The Recovery of Consumer Purchasing Behavior after a Food Crisis: A Case Study of the Melamine Incident in China

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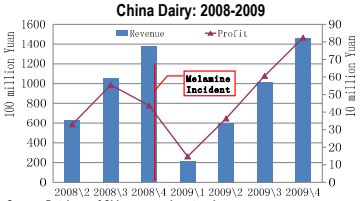
Introduction

Figure 1: Sales Revenue and Profit of China Dairy: 2008-2009



Sources: Database of China economic network.

The Melamine Incident in baby milk powder occurring in September 2008 triggered a sudden drop in the profits of Chian dairy industry.

However, according to the data from China economic information network, the sales revenue and profit fully restore to the level before the incident in less than one year.

Sudden drop VS. Rapid recovery
How come a so fast recovery?

According to the previous research, the sharp drop in demand after a food crisis is due to a swelling wave of distrust and a rapid increase in perceived risk.But these subjective factors we call "**staged factors**" change over time and their levels are different in the recovery stage.The mitigative change of the staged factors may result inconsumers' purchase recovery.

Two main objectives in this paper: first, we will analyze the extent to which the dairy market has recovered from the Melamine incident; and secondly, we will study the factors which influence consumers' recovery behavior after this food crisis.

Framework

As risky food has different features from general merchandise, consumers can not directly identify the actual risk level of dairy products. Under this assumption, uncertainty factor or risk factor is always introduced in the consumer utility function. Thus, the demands for dairy products are as follows.

$$X^* = X(I,P,\pi) \quad and \quad \frac{\partial X}{\partial \pi} < 0 \qquad (1)$$

Demand for the risky food depends not only on price and income, but also the risk factor π. The higher the risk, the less the demand.

π is vitually consumers' perceived risk, not the actual risk level of food. According to existing research, perceived risk is affected by many subjective factors like obtained knowledge (K), trust in information (T) and risk attitudes (R).

$$X^* = X(I,P,\pi(\,)) \qquad (2)$$

$$X_t = X(I,P,K,T,R) \qquad (3)$$

in the recovery stage

$$X_0 = X(I,P,\pi^*) \qquad (4)$$

before the incident, π is a constant

$$r = \frac{X_t}{X_0} = \frac{X(I,P,K,T,R)}{X(I,P,\pi^*)} = r(I,P,K,T,R) \qquad (5)$$

r represents the recovery ratio

From above analysis we give three hypotheses:

(1) The more consumers know about the melamine, the easier consumers will recover from the incident.
(2) The more consumers trust on various new information, the easier consumers will recover.
(3) The more consumers are risk-loving, the easier they will recover.

Method & data

The recovery behavior reflecting the consumer' decision can be divided into two stages:

(a) First stage : recover or not ?

$$d_i^* = Z_{1i}\beta_1 + \mu_i \quad , \mu_i \quad N(0,1), i = 1,2,\cdots n$$

$$d_i = \begin{cases} 1, d_i^* > 0 \\ 0, d_i^* \le 0 \end{cases}$$

(b) Second stage: how much to buy if recover ?

$$r_i^* = Z_{2i}\beta_2 + \upsilon_i \quad , \upsilon_i \quad N(0,\sigma^2), i = 1,2,\cdots n$$

$$r_i = \begin{cases} r_i^*, Conditon(1) \\ 0, Conditon(2) \end{cases}$$

	Heckman Model	Double hurdle
Conditon(1)	d_i=1	di=1&ri*>0
Conditon(2)	d_i=0	otherwise
Meaning	Consumers who buy 0 in stage(b) must be those who decide not to recover in stage(a).	Consumers who decide to recover in stage(a) can also have a 0 consumption in stage(b).

A survey about consumer purchase behavior of dairy products was conducted in Hebei province, China, in October 2009, one year after the melamine incident.

Descriptive statistics for sample characteristics are presented in table 1.

The condition(1) and condition(2) are different in Heckman Model and independant Double-Hurdle Model, and we choose bothto conduct the estimation.

Table 1 Descriptive Statistics

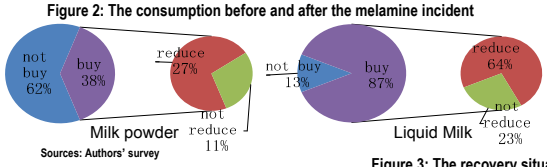
Var.	Desc.	Num.	Per.	Var.	Desc.	Num.	Per.
District	Rural	462	50.6	Child	yes	508	55.8
	Urban	451	49.4		no	404	44.3
City	SJZ	472	51.7	Elder	yes	349	38.9
	BD	441	48.3		no	549	61.1
Gender	female	637	70.8	Age	⩽20	28	3.1
	male	263	29.2		21-30	302	33.1
Marital status	Married	768	85.7		31-40	211	23.1
	Unmarried	129	14.4		41-50	149	15.8
Food shopper	yes	650	72.5		51-60	129	14.1
	no	247	27.5		>60	99	10.8

Sources: Authors' survey

Description Analysis

We distinguished the milk product into two parts: fluid milk and milk powder, and asked the respondents whether they had purchased the two products respectively before and after the Melamine Incident. Figure 2 reports the answers.

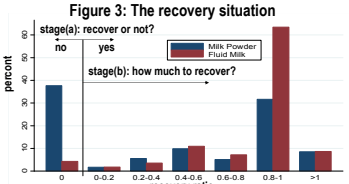
Figure 2: The consumption before and after the melamine incident



Sources: Authors' survey

The consumption of milk powder and fluid milk are almost opposite, due to their different consumer groups and consumer characteristics. Consumers who reduced their dairy consumption after the incident in Figure 2 are targets of this research, their recovery situation are shown in Figure 3.

Figure 3: The recovery situation



Sources: Authors' survey

Results & Conclusions

Based on the analysis framework, we choose economic factors (including price and income), staged factors (including risk attitude, obtained knowledge and trust) and socio-demographic characteristics to conduct the estimation. Specially, konwledge factor is divided into two parts: about safety and about harmfulness. A factor analysis on trust is performed and yields five well distinguishable principal components. The estimation results are shown in Table2.

Table 2: Estimation results for Heckman model and Double-Hurdle model

Stage(a)	Milk Powder		Liquid Milk		Stage(b)	Milk Powder		Liquid Milk	
Var.	Heckit	Dhurdle	Heckit	Dhurdle	Var.	Heckit	Dhurdle	Heckit	Dhurdle
ra	-0.0452	-0.0571	0.0766	0.0908	ra	0.0213	0.0356	**0.0173****	**0.0169***
know1	-0.0215	-0.0103	-0.0196	0.0022	know1	**-0.0775***	-0.0725	0.0050	0.0038
know2	**0.2135***	**0.1923***	0.1127	0.1420	know2	0.0381	0.0130	-0.0136	-0.0151
T.Gov.	0.1348	0.1160	0.0663	0.0430	T.Gov.	**0.1308*****	**0.1150****	**0.0355*****	**0.0375*****
T.Med.	0.0422	0.1596	-0.0874	-0.0897	T.Med.	-0.0439	**-0.0928****	**-0.0322****	**-0.0324****
T.Ent.	-0.0610	-0.1356	-0.0467	-0.0400	T.Ent.	-0.0161	0.0305	0.0050	0.0039
T.NGO.	-0.1099	-0.1366	**0.1942***	**0.2207***	T.NGO.	-0.0634	-0.0303	-0.0050	-0.0053
T.Fri.	**0.1593***	**0.2135***	-0.0712	-0.0602	T.Fri.	0.0367	-0.0191	**-0.0335****	**-0.0346****
income	**0.0104*****	**0.0101****	-0.0019	-0.0015	income	0.0026	0.0004	-0.0008	**-0.0009***
price	-0.0068	-0.0113	0.0376	0.0398	price	-0.0061	-0.0030	0.0050	0.0050
Milk Powder	**Log-likelihood**		**Prob>chi2**	**rho.**	**Milk Powder**	**Log-likelihood**		**Prob>chi2**	**rho.**
Heckit	-208.0309		0.0140	**0.9382*****	Heckit	-198.1606		0.0006	-0.0031
Dhurdle	-214.9462		——	——	Dhurdle	-196.8714		——	——

Overall, the model fits the data well, especially for the fluid milk sample. For milk powder, the model fitness in the first stage is better; but for liquid milk, the fitness for the second stage is better, which means the "threshold" effect in first stage is relatively stronger for milk powder.

Comparing the above estimates, we can find some conclusions as follows:

(1) Among the economic factors, the influence of price is not statistically significant； and in contrast, the impact of income shows obvious difference for milk powder and fluid milk.
(2) The knowledge variables don't significantly affect the recovery of liquid milk, but these variables have a significant impact on the recovery of milk powder.
(3) The trust factors have different influence on consumers' purchasing recovery of milk powder and fluid milk. The effects of consumers' trust in alternative food safety information sources also show significant differences.
(4) Consumers' risk attitude significantly affects the recovery of fluid milk, while it doesn't have a significant impact on the recovery of milk powder.

The policy implications can be given as follows.

(1) First, government should increase consumers' knowledge about the melamine through various channels and information sources, especially for the "safety" knowledge.
(2) The primary trust factor in our analysis is government, indicating that it is very essential for government to release trustworthy information after the food crisis.
(3) Finally, during the phase of food safety incident, NGOs should play an important role in achieving the recovery of consumers' confidence through taking corresponding measures, and restricting the mass media' s exaggerated, excessive and untrue reports.

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