation of home-delivered meal-kits within a rural, southern united states community food system. *J Hunger Environ Nutr* 2022;17:718-21. [CROSSREF](#)
11. Horning ML, Hill T, Martin CL, Hassan A, Petrovskis A, Bohem L. The east side table make-at-home meal-kit program is feasible and acceptable: a pilot study. *Appetite* 2021;160:105087. [PUBMED](#) | [CROSSREF](#)
12. Mun JY, Ban HJ, Kim HS. A study on consumers' perception of meal kit: after the spread of coronavirus infectious disease-19 (COVID-19). *Culin Sci Hosp Res* 2020;26:198-207.
13. Buckley M, Cowan C, McCarthy M. The convenience food market in Great Britain: convenience food lifestyle (CFL) segments. *Appetite* 2007;49:600-17. [PUBMED](#) | [CROSSREF](#)
14. Andonova Y, Anaza NA, Bennett DH. Riding the subscription box wave: understanding the landscape, challenges, and critical success factors of the subscription box industry. *Bus Horiz* 2021;64:631-46. [CROSSREF](#)
15. The Harris Poll. Meal kits deliver on convenience and health [Internet]. Chicago (IL): The Harris Poll; 2017 [cited 2024 April 14]. Available from: <https://www.prnewswire.com/news-releases/meal-kits-deliver-on-convenience-and-health-300433374.html>.
16. Satell G. 5 Things managers should know about the big data economy [Internet]. Jersey City (NJ): Forbes; 2014 [cited 2023 August 11]. Available from: <http://www.forbes.com/sites/gregsatell/2014/01/26/5-things-managers-should-know-about-the-big-data-economy/>.
17. Baskin E, Choi JW, Heo SY, Park SJ. Trends in the home meal replacement market. *J Distrib Sci* 2016;14:5-15. [CROSSREF](#)
18. Jo H, Lee S, Choe Y. Home meal replacement market segmentation: a food-related lifestyle. Proceedings of 2014 Annual Meeting of the Agricultural and Applied Economics Association; 2014 July 27-29; Minneapolis (MN), USA. Milwaukee (WI): Agricultural and Applied Economics Association; 2014.

19. Cannibalization YI. *J Revenue Pricing Manag* 2012;11:353-4. [CROSSREF](#)
20. Mailloux MH. *Impacts on the Interest Level of Consumers Toward Meal Kit Delivery Services*. Manila: La Salle University; 2017.
21. Moir J, Megheirkouni M, Fletcher KA, Oniga A. Marketing meal kits: from customer agency to corporate social responsibility. *Acad J Int Econ Manag Res* 2023;4:22-33.
22. Statista. Revenue of the meal kit delivery industry in the U.S. 2017–2027 [Internet]. New York (NY): Statista; 2023 [cited 2024 May 12]. Available from: <https://www.statista.com/forecasts/1346154/united-states-revenue-in-the-meal-kits-market>.
23. Larson R. Marketing meal solutions. *J Food Prod Mark* 2002;8:63-71. [CROSSREF](#)
24. Food Information Statistics System (aTFIS). *Convenience food: processed market segment status report* [Internet]. Naju: Korea Agro-Fisheries & Food Trade Corporation; 2019 [cited 2023 Feb]. Available from: <https://www.atfis.or.kr/home/board/FB0027.do?act=read&bpoid=3260&bcaId=0&pageIndex=1>.
25. Oberle MM, Loth KA, Schendel A, Fox CK, Gross AC. Acceptance of a meal kit programme in an outpatient paediatric weight management clinic: a qualitative pilot study. *Clin Obes* 2020;10:e12371. [PUBMED](#) | [CROSSREF](#)
26. Choi SG, Park DS, Hong WS. A study of singles' dining-out behavior by the food-related lifestyle on the adults between 25 to 54 years in the Seoul Metropolitan Area. *J Foodserv Manag* 2012;15:131-53.
27. Park S, Hwang JH. A study on the effect of meal kit selection properties on consumers' purchasing. *J Soc Sci* 2021;28:157-75. [CROSSREF](#)
28. Statista. Revenue of the meal kit delivery industry worldwide 2017–2027 [Internet]. New York (NY): Statista; 2023 [cited 2024 May 12]. Available from: <https://www.statista.com/forecasts/1346146/global-revenue-in-the-meal-kits-market>.
29. Costa AI, Dekker M, Beumer RR, Rombouts FM, Jongen WM. A consumer-oriented classification system for home meal replacements. *Food Qual Prefer* 2001;12:229-42. [CROSSREF](#)
30. Oh WK, Hong JY. IPA analysis on selection attributes of RTC (ready to cook) type milk kit HMR (home meal replacement). *Culin Sci Hosp Res* 2019;25:69-81.
31. Sharnock TR. *Factors that Influence the Consumer Purchase Decision to Subscribe to a Meal-Kit Delivery Service* [dissertation]. Johannesburg: University of Pretoria; 2018.
32. Moores CJ, Bell LK, Buckingham MJ, Dickinson KM. Are meal kits health promoting? Nutritional analysis of meals from an Australian meal kit service. *Health Promot Int* 2021;36:660-8. [PUBMED](#) | [CROSSREF](#)
33. Gibson AA, Partridge SR. Nutritional qualities of commercial meal kit subscription services in Australia. *Nutrients* 2019;11:2679. [PUBMED](#) | [CROSSREF](#)
34. Grier K. *An Update on the Canadian Home Meal Replacement Market*. Guelph: George Morris Centre; 2001.
35. Konrad A. *The Swedish meal kit startup that inspired blue apron, plated and HelloFresh speaks out* [Internet]. Jersey City (NJ): Forbes; 2015 [cited 2023 July 7]. Available from: <https://www.forbes.com/sites/forbestreptalks/2015/10/14/the-swedish-startup-that-inspired-meal-kits-speaks-out/?sh=5d4856972fc6>.
36. McKay FH. What's in a commercial meal kit? Structured review of Australian meal kits. *Public Health Nutr* 2023;26:1284-92. [PUBMED](#) | [CROSSREF](#)
37. Seo S, Im SY. Comparison of influencing factors on Korean household's dining out frequency and HMR purchase frequency using the consumer behavior survey for food 2019. *J Tour Sci* 2020;44:55-78. [CROSSREF](#)
38. Statista. *Convenience food report 2023* [Internet]. New York (NY): Statista; 2023 [cited 2024 May 12]. Available from: <https://www.statista.com/study/48833/convenience-food-report/>.
39. Yang HC, Kim JB, Kim AS. Different perception on product attributes of HMR: focusing on college students and consumers. *J Distrib Sci* 2016;14:47-56. [CROSSREF](#)
40. Von Laar M, Knier M. *Food for Thought: What Factors Influence the Meal Kit Purchase?* [master's thesis]. Copenhagen: Copenhagen Business School; 2021.
41. Bumbudsanpharoke N, Ko S. Packaging technology for home meal replacement: innovations and future prospective. *Food Control* 2022;132:108470. [CROSSREF](#)