Empirical Analysis of the Influencing Factors of Infant Milk Powder Sales in China

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Abstract: Infant milk powder has always been a hot topic of social concern, "Comprehensive two-child" policy promotes the milk powder industry demand recovery, but China's milk powder incident is frequent, consumers are more and more cautious about the choice of milk powder. In order to further explore the influencing factors of milk powder sales , according to the 846 sales Information collected on an e-commerce platform , the product evaluation quantity is used to reflect the product attention. First of all, according to the consumption theory, the factors influencing the amount of evaluation (consumption degree) are obtained, The data collected are classified and analyzed, and secondly, the important variables are extracted from the data collected by the e-commerce platform, and the multivariate regression model with virtual variables is established, and it is found that the important factors affecting the evaluation amount are domestic or imported and unit prices, among which the evaluation amount of imported milk powder is higher than that of domestic evaluation. And there is a negative correlation between the amount of evaluation and unit price, and finally give relevant suggestions to merchants and consumers.

Keywords: Infant milk powder; Influencing factors; Multivariate regression; Suggestion

1. Introduction

Infant Milk powder has been a hot topic of social concern, especially after the terrible milk powder incident, in the choice of milk powder, consumers are also more and more cautious. As the world's second largest infant consumer market, the size of infant milk powder market is increasing, and it's market retail sales increased from 911 billion yuan in 2013 to 1650 billion yuan in 2017, the annual growth rate reached 16%. The demand for milk powder is greater. With the development of the Internet, cross-border e-commerce pushs a large number of foreign brands into the Chinese market, so that the milk powder brand competition is extremely fierce, but also to make the choice of Chinese consumers more difficult.

For the milk powder market sales influencing factors, From the point of view of the macro environment, industrial environment and competitive adversary of the sales of American milk powder, He Xuesong (2014) analyzes and studies the product price management, distribution channels, promotion strategies and sales management of the American praise Milk powder, which is only for the analysis of the specific sales of the United States. From the point of view of sales management, Zhao Xueyan(2017) studies the sales of milk powder, and finally makes a specific analysis of the case, puts forward that the milk powder enterprises in the sales should pay attention to the problems and opinions, The shortcoming is focusing on the sale of milk powder rather than the specific nature of milk powder, which has no reference value to consumers. In a word, the existing literature more or less has its shortcomings, need to be perfected.

2. Background

In recent years, along with the development of China's dairy industry and infant food industry, infant formula Market has continued to rise, China has now become the second largest infant milk powder market after the United States, the development momentum is good. It's market characteristics are as follows:

China's infant milk powder consumption level is high, the demand potential is huge, especially the current " second child " in China Policy gradually opened up, the neonatal birth rate has been improved, stimulating the expansion of China's milk powder market scale;

With the occurrence of milk powder quality accident , China's milk powder industry threshold gradually improve, milk powder market tends to concentrate development, The role of brand is becoming more and more prominent; the rise of;

E-commerce has impacted the traditional marketing mode of milk powder, and the domestic milk powder brand is facing greater pressure and challenge under the

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influence of cross-border e-commerce, are and other marketing models.

According to the data released by the China Business Research Institute, the market size of infant milk powder in China has increased since 2013, and the birth rate has declined slightly in 2016. The demand for infant milk powder in China has also increased from 826,000 tons in 2013 to 11.0 million tons in 2017, which is growing rapidly. China's infant milk powder market size (100 million yuan) and demand (ten thousand tons) as shown in Fig 1.
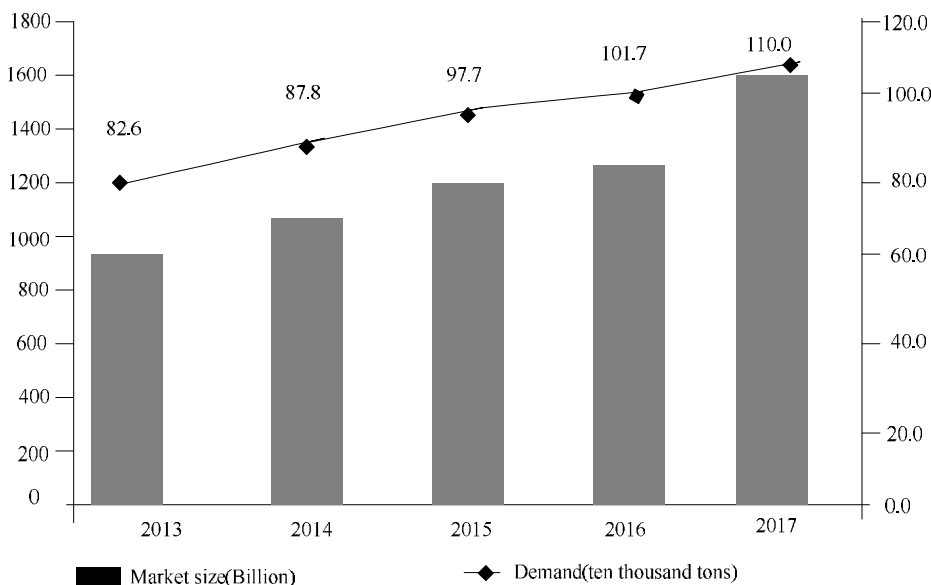

Figure 1. Changes in the size and demand of infant milk powder market in China

As can be seen from Fig 1, infant milk powder can be described as a big cake in the maternal and child market. With the introduction of the "Comprehensive Two-Child" policy, the whole infant milk powder market will surely prosper, so the factors affecting the sales of infant milk powder will be studied. It is conducive to the establishment of reasonable prices and marketing strategies for milk powder merchants to enhance their market competitiveness.

3. Analysis of Influencing Factors of Milk Powder Market Consumption

3.1. Variable establishment and data preprocessing

Product information transmission is mainly reflected in the milk powder enterprises publicity intensity and demand to discuss the heat, in view of the data collected as cross-sectional data, which cannot be in response to the impact of the enterprise at that time and the social purchase of heat to the factors affecting the purchase of milk powder level analysis, and this gap as a certain time in the difference is more obvious, Therefore, the difference of periodic purchase volume caused by heat is classified as random disturbance m_1, The basic demand for milk powder in infants and young children is b_0.

To analysis the quality and the price of the product, we define the collected data as import categories, packaging units, segments and unit prices, which due to the mismatch between gross weight and price, so the ratio of the unit price (Group Purchase Price / Gross weight) as a price indicator, which X_1 indicates domestic or imported milk powder ($X_1 = 1$ For domestic, $X_0 = 0$ For the import), X_2 indicates packaging units($X_2 = \{1, 2, 3, 4 | 1 = \text{Bagged}; 2 = \text{Barrel}; 3 = C\text{ases}; 4 = \text{Box}\}$), X_3 Indicates the milk powder segment, X_4 is the unit price (X_4 =Group Purchase Price / Gross weight= P/M)

Marginal utility factors indicate the psychological factors of people after the purchase of goods, the degree of influence can be used as a random disturbance m_2 ,and is not affected by a certain point in time. According to the economic principle, the influence relation of variable evaluation quantity can be expressed preliminarily by mathematical model, and the evaluation quantity is set as Y, That is:

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$$Y = b_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + m_1 + m_2$$

3.2. Empirical result

This paper constructs a Multivariate linear regression mould Type. The results are obtained by using the SPSS software as follows:

Table 1. Coefficient results

Variable	Constant	X1	X2	X3	X4
Coefficient	5042.478	-16789.46	6689.353	4690.334	-15.914

$$Y = 5042.478 - 16789.46 X_1 + 66889.353 X_2$$
$$+ 4690.334 X_3 - 15.914 X_4$$

The sales situation of infant milk powder (evaluation amount) is positively correlated with the packing unit, which is positively correlated with the age-oriented segment, and negatively correlated with the unit price of milk powder, in which the proportion coefficient of packing unit is the largest.

3.3. Result analysis

Based on the consumption theory, the multivariate linear regression model is composed of the factors that influence the amount of evaluation (consumption degree), which cannot be seen as a single class of influencing factors such as The relationship between product information transmission, product quality, product price and marginal effect, so it is necessary to further find out the correlation coefficient between various influencing factors, which is helpful to clearly analyze the correlation between various factors, judge the relevant situation of infant milk powder consumption market from macroscopic point of view, and the correlation coefficient of various factors, such as Tab.2:

Table 2. Pearson correlation coefficient

	Y	X1	X2	X3	X4
Y	1	-0.065	0.068	0.055	-0.097
X1	-0.065	1	0.256	0.128	-0.153
X2	0.068	0.256	1	0.092	-0.073
X3	0.055	0.128	0.092	1	-0.031
X4	-0.097	-0.153	-0.073	-0.031	1

In Tab.2,it can be found that the amount of evaluation expressed as the degree of consumption and product packaging, milk powder quality, segment correlation is not obvious, compared with the packaging unit and milk powder quality and segment has a strong correlation, so you can make the following conjecture:

As milk powder packaging has bags, boxes, buckets, boxes and different shapes, packaging will bring visual differences to consumers, thus affecting milk powder sales. In addition, consumers choose to buy milk powder generally focus on "convenience" and "beauty", so that consumers do not have to spend too much trouble to bring milk powder home, aesthetics is from the consumer psychology, consumers believe that the packaging style of high milk powder generally has a high quality.

Combined with consumption theory, the market factors affecting infant milk powder sales are classified, and the functional formula is not generally representative, and the correlation coefficient cannot be shown in the analysis of correlation coefficients. Therefore, the data collected are analyzed according to the specific factors combined with the multivariate regression analysis method.

4. Analysis of the Influencing Factors of Milk Powder Sales Market

4.1. Empirical result

From the data collected to remove the origin of milk source and the age of use of the two variables, the remaining variables due to the price of goods will also be affected by the weight of goods, so combined with the group purchase price of goods and the gross weight of goods to introduce new variable unit prices, The formula is: Unit Price (P*)=Price (P)/Gross product weight (W), Which Domestic or imported, formulated and classified (bovine milk powder / milk powder) are virtual variables, variable names such as Tab 3:

Table 3. Variable name and type

Index	Symbol	Variable type
Domestic or imported	D1	Virtual variables

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Formula	D2	Virtual variables
Categories (Milk/Goat's milk)	D3	Virtual variables
Dan	X3	Continuous variables
Unit Price	X4	Continuous variables

The multivariate linear model is: $Y_i = b_0 + b_1 D_{1i} + b_2 D_{2i} + b_3 D_{3i} + b_4 X_{3i} + b_5 X_{4i} + m_i$, Which $b_j (j = 1, 2, 3, 4, 5)$. For the parameters of each variable, m_i is a random error entry, D1, D2, D3 are virtual variable, which as follows:

$$D_1 = \begin{cases} 1 & \text{Imported} \\ 0 & \text{Domestic} \end{cases},$$

$$D_2 = \begin{cases} 1 & \text{Conventional formula} \\ 0 & \text{Unconventional formula} \end{cases},$$

$$D_3 = \begin{cases} 1 & \text{Milk powder} \\ 0 & \text{Goat milk powder} \end{cases}$$

4.2. Result analysis

Use STATA Software Solution in $ina = 0.05$, parameter estimation are shown in the Tab.4:

Table 4. Parameter estimation

Variable	Regression parameters	P Values	Significance of Judgement
D1	13860.85	0.017	Significant
D2	15203.36	0.330	Not significant
D3	15203.36	0.090	Not significant
X4	5039.899	0.085	Not significant
X5	-16.03283	0.004	Significant
C	-7292.084	0.518	Not significant

$Y_i = -7292.8 + 13861 D_{1i}$

$+ 15203 D_{2i} + 15203 D_{3I}$

$+ 5040 X_{4i} - 16.03 b_5 X_{5i} + m_i$

Where only variables D1, X5is remarkable, it can be seen that domestic or imported and unit prices are important factors affecting the amount of evaluation. Then the variance is tested on the results, assuming that the basic model is:

$Y = b_0 + b_1 D_1 + b_2 D_2 + b_3 D_3 + b_4 X_4 + b_5 X_5 + m$

Calculations are available: F=2.45 , P=0.0327<0.05 , The original hypothesis is rejected, that is, there is heteroscedasticity in the original model. The method of weighted least squares (WLS) is used toremedy, and the new estimation model is obtained as follows:

$Y = 4845.172 + 5478.704 D_{1i} - 2128.673 D_{3i}$

$- 2169.201 X_{1i} - 1.234 b_5 X_{5i} + m_i$

Thus, the important factors affecting the evaluation quantity are domestic or imported as well as the unit price of the commodity, in which the evaluation amount of imported milk powder is higher than the domestic evaluation quantity, and the evaluation quantity is negatively correlated with the unit price.

5. Conclusions and the Suggestions

The market on the brand milk powder formula is different, nutrition focus is different, consumers should be based on the infant's own nutritional needs to buy the appropriate milk powder, scientific consumption. In order to optimize China's milk powder market and in-dustry competition, improve the core competitiveness of domestic milk powder, through the multi-regression analysis of the influencing factors of infant formula, combined with the current situation of China's milk powder market development and related issues of analysis and research, from the government, milk powder manufacturers and the vast number of consumers and other perspectives, put forward the following recommendations:

5.1. Strengthening the construction of milk source base

To improve the quality of domestic dairy products, to ensure the safety of infant milk powder, must start from the source, from Nestle, Danone and other international brands of milk powder production, with specialized, large-scale, standardized cow Ranch, mature and perfect production line and milk source traceability system is the key to the achievement of high-quality milk powder, consumers can be convenient, fast, Accurate tracking of milk source information, through the analysis and reference of these internationally renowned milk powder enterprises production methods, domestic milk powder enterprises should vigorously promote the construction of family pastures and standard large-scale natural pastures, the use of controllable raw materials and strict management system to produce milk powder.

5.2. Improve the content of milk powder science and technology

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In recent years, the relevant institutions of research data show that the international milk powder brand by virtue of its strong technical advantages and brand advantages, in China's milk powder market has been in a dominant position, although domestic milk powder enterprises in the production and packaging of products have made great technological progress this year, but there is no doubt that there is still a big gap with the international major brands, The production of products are still mainly low-grade milk powder, because many domestic milk powder enterprises are faced with limited market competitiveness and consumer recognition of the problem, it is difficult to achieve greater development. Therefore, our enterprises should actively increase investment in the production of science and technology research, can work with domestic well-known research institutes, laboratories and related experts to jointly develop new products, strive for technological breakthroughs, enhance the brand image, to win the favor of consumers in the market.

5.3. Develop e-commerce marketing channels

At present, the domestic milk powder market is mixed, a variety of brand formula to dazzle consumers, therefore, in marketing means and publicity methods on the innovative changes have become an important factor affecting the sale of milk powder, enterprises can take the following strategies: First, in the publicity, enterprises should actively promote the brand, strengthen publicity efforts, Introduce consumers to the advantages of their products through all available promotional channels. Second, in marketing, a single offline sales channel has been unable to meet the needs of enterprise development, so you can make use of some of the current well-known e-commerce platforms such as Taobao, JingDong, SuNing and so on to develop some of the form of novel, creative promotional activities.

5.4. Increase government support and strengthen industry supervision

For the government, supporting the development of domestic enterprises is conducive to increasing employment and promoting economic development. As we all know, agriculture and animal husbandry itself is an industry with large capital investment, long production cycle and slow income efficiency. This has a profound impact on dairy manufacturing enterprises. To develop high-level milk powder enterprises, the government needs financial and policy support. For diseases such as foot-and-mouth disease that are prone to occur in dairy farming, the government can provide free vaccines and expert help to help enterprises develop. Secondly, it is of vital importance to strengthen the supervision of the industry. The poisoned milk powder incident has had a serious social impact, which makes the whole domestic milk powder industry face a crisis of credibility. The national government and relevant departments must raise the threshold for entry into the milk powder industry and product inspection standards, from the source. Grasp, severely punish violations of laws and regulations, and earnestly safeguard consumer rights.

5.5. Strengthen consumption concept education

On the issue of choosing milk powder, consumers are becoming more cautious about the health of their baby. With the development of the Internet, cross-border e-commerce and Haitao have introduced a large number of foreign brands, and consumers should not blindly pursue foreign brands in the face of a variety of milk powder. Due to the existence of tariffs, many foreign milk powders have doubled in the intangible price of entering the Chinese market, and Chinese consumers should rationally choose and carefully compare the quality of domestic products with the reputation of the company, and do not blindly pursue imported products.

6. Conclusion

Based on the sales information collected by an e-commerce platform, combined with the knowledge of relevant economic consumption theory and the basic situation of the domestic infant milk powder market at present, this paper analyzes the influencing factors of milk powder sales, and finds that the brand, origin and price of milk powder will have an impact on sales volume.The evaluation amount of imported milk powder is higher than that of domestic evaluation, and the conclusion of negative correlation between evaluation quantity and unit price is basically in line with the market reality. On the basis of the previous research results, this paper puts forward some suggestions and strategies for the government, enterprises and consumers in order to improve the domestic milk powder market environment, improve the competitiveness of domestic brand market, and promote the high quality development of China's milk powder industry.

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