ESSENCE OF GROWING HEALTH FOOD MARKETS IN ASIAN COUNTRIES

A Essência do Crescimento do Mercado de Alimentos Saudáveis em Países Asiáticos

Hideyuki Aoki, Yoko Ishino
Graduate School of Innovation & Technology Management, Yamaguchi University, Ube, Japan
E-mail: hemy.aoki@384.jp, ishino.y@yamaguchi-u.ac.jp

Abstract: So-called health food has attracted attention for more than two decades, since its market has been steadily expanding. However, there are no world-wide studies on relationships between the health food market and the economic or social situations. This is because the definitions and regulations about health food differ from one country to another, so that it is difficult to compare various countries at once. We focused on Asia, since several Asian countries have established the rules and regulations of health food to date, and this area contains various countries in terms of economic situations. We executed multiple regression analysis, in which the per-capita health food expenditure and other six variables were respectively set as the objective variable and the explanatory variable candidates. As a result, it turned out that we can estimate the per-capita health food expenditure with considerable accuracy by using only two explanatory variables: the per-capita GDP and the population aging rate. The regression function obtained in this research enables us to quantitatively predict the health food market size. This can greatly contribute to making a global marketing strategy of health food.
Key words: Health food market; Multivariate analysis; GDP; Population aging rate

Resumo: O chamado alimento saudável tem atraído atenção por mais de duas décadas, já que seu mercado vem se expandindo constantemente. No entanto, não há estudos mundiais sobre as relações entre o mercado de alimentos saudáveis e as situações econômicas ou sociais. Isso ocorre porque as definições e regulamentos sobre alimentos saudáveis diferem de um país para outro, de modo que é difícil comparar vários países ao mesmo tempo. Focando na Ásia, e dado que vários países asiáticos ja tem estabelecido regras e regulamentos dos alimentos saudáveis, e esta área contém vários países em termos de situações econômicas; foi realizada uma análise de regressão múltipla, na qual a despesa de alimentos saudáveis per capita como variável dependente e outras seis foram utilizadas como variáveis independentes. Como resultado, verificou-se que podemos estimar a despesa de alimentos saudáveis per capita com uma precisão considerável usando apenas duas variáveis explicativas: o PIB per capita e a taxa de envelhecimento da população. A função de regressão obtida nesta pesquisa nos permite prever quantitativamente o tamanho do mercado de alimentos saudáveis. Isso pode contribuir muito para fazer uma estratégia de marketing global de alimentos saudáveis.
Palavras-chave: Mercado de alimento saudáveis; Análise Multivariada; GDP; Longevidade

INTRODUCTION

Currently, the concept of "functional food" or "health food" has been widely accepted in Asia, America, Europe and elsewhere in the world (Siró, I., et al,2008. The word "functional food" was used first in Japan in the 1980's. In 1984, the Ministry of Education, Science and Culture of Japan classified the functions of food into three categories: nutritional function as a primary function, palatability trait as a secondary function, and disease prevention by biological regulation as a third function. Among these functions, the third function received a special attention and new food products with this function were called functional food. An original regulatory system of Food with Health Claims (FHC was established in 1991. Since then, the health food market in Japan has been steadily expanding. In particular, the health food market hovered at a high growth rate from the 1990's to 2005. After that, although the growth rate slowed down due to a labeling regulation of the Pharmaceutical Affairs Act in 2006, the health food market in Japan kept growing and the market size reached 1.21 trillion yen in 2013 .During that time, several institutional reformations were executed and the newest category "Food with Function Claims (FFC" was established in 2015. It is generally believed that the main factor of the market growth of health food would be the growing health awareness due to an increase in lifestyle-related diseases and an acceleration of demographic aging.

From a perspective of Management of Technology (MOT, a development of health food is certainly a product innovation, and it is often the case of a material or ingredient innovation. Developing innovative materials to achieve innovative functions has often occurred in the functional food area. For a product to survive in such environment, a business organization must understand consumer needs precisely. Although the very idea of functional food has been accepted in many countries to date, the kinds of functional food widely spread among people depend on their culture, religion and environment (Siró, I. ,et al,2008. For example, a fortified cereal and various supplements are very popular in USA, while ginseng powder is a favored product in South Korea. Perhaps for that reason, the previous studies about health food entirely focused on the individual differences of health food instead of shared trends.

On the other hand, various media have already reported that the dietary life changes in accordance with the economic growth. The main changes are that people prefer processed food to fresh food, and they eat more meals outside their home. Also, it is thought that the growth of the health food market would be related to the economic situation change. However, there are very few studies on relationships between the health food market and the economic situation till now, though a lot of studies on the regulations of health food have been performed (Coppens, P., et al,2006; Charalampopoulos, D. ,2002; Bech-Larsen ,2007. This must be because research across countries was not easy since the products, regulations, and rules of health food are different depending on country.

This research was conducted based on the hypothesis that the growth of the health food market would be related to the change of economic and social situations. We focused on Asia, since this area has various countries in terms of per-capita Gross National Income (GNI. Typical cases are India and Indonesia as lower middle income countries, Thailand and China as higher middle income countries, and Japan, Singapore, South Korea and Taiwan as high income countries. The main purpose of this research is to clarify whether the market size of health food can be predicted using economic and other social indices, and if so, which indices should be used, by using data of Asian countries. This research aims to provide a concrete method to quantitatively predict the future market size of health food. This can greatly contribute to making a global marketing strategy of health food.

PREVIOUS RESEARCH

A lot of studies on health food have been performed. However, most of them were conducted regarding each ingredient (or material), the characteristics, or the national regulations of health food. There has been little research about the relationships between the growth of the health food market and the economic indices. However, they have already studied about the relationships between per-capita Gross Domestic Product (GDP) and other social or health-related indices. Some of typical researches are as follows.

● The relationship between per-capita nominal GDP and product diffusion was reported: (1) the sales amount of daily necessaries, such as hair-care and oral-care products, increases when the per-capita GDP reaches 4,000 US dollars or more, and (2) the sales amount of luxury items including skin-care products increases when the per-capita nominal GDP reaches to a level of 4,000-10,000 US dollars (Takato, N., Mototani, T. ,2013).

● The strong correlation between per-capita nominal GDP and medical expenditure was reported (Hiroi, Y.,1994). Also, the proportion of the medical expenditures is considered to rapidly increase when the per-capita GDP is greater than approximately 10,000 US dollars.

● It is considered that when per-capita nominal GDP increases, the modern-type retail sales increases, and moreover, when per-capita nominal GDP exceeds 10,000 US dollars, the modern-type retail sales reaches approximately 80% of all trade (Takato, N., Mototani, T. ,2013).

● It is found that an average life-span increases as the per-capita GDP increases (Todo, Y. ,2015; Kojima, K., Ogata, H. ,2008). Also, an average life-span increases as the per-capita medical expenditure increases (Hiroi, Y.,1994).

● There is a deep relationship between an average life-span and an aging population (Ota, M.,2009), and an aging population is believed to be one of the factors to increase medical expenditures[1]

DEFINITIONS AND COVERAGE OF HEALTH FOOD IN EACH COUNTRY

The definitions of health food differ among countries. The definitions and coverage of health food in eight Asian countries (Japan, India, Indonesia, Thailand, China, South Korea, Taiwan and Singapore) of which data was used in this research are as follows. The data was derived from the report published by a Japanese market research company.

1) Japan

According to the Ministry of Health, Labor and Welfare, there is no legal definition of so-called "health food," and the health food indicates the whole range of products which are sold and used for the general purpose of health improvement. However, the health food which meets the government's safety and efficacy standards can be referred to as "Food with Health Claims (FHC)." FHC's efficacy and functions can be officially publicized under the government's rules. FHC can be broken down into three categories, Food with Functional Claims (FFC), Food with Nutrient Function Claims (FNFC), and Food for Specified Health Uses (FOSHC) [2]. FFC, which was established in April 2015, is the newest category. This research targeted the broad health food including FHC: supplements, drinks and others (fortified biscuits, concentrated extracts, etc.).

---

[1] White Paper on Aging Society 2014, Cabinet office, Government of Japan, http://www8.cao.go.jp/kourei/ whitepaper/ w-2014/ zenbun/s1_1_3.html

[2] Health Food Homepage, Ministry of Health, Labour and Welfare, http://www.mhlw.go.jp/stf/seisakunitsuite / bunya/kenkou_iryou/shokuhin/hokenkinou/

2) India

In India, the Food Safety and Standards Authority of India (FSSAI) has been working on the establishment of standards and criteria of health food. However, "Food Safety & Standards Regulations 2011" established by FSSAI did not contain the regulations about the health food. This research targeted the following health-related foods and drinks: supplements, drinks, Ayurveda and others (fortified biscuits, concentrated extracts, etc.).

3) Indonesia

In Indonesia, there is no legal definition of health food. However, so-called health food is categorized as specific processed food. This research targeted the following health-related foods and drinks: supplements, drinks and others (concentrated extracts, herb products, etc.).

4) Thailand

The Food and Drug Administration Thailand (Thai FDA) defines and controls the regulations of food, drug, and dietary supplements. The supplements include all the following forms: tablet, capsule, powder, flake and liquid. This research targeted the following health-related foods and drinks: supplements, drinks and others (fortified biscuits, concentrated extracts, etc.).

5) China

The China Food and Drug Administration (CFDA) defines and controls the regulations of food, drug, and cosmetics. Health food is defined as a part of food, which has the specified health efficacy or aims at supplying vitamins and/or minerals to human. Also, the health food is defined as food that enables some sort of people to get themselves in shape by eating it. This research targeted the health-related food and nutrient-enhanced food including supplements, drinks and others.

6) South Korea

The Korea Food and Drug Administration (KFDA) defines and controls the regulations of food, drug, medical equipment, functional cosmetics and so on. KFDA defines the functional health food as food that contains materials (or ingredients) with beneficial functions for human bodies. The functional health food is divided into two types: one is a standard license type and the other is a license type on a case-by-case basis. This research targeted the following health-related foods and drinks: supplements, drinks and others (fortified biscuits, concentrated extracts, unprocessed materials for herbal medicine, etc.).

7) Taiwan

The Taiwan Food and Drug Administration (TFDA) defines and controls the regulations of food and drug. Food is categorized into three types: regular food, health food, and special nutritive food. The health food is defined as food which has some sort of health efficacy and displays it on the package or endorses it in the advertising media. This research targeted the following health-related foods and drinks: supplements, drinks and others (fortified biscuits, concentrated extracts, unprocessed materials for herbal medicine, etc.).

8) Singapore

Health Science Authority (HSA) takes control of the regulations of health-related products including dietary supplement, drug, medical equipment, cosmetics and so on. The dietary supplements are to be consumed for improving human's health or enhancing the nutrition of a meal. This research targeted the following health-related foods and drinks: supplements, drinks and others (fortified biscuits, concentrated extracts, etc.).

METHOD

Through literature research, the authors developed a hypothesis that the growth of the health food market would be related to the change of economic and social situations. The research method was designed to verify this hypothesis. First the economic and social indices considered important were selected, and then the data of such indices were collected, and finally the multiple regression analysis was performed using the data.

Variables used in research

The economic and social indices selected are as follows. Henceforth, these indices are called
variables.

● Per-capita health food expenditure

This is the value obtained by dividing the size of the health food market in each country by the number of population of the country. In this research, this variable is measured in Japanese yen. This is used as an objective variable.

● Per-capita GDP

This is the value calculated by dividing GDP (US dollar), which is a total amount of added values of products or services produced in the country within a certain period of time, by the number of population of the country. In general, the larger the per-capita GDP is, the higher the living standards are. This is one of the most representative economic indices. Note that, when comparing countries, purchasing power parity (PPP) of GDP is used to cancel out the difference of price levels between countries, where PPP is calculated using the exchange rates between two currencies.

● Per-capita medical expenditure

This is the value calculated by dividing the total amount of medical expenditures for treatment in a year by the number of population of the country. In this research, this variable is measured in US dollar. For countries that have the publicly funded health system, the value of the per-capita medical expenditure is calculated after the expenditures of the system are added to the out-of-pocket expenditures.

● Engel's coefficient

This is the proportion (expressed as a percentage) of food and drink expenditure in household consumption expenditure. In general, Engel's coefficient, one of the living standard indicators, is considered to decrease as the living standard improves (Arai, Y., 2010). However, it was found in some cases in developed countries that, even when the living standards improve, the Engel's coefficient does not decrease (Yoshimoto,2015). This variable sometimes behaves differently among some social groups that have different social customs from other groups. Since the Engel's coefficient has an opposite correlation with the economic affluence, "100 Engel's coefficient" was used in this research.

● Ratio of the modern retail sales (mail-order, Internet sales, and door-to-door sales)

This is the proportion (expressed as a percentage) of the sales amount obtained by the modernistic retailing (the door-to-door selling, the mail/catalogue order, and the Internet selling), against the total retail sales. In the processed food market, the traditional retailing including over-the-counter sales has a high proportion at the earlier stage of the market, and then the modernistic retailing extends according to the growth of the market (Kaneko, S., et al,1996).

● Average life-span

This value, which is measured in years, means the average number of years a person born in a given country expected to live if mortality rates at each age were to remain steady in the future. This variable, which is measured in years, is one of indices showing the comprehensive level of health and welfare.

● Population aging rate

This is the ratio (expressed as a percentage) of elderly people (the age of 65 or older) against the total population in a country. A high value of this variable indicates that the population is aging.

Multiple regression analysis

Multiple regression analysis is an extension of simple linear regression analysis. In general, regression analysis is a statistical process for estimating the relationships among variables. Multiple regression analysis is executed to answer how large a change of the dependent variable (or objective variable) is when any one of the independent variables (explanatory variables) is varied, while the other independent variables are fixed. The estimation target of multiple regression analysis is a function of the independent variables called the regression function. Multiple regression analysis also answers the overall fit (variance explained) of the model and the relative contribution of each of the independent variables to the total variance explained.

In this research, the "per-capita health food expenditure" was set as an objective variable, while other variables described above were regarded as the explanatory variable candidates. The following procedures were performed. First we computed correlation and partial correlation matrices using all the variables to understand each relationship. Then, after removing the variable suspected of having high multicollinearity, the multiple regression analysis was performed to obtain the regression function. In this stage, the 2009 data of aforementioned eight Asian countries was used, although only as to the average life-span the 2011 data was used instead because of data unavailability.

RESULTS

Figure 1 shows the value of the per-capita health food expenditure (Japanese yen) of eight Asian countries in 2011. The per-capita health food expenditures widely varied depending on the countries. Singapore had the highest per-capita health food expenditure and India had the lowest.

Then, to examine the relationships between two variables in all combinations, we calculated correlation and partial correlation matrices as shown Table 1 and 2. As shown in Table 1, most of the correlation coefficients are more than 0.7. This means that the variables are strongly associated with each other. Only the "ratio of the modern retail sales" had a weak correlation with the "per-capita health food expenditure (=Y)." The following three variables, "per-capita medical expenditure," "100 Engel's coefficient" and ""average life-span," showed strong positive correlations with Y as shown in Table 1.

However, the partial correlation coefficients of these three variables were negative values shown in Table 2. This would be the evidence that there is high multicollinearity among six explanatory variables.

Figure 1 Per-Capita Health Food Expenditure of Asian Countries (2011)
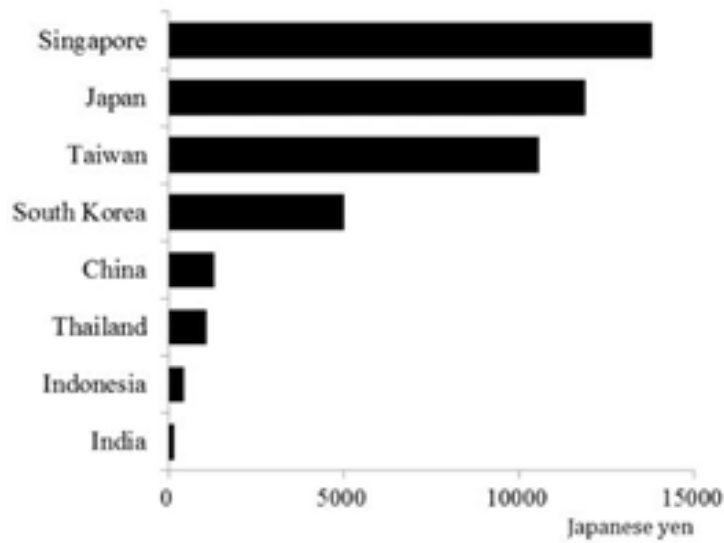
Table 1 Correlation Matrix between Variables

	Per-capita health food expenditure	Per-capita GDP	Average life-span	100 - Engel's coefficient	Per-capita medical expenditure	Population aging rate	Ratio of the modern retail sales
Per-capita health food expenditure	1.00	0.89	0.86	0.79	0.85	0.70	0.39
Per-capita GDP		1.00	0.81	0.86	0.62	0.38	0.21
Average life-span			1.00	0.86	0.81	0.72	0.56
100 - Engel's coefficient				1.00	0.73	0.60	0.57
Per-capita medical expenditure					1.00	0.94	0.58
Population aging rate						1.00	0.74
Ratio of the modern retail sales							1.00

Table 2 Partial Correlation Matrix between Variables

	Per-capita health food expenditure	Per-capita GDP	Average life-span	100 - Engel's coefficient	Per-capita medical expenditure	Population aging rate	Ratio of the modern retail sales
Per-capita health food expenditure	1.00	0.91	−0.41	−0.73	−0.17	0.61	0.09
Per-capita GDP		1.00	0.61	0.83	0.41	−0.77	−0.14
Average life-span			1.00	−0.28	−0.34	0.57	0.06
100 - Engel's coefficient				1.00	−0.10	0.44	0.43
Per-capita medical expenditure					1.00	0.85	−0.46
Population aging rate						1.00	0.37
Ratio of the modern retail sales							1.00

In the end, the three variables, "per-capita medical expenditure," "100 - Engel's coefficient" and "average life-span," were removed from the candidates of explanatory variables. The remaining three variables, "per-capita GDP (= X_1)," "ratio of the modern retail sales (= X_2)" and "population aging rate (= X_3)" were used for the multiple regression analysis. Finally, the best regression function was obtained by using the stepwise method of the multiple regression analysis. Only two explanatory variables X_1 and X_3 appeared in the best regression function, and the determination coefficient (adjusted R^2) was 0.909. The value of the determination coefficient shows how well the model fits, and this R^2 was sufficiently high to explain the "per-capita health food expenditure (Y)."

CONCLUSIONS

In this study, it turned out that the growth of the health food expenditure is explained by using only two indices, the per-capita GDP and the population aging rate. The former variable is an economic index, but the latter is a social index. Interestingly, this is a shared trend among Asian countries. In contrast, previous studies about health food have focused on not a shared trend but the individual food products. This could be because the kinds of functional food spread among people differ from one country to another due to their culture, religion and environment. The regression function obtained in this research enables us to quantitatively predict the future market size of health food, since the determination coefficient (adjusted R2) was sufficiently high. This can greatly contribute to making a global marketing strategy of health food. However, the amount of data used for estimating the regression function was small because of the limitation of data source. We intend to undertake further verification of a conclusion using new data.

REFERENCES

Siró, I., Kápolna, E., Kápolna, B., Lugasi, A. Functional food. Product development, marketing and consumer acceptance - a review[J]. Appetite. 2008, 51(3):456-467

Editorial Department of Food Processing and Ingredients. Trends in the Market for Dietary Supplement, Health Ingredients and Production Technology[J]. Food Processing and Ingredients, 2013, 49(3):43-45 (In Japanese)

Coppens, P., da Silva, M.F., Pettman, S. European regulations on nutraceuticals, dietary supplements and functional foods: a framework based on safety[J]. Toxicology. 2006, 221(1):59-74

Charalampopoulos, D., Wang, R., Pandiella, S.S., Webb, C. Application of cereals and cereal components in functional foods: a review[J]. Int J Food Microbiol. 2002, 79(1-2):131-141

Bech-Larsen, T, Scholderer, J. Functional foods in Europe: consumer research, market experiences and regulatory aspects[J]. Trends in Food Science & Technology, 2007, 18(4):231-234

Takato, N., Mototani, T. Health & Beauty Market Characteristic and Deployment Strategies[J]. Knowledge Creation and Integration, 2013, 21(8):36-45 (In Japanese)

Hiroi, Y. Increases of Health Care Expenditures and Economic Growth -Access, Technological Changes and Aging-[J]. Japanese Journal of Health Economic and Policy, 1994, 1:69-82 (In Japanese)

Nomura Research Institute. Industry in the Year 2020 [M]. Toyo Keizai Inc., 2013: 302-303 (In Japanese)

Todo, Y. Introductory Development Economics [M]. Saiensu-sha Co., Ltd., 2015: 18-20 (In Japanese)

Kojima, K., Ogata, H. Reorganizing Health Care Systems in Diversified and Aging Societies in Canada, Japan and Korea[J]. The Review of Comparative Social Security Research, 2008, (163): 45-54 (In Japanese)

Ota, M. Tales of Times Now Past on Functional Food: from Past to Future[J]. Food style21, 2009, 13(3):39-46 (In Japanese)

White Paper on Aging Society 2014, Cabinet office, Government of Japan [R]. http://www 8.cao.go.jp/kourei/whitepaper/w-2014/zenbun/s1_1_3.html

Health Food Homepage, Ministry of Health, Labour and Welfare [R]. http://www. mhlw .go.jp/stf/seisakunitsuite/bunya/kenkou_iryou/shokuhin/hokenkinou/

Arai, Y. Global Strategy of Food Company [M]. Gyosei Corporation, 2010: 16-18 (In Japanese)

Yoshimoto, Y. Family Income and Expenditure Survey for Marketing [M]. Kodansha Ltd., 2015: 122-155 (In Japanese)

Kaneko, S., Koganemaru, S., Matsumoto, T., Fujikura, R., Imura, H. Study on Empirical Equations for Long-Term Forecasts of Global Environmental Changes[J]. Pre-Prints of the Symposium on Global Environment, 1996, 4: 227-233 (In Japanese)