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Food Safety Issues in China: An Insight into the Dairy Sector

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Abstract: The frequent occurrence of food safety issues have tarnished the made in China labeled product. Of these, the melamine incident of baby formula milk powder jolted the growth of dairy sector in China. The results of pre and post-melamine event analysis show that the melamine incident has statistically significantly affected milk production, number of livestock and export and import of cream and milk except import of concentrated and sweetened milk and cream. The incident affected trust of consumers both in domestic and foreign countries and resultantly the dairy industry incurred huge economic losses. The import for concentrated and sweetened milk and cream has experienced the compound rate of growth of -1.98%. However, a sky rocketing increase has been observed during the post-melamine period with compound rate of growth of 99.77%. The import for milk and cream neither concentrated nor sweetened has increased at the compound rate of growth of 3.46% during the pre-melamine period while increasing at the instantaneous rate of growth of 26.20% and compound rate of growth of 29.95%.

Key words: Food safety, melamine, dairy sector, trend and event analysis, instantaneous

INTRODUCTION

China is home to 1.35 billion people. The International Monetary Fund (IMF) (http://www.imf.org/external/ns/cs.aspx?id=29) ranks it the second largest economy of the world on the basis of its nominal GDP (approximately US$8.227 trillion) and purchasing power parity (US$12.405 trillion in 2012). Since, its open door policies of 1978, China is placed among the fastest growing economies of the world. The growth rate in real Gross Domestic Product (GDP) has been estimated at 10% per annum during 1978 to 2007 (Wang *et al*., 2013). This incredible growth in income is being contributed to global economic growth (Carter, 2011).

Besides growth in other sectors, agriculture in China has also enjoyed a hasty growth due to rapid farm mechanization, cultivating high yielding varieties of crops and high quality livestock breeds rearing. Grain output has increased at a faster rate (2.5% per annum) than its population growth (1% per annum) during 1978 to 2007. While the value added in agriculture has gone up at an annual rate of 4.8% during the same period (Wang *et al*., 2013). Gale (2002) surprises to note that for an economy with inadequate resources and massive number of consumers, the food imports is low. Researcher declares China almost self-sufficient in food items and a major exporter of several food items, like animal products, beverages, fish and seafood, fruits and vegetables and tea.

In addition to growth in crops sector, the livestock sector has also performed tremendously (Fuller *et al*., 2006; Fuller and Hu, 2005). Milk production has increased from 5.8-35 million tons during 1995 to 2007 with the annual rate of 20% (Huang *et al*., 2010; Ma *et al*., 2007; Mo *et al*., 2012; NBSC, 2008). This makes China the third milk producing country in the world after India and United States (Mo *et al*., 2012). The attribute for this upward jump in milk is not due to increase in yield but also increase in the number of animals (Fuller *et al*., 2005; Yang *et al*., 2004).

The impressive growth has changed the level of income that resulted changes in the consumption pattern of Chinese people. Since, long the dairy products have not been included in the Chinese diet. Garnaut and Ma (1993) delineate demand for grains is increasing slowly than for fruit, fish and meat, consistent with the food consumption pattern of East Asian countries. They also observe low consumption of milk and milk products both in urban (7.51) and rural (2.51 kg per capita) areas of China. However, the increasing income level and health consciousness have modified the demand pattern and consumption of healthy and quality food including dairy have increased (Fuller *et al*., 2004, 2005; Yang *et al*., 2004; Zhou *et al*., 2002) especially in urban areas (Ma *et al*., 2007).

To keep pace with the ever increasing demand, net imports of milk and milk products have gone ballistic from US$28 million in 1995 to US$295 million in 2003. Besides

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changes in consumption pattern, continuous food safety issues in China have also resulted in exploded import demand of milk and milk products (NDRC, 2008). In the past, the food safety issue has been only trade concern but recently it has turned into a critical issue of national concern (Wang *et al*., 2008).

Food safety issues: melamine incident: The United States Department of Agriculture highlights the main food safety issues of China (Gale and Buzby, 2009).

> The infant formula incident followed a string of domestic incidents including an earlier series of infant deaths in 2004 from consuming fake milk powder use of toxic dye in duck feed, chili sauce and other foods an outbreak of meningitis traced to snails served in a Beijing restaurant, periodic food poisonings in school or workplace cafeterias use of industrial bleach to whiten noodles, carcinogenic drugs in fish and shrimp, poisoning from a steroid used in pork production and the widespread sale of pork from pigs that were sick or had died from illness

Of these issues, the melamine scandal in baby formula powder milk has jolted the dairy industry. About six babies died and 300,000 hospitalized due to kidney stone problem caused by melamine in baby formula powder milk. The crisis has not only affected the local consumers' trust but also labeled a bad name to Chinese products in international market. Several countries including United States and Europe have prohibited entry of dairy products from China in their markets. This act has caused huge economic losses to Chinese dairy industry (Qiao *et al*., 2010). The event has also affected millions of farmers dependent on dairy for their livelihood. They have been looking for milk buyers causing a sharp decrease in milk production during 2008 to 2009 (Ministry of Agriculture, 2010).

In the light of the above discussion, the study in hand is carried out with the objective to portray the rate of growth of Chinese dairy industry especially before and after the melamine incident in terms of local production and international trade.

MATERIALS AND METHODS

Theoretical and empirical models

Trend and compound growth rate: To capture overtime tendency of growth (either positive or negative) economists often use time trend.

$$Y_t = \alpha_0 + \alpha_1 t + \varepsilon_t \quad (1)$$

Where:

Y_t = Dependent variable (milk production, import and export)
t = Time trend
α_0 and α_1 = Coefficients to be estimated
ε_t = Error term which is an independent, identically distributed (i.i.d.) progression with $E(\varepsilon_t) = 0$, $Var(\varepsilon_t) = \sigma_\varepsilon^2$

The coefficient α_1 is change in Y_t from one point to another as time passes on when $\Delta\varepsilon_t = 0$.

$$\alpha_1 = Y_t + Y_{t-1} = \Delta Y_t \quad (2)$$

If $\alpha_1>0$ then there is an upward trend in Y_t and if $\alpha_1<0$ then there is an downward trend in Y_t. Because of randomness the mean values of do not fall on the line while the expected values are on the line. Unlike the mean values of Y_t its variance is constant across time $Var(Y_t) = Var(\varepsilon_t) = \sigma_\varepsilon^2$. However, Y_t is independent but not identically distributed like ε_t.

In practice, the sequence of time series is better explained by an exponential trend which is captured by incorporating the natural logarithm as a linear trend with the assumption that $Y_t>0$:

$$\ln Y_t = \alpha_0 + \alpha_1 t + \varepsilon_t \quad (3)$$

This shows that Y_t has a linear exponential trend $Y_t = \exp(\alpha_0+\alpha_1 t+\varepsilon_t)$ and $\alpha_1 = \Delta \ln Y_t = \ln Y_t - \ln Y_{t-1}$ which is a proportionate change in Y_t. Taking total differential with respect to t it produces:

$$\alpha_1 = \frac{d(\ln Y)}{dt} = \left(\frac{1}{Y}\right)\left(\frac{dY}{dt}\right) = \frac{(dY/Y)}{dt}$$

In other words:

$$\alpha_1 = \frac{(Y_t - Y_{t-1}/Y_{t-1})}{t_t - t_{t-1}} \text{ or } \alpha_1 = \frac{\text{Relative change in Y}}{\text{Absolute change in t}} \quad (4)$$

where, $\alpha_1\times100$ is known as the instantaneous rate of growth or semi-elasticity of Y with respect to t and gives the percentage change or growth rate in Y for an absolute change in t. The compound (over a period of time) rate of growth (r) is estimated as:

$$\alpha_1 = \ln(1+r) \quad (5)$$

Taking antilog of α_1 and subtracting 1 from it and multiply the difference by 100 would give compound rate of growth:

$$\text{Antilog}(\alpha_1) = (1+r), \quad r = \text{antilog}(\alpha_1) - 1 \tag{6}$$

Though linear (Eq. 1) and exponential (Eq. 3) trends are common to capture the time trend but to in practice are the most common, time trends can be more complicated and have a quadratic time trend.

$$Y_t = \beta_0 + \beta_1 t + \beta_2 t^2 + \varepsilon_t \tag{7}$$

Taking derivative of Eq. 7 researchers get:

$$\frac{d(Y)}{dt} = \frac{\Delta Y}{\Delta t} \approx \beta_1 + 2\beta_2 t$$

If β_1 and $\beta_2>0$ then there is an upward trend in Y_t and if $\beta_1>0$ and $\beta_2<0$ then the increasing trend is followed by a downward trend in and the trend has a hump shape.

Event analysis: To study whether the melamine incident has affected the production, import and export of milk in China even analysis is carried out. The binary (dummy) variables are the main component of event analysis. A simple version of event equation is given as:

$$Y_t = \gamma_0 + \gamma_1 t + \gamma_2 D + \varepsilon_t \tag{8}$$

$$Y_t = \gamma_0 + \gamma_1 t + \gamma_2 D + \gamma_3 tD + \varepsilon_t \tag{9}$$

$$\ln Y_t = \gamma_0 + \gamma_1 t + \gamma_2 D + \varepsilon_t \tag{10}$$

$$\text{In}Y_t = \gamma_0 + \gamma_1 t + \gamma_2 D + \gamma_3 tD + \varepsilon_t \tag{11}$$

where, D is dummy variable (equals to 1 when the melamine event occurred and zero otherwise).

Data: The study is based on time series data starting from 2000 to 2011 for trade data and till 2102 for milk production and number of animals. Data on import and export of milk and cream (both concentrated and sweetened and neither concentrated nor sweetened) for the present study come from International Trade Centre (ITC) while data on milk production and number of livestock are acquired from FAOSTAT (database of the statistics division of Food and Agricultural Organization).

RESULTS AND DISCUSSION

Trend and rates of growth in milk production, number of livestock and export and import of milk and milk products: Regression results for trend in milk production, number of livestock (includes buffalo, cow, goat and sheep) and export and import of milk and milk products based on linear and log linear models are presented in Table 1. The results show that overall models are good (high R^2-value and significant F-statistic) except for export.

Despite a lowest milk consuming country of the world, a statistically significant increasing trend has been observed in milk production, number of livestock and import of milk and milk products. While statistically insignificant decreasing trend is observed in export of milk and milk products.

Milk production during the period under study (2000 to 2012) has increased from 11985.4 thousand metric tons to 41479.82 thousand metric tons at an annual increase of 3000.9 thousand metric tons. Number of livestock has increased at 1040.04 thousand per year from 49172-59693.102 thousand numbers. While the import for milk and cream (concentrated and sweetened) has increased at an annual increase of 4.89 thousand tons from 9.60-93.78 thousand tons. Similarly, the import of milk and cream (not concentrated nor sweetened) has increased from 59.85-578.61 thousand tons at an annual increase of 39.25 thousand tons. However, the export of milk and cream for both the concentrated and sweetened and neither concentrated nor sweetened have statistically insignificantly decreased at an annual rate of 0.39 and 0.28 thousand tons (Table 1 and Fig. 1).

The results of quadratic function (Eq. 7) show that the increasing trends in milk production, livestock number and import and export of milk and milk products is followed by a downward trends as $t>0$ and $t^2<0$, forming a hump shape (Table 2 and Fig. 2).

The results of instantaneous and compound rates of growth are derived from Eq. 3 and estimating Eq. 6 (Table 3). During the study period (2000 to 2012) milk

Table 1: Linear trend analysis

Parameters	Constant	t-values	F-values	R^2-values
Milk production	10623.47*	3000.90*	113.18*	0.920
Livestock number	49483.88*	1040.04*	45.66*	0.820
Export of milk and cream'	31.46	-0.39	0.04	0.004
Export of milk and cream''	32.05	-0.28	0.18	0.020
Import of milk and cream'	-14.88	4.89**	8.02**	0.450
Import of milk and cream''	-38.80	39.25*	21.80*	0.680

Table 2: Quadratic linear trend analysis

Parameters	Constant	t-values	t^2	F-values	R^2-values
Milk production	3141.66	6207.39*	-246.65*	189.07*	0.98
Livestock number	45416.82*	2783.06*	-134.08*	81.35*	0.95
Export of milk and cream'	-7.69	16.38**	-1.29**	2.87***	0.39
Export of milk and cream''	20.18**	4.81***	-0.39***	2.44	0.21
Import of milk and cream'	30.35**	-14.50*	1.49*	22.29*	0.83
Import of milk and cream''	179.34**	-54.24**	7.19*	40.62*	0.90

Milk quantity is in thousand metric tons while livestock are in thousand numbers. ' and '' represent concentrated and sweetened and neither concentrated nor sweetened, respectively. *, ** and *** represent significance level at 99, 95 and 90%, respectively

production has increased at the instantaneous rate of growth of 12% while the compound rate of growth during this period is 12.75%. Number of livestock has increased at the instantaneous rate of growth rate of 2% and at the compound rate of growth of 2.02%. The import for concentrated and sweetened milk and cream has increased at the instantaneous rate of growth of 22.8% and at the compound rate of growth of 25.61%. Similarly, the import for milk and cream neither concentrated nor sweetened has increased at the instantaneous rate of growth of 16.70% and at the compound rate of growth of 18.18%.

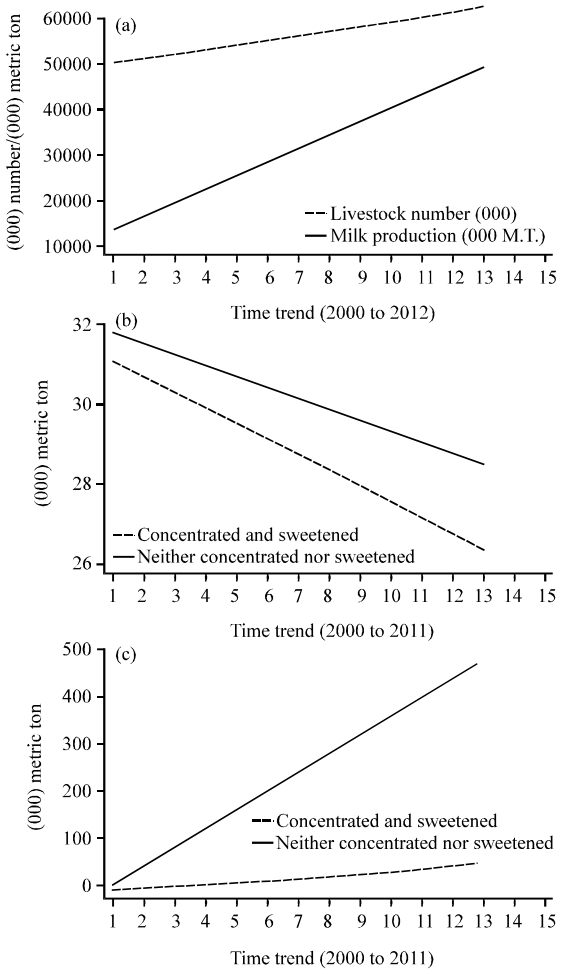

Fig. 1: Linear trend: a) linear trend in milk production and livestock number; b) linear trend export of milk and cream and c) linear trend in import of milk and cream

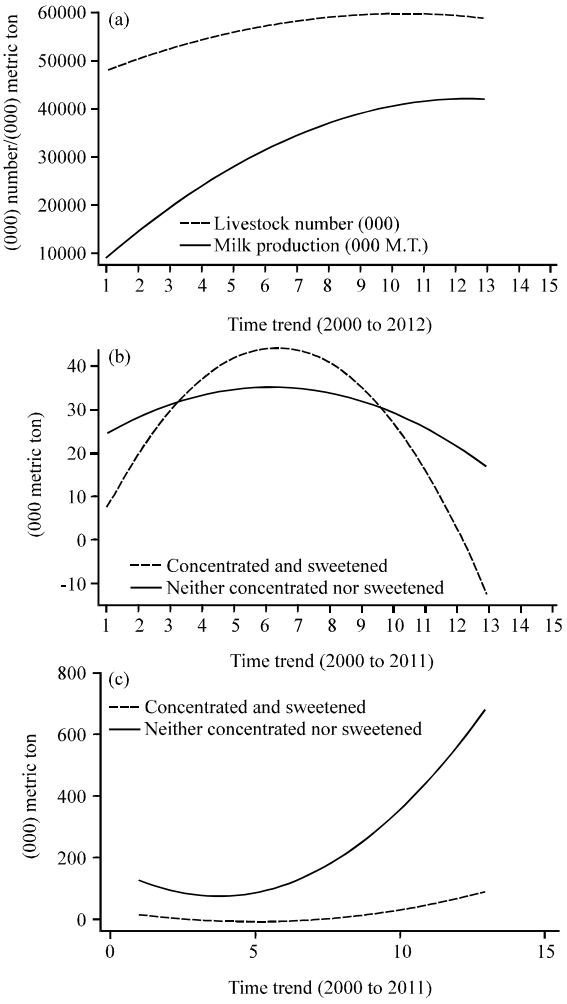

Fig. 2: Quadratic trend: a) quadratic linear trend in mik production and livestock number; b) quadratic linear trend in export of milk and cream and c) quadratic linear trend in import of milk and cream

Table 3: Log linear trend analysis and rate of growth

					Rates of growth	
Parameters	Constant	t-values	F-values	R^2-values	Instantaneous	Compound
Milk production	9.47*	0.12*	67.49*	0.87	12.00	12.75
Livestock number	10.81*	0.02*	44.76*	0.82	2.00	2.02
Export of milk and cream[I]	3.454*	-0.05	0.72	0.07	-5.20	-5.07
Export of milk and cream[II]	3.46*	-0.01	0.34	0.03	-1.20	-1.19
Import of milk and cream[I]	0.66	0.23*	13.07*	0.57	22.80	25.61
Import of milk and cream[II]	4.05*	0.17*	24.89*	0.71	16.70	18.18

Milk quantity is in thousand metric tons while livestock are in thousand numbers. [I] and [II] represent concentrated and sweetened and neither concentrated nor sweetened, respectively. *, ** and *** represent significance level at 99, 95 and 90%, respectively

However, an insignificant decrease has been observed for exports of milk and cream both concentrated and sweetened and neither concentrated nor sweetened during the period.

Event analysis and rates of growth in milk production, number of livestock and export and import of milk and milk products: The results of pre and post-melamine event analysis (Table 4 and Fig. 3) show that the melamine incident has statistically significantly affected milk production, number of livestock and export and import of cream and milk except import of concentrated and sweetened milk and cream. The results show that with the occurrence of melamine incident milk production has decreased by 8792.6 thousand metric tons, livestock number decreased 4492.1 thousand and export for concentrated and sweetened milk and cream decreased by 72.46 thousand metric tons and milk and cream neither concentrated nor sweetened has decreased by 24.749 thousand metric tons. However, the import of milk and cream neither concentrated nor sweetened has increased by 234.379 thousand metric tons while the import of concentrated and sweetened milk and cream has statistically insignificantly increased by 19.74 thousand metric tons.

The results of Eq. 9 (Table 5 and Fig. 4) delineate that the slope of the coefficient has also changed with the event of melamine incident, i.e., the pattern of trend has twisted for milk production, number of livestock and export and import of cream and milk. This change in slope is statistically significant for milk production and import of cream and milk and insignificant for number of livestock and export of cream and milk.

Table 4: Event analysis (linear trend)

Parameters	Constant	t-values	D-values	F-values	R^2-values
Milk production	7426.16*	3830.97*	-8792.60*	159.91*	0.97
Livestock number	47850.3*	1464.12*	-4492.10*	55.29*	0.92
Export of milk and cream'	2.91	7.71*	-72.46*	18.26*	0.80
Export of milk and cream''	22.30*	2.50*	-24.75*	38.41*	0.90
Import of milk and cream'	-7.11	2.68	19.74	4.32**	0.49
Import of milk and cream''	53.53	13.03	234.38*	22.82*	0.84

Milk quantity is in thousand metric tons while livestock are in thousand numbers. ' and '' represent concentrated and sweetened and neither concentrated nor sweetened, respectively. *, ** and *** represent significance level at 99, 95 and 90%, respectively

To show the instantaneous and compound rates of growth in milk production, number of livestock and export and import of milk and cream during pre (2000 to 2008) and post-melamine period (2009 to 2012) Eq. 11 is estimated and results are presented in Table 6. During the pre-melamine period the milk production has increased at

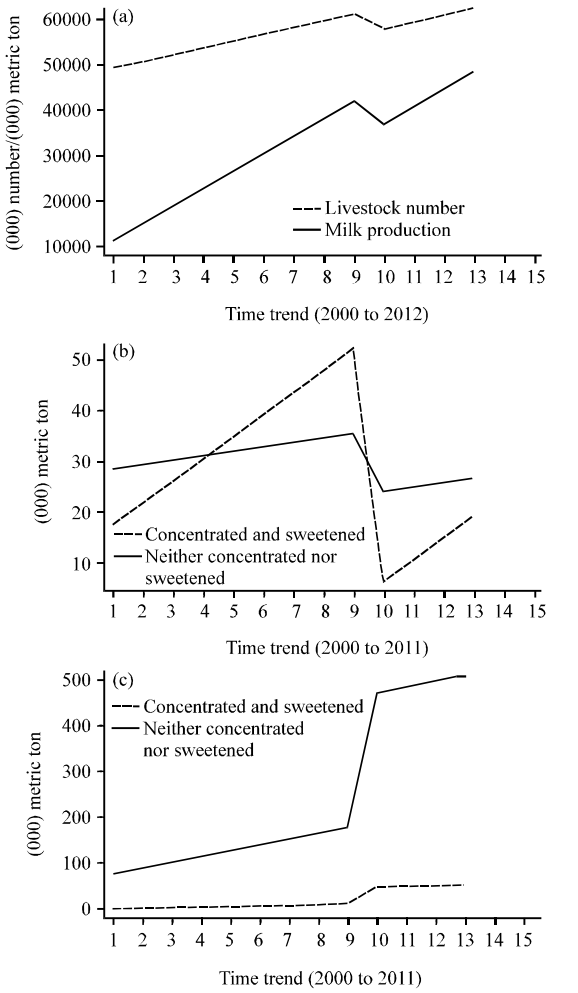

Fig. 3: Event analysis: a) linear trend and event analysis for milk production and livestock number; b) linear trend and event analysis for export of milk and cream and c) linear trend and event analysis for import of milk and cream

Table 5: Event analysis (linear trend)

Parameters	Constant	t-values	D-values	t×D	F-values	R^2-values
Milk production	6907.143*	3934.78*	25981.86**	-3217.94**	201.34*	0.98
Livestock number	47673.34*	1499.53*	7370.26	-1097.70	39.73*	0.94
Export of milk and cream'	-0.89	8.56*	5.99	-7.96	15.28*	0.80
Export of milk and cream''	22.27*	2.50*	-24.16	-0.06	22.77*	0.90
Import of milk and cream'	5.80	-0.19	-246.09*	26.96*	27.96*	0.91
Import of milk and cream''	101.59*	2.35	-755.63*	100.39*	105.73*	0.98

Milk quantity is in thousand metric tons while livestock are in thousand numbers. ' and '' represent concentrated and sweetened and neither concentrated nor sweetened, respectively. *, ** and *** represent significance level at 99, 95 and 90%, respectively

the instantaneous rate of growth of 16% while the compound rate of growth during this period was 17.35% per year. These rates in milk production have tremendously decreased during the post-melamine period

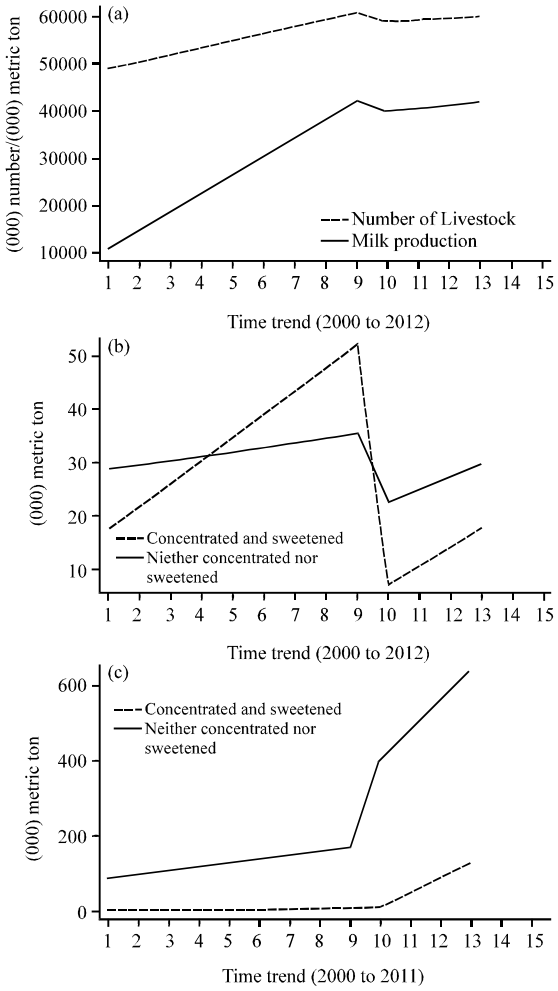

Fig. 4: Event analysis with twist in slope: a) linear trend and event analysis for milk production and number of livestock; b) linear trend and event analysis for export of milk and cream and c) linear trend and event analysis for import of milk and cream

to 2.00 and 2.02%, respectively for instantaneous and compound rates of growth. The number of livestock has increased at the instantaneous rate of growth rate of 3% and the compound rate of growth of 3.05% during the pre-melamine period while during the post period these rates are estimated to be 1% each for instantaneous and compound rates of growth. The export for concentrated and sweetened milk and cream has increased at the instantaneous rate of growth of 22.5% and at the compound rate of growth of 25.23% while decreased to 6.70 and 6.93% for instantaneous and compound rates of growth with the melamine event. However, a slight increase has been observed for export of neither concentrated nor sweetened milk and cream during the post melamine period. During the post melamine period, the neither concentrated nor sweetened milk and cream has been growing at instantaneous rate of growth of 10.30% and compound rate of growth of 10.85%, contrary to the pre-melamine period where the instantaneous rate of growth has been 7.40% and compound rate of growth of 7.68%. The import for concentrated and sweetened milk and cream has experienced the instantaneous rate of growth of -2.00% and the compound rate of growth of -1.98%. However, a sky rocketing increase has been observed during the post-melamine period at the instantaneous rate of growth of 69.20% and the compound rate of growth of 99.77%. The import for milk and cream neither concentrated nor sweetened has increased at the instantaneous rate of growth of 3.40% and at the compound rate of growth of 3.46% during the pre-melamine period while increasing at the instantaneous rate of growth of 26.20% and compound rate of growth of 29.95%.

Dairy sector (pre and post-melamine scenario): The dairy sector in China has gone through major restructuring in the form of active government support by allocating land to rear cattle, improvement in the grasslands and yields, providing economic incentives to livestock farmers in the form of exemption from land tax, provision of loans on soft terms and providing processing and packaging operators (Pei *et al*., 2011).

Table 6: Event analysis (log-linear trend) and rate of growth

							Pre-melamine growth (%)		Post-melamine growth (%)	
Parameters	Constant	t-values	D-values	t×D	F-values	R^2-values	Instantaneous	Compound	Instantaneous	Compound
Milk production	9.29*	0.16*	1.14	-0.14**	91.92*	0.97	16.00	17.35	2.00	2.02
Livestock number	10.78*	0.03*	0.14	-0.02	40.18*	0.94	3.00	3.05	1.00	1.01
Export of milk and cream^{I}	2.46*	0.22*	-0.76	-0.16	23.71*	0.90	22.50	25.23	6.70	6.93
Export of milk and cream^{II}	3.16*	0.07*	-1.09**	0.03	36.16*	0.93	7.40	7.68	10.30	10.85
Import of milk and cream^{I}	1.61*	-0.02	-5.48**	0.71*	23.65*	0.90	-2.00	-1.98	69.20	99.77
Import of milk and cream^{II}	4.54*	0.03	-1.28	0.23	24.80*	0.87	3.40	3.46	26.20	29.95

Milk quantity is in thousand metric tons while livestock are in thousand numbers. ^{I} and ^{II} represent concentrated and sweetened and neither concentrated nor sweetened, respectively. *, ** and *** represent significance level at 99, 95 and 90%, respectively

The growth in dairy sector is mainly attributed by change in consumption patterns due to increase in level of income, health awareness, government interventions to promote consumption of milk and mounting exports of dairy to Hong Kong, Macao and Southeast Asia, especially dry milk products (Pei *et al*., 2011). In addition, introducing high quality dairy breeds (from Australia, Canada, Europe, New Zealand and United States) and adopting the improved livestock management practices (Beghin, 2006; Xiu and Klein, 2010) also increased milk production. This astonishing performance in milk production makes China the third largest milk producing country in the world.

The rapidly growing dairy sector of China has also attracted both the domestic and foreign investment in the form of processing plants and stream lined the collection and distribution system necessary for efficient marketing. All these factors have induced the dairy sector of the country to perform by heaps.

However, when the Chinese government made it public on September 11, 2008 that baby milk powder is contaminated by melamine, the news created havoc among the consumers. The situation further aggravated when it came to know that milk and milk products from China also contained melamine. Globally most of the countries including United States and Europe banned entry of dairy products or products that contained milk from China in their markets. The incident affected public health and trust of consumers both in domestic and foreign countries and resultantly the dairy industry incurred huge economic losses (Badrie *et al*., 2009; Liu *et al*., 2008; Qiao *et al*., 2010; Wang *et al*., 2008; Xiu and Klein, 2010).

The event has also affected millions of farmers dependent on dairy for their livelihood. They have been looking for milk buyers causing a sharp decrease in milk production during 2008 to 2009 (Ministry of Agriculture, 2010). According to Zhao *et al*. (2009), 73% of the dairy farms in Inner Mongolia contained <10 milking cows. Further, 43% of the households only dependent on dairy income for their livelihood while for 30% the dairy income contained more than half of their household income. These small farmers were directly affected by the melamine incident as demand for milk dropped and a sharp declined in price of milk occurred.

Nobody can capture the economic values of the precious life losses and human mental trauma due to melamine tainted baby milk powder along with the added medical expenses. However, the incident proved to be devastating for the fastest growing dairy sector. For example, the dairy giants like Mengniu and Yili experienced 80% losses in sales during the first 10 days after revelation of the incident (Lu, 2009). In addition the milk processing companies made a public recall of their products and dumped. The consumer worriedly searching safe dairy products for their family members. According to Wang (2009), direct losses to the dairy industry in the 1st 4 months (after revelation of the melamine till December 31, 2008) were estimated to be more than US$3 billion.

The melamine incident also responsible for bringing changes in the Chinese food safety system. In 2008, the United Nation (United Nations, 2008; Advancing food safety in China, Occasional paper, United Nations in China) described the food safety system of China as lack of co-ordination among the authorities involved, short of financial resources and a considerable disparity in the number of official controls between urban and rural areas. With the occurrence of melamine incident the government has shifted its stress of supporting the dairy industry and currently more emphasis is being put on strengthening the regulatory framework and quality control (Pei *et al*., 2011).

In nut shell, the event proved a catastrophe to the made in China, trust of domestic consumers and trade partners lost. This caused loss to consumer in terms of health and buying costly imported items and loss to government in term of foreign exchange earnings because of decrease in exports and increase in imports.

CONCLUSION

The dairy sector in China has gone through major restructuring by active government support to livestock farmers. The findings of the study show that milk production, number of livestock, import for both the concentrated and sweetened and neither concentrated nor sweetened milk and cream has increased. However, an insignificant decrease has been observed for exports of milk and cream both concentrated and sweetened and neither concentrated nor sweetened during 2000 to 2011. The growth in dairy sector is mainly attributed by change in consumption patterns, mounting exports, introducing high quality dairy breeds and adopting the improved livestock management practices. The results of pre and post-melamine event analysis show that the melamine incident has statistically significantly affected milk production, number of livestock and export and import of cream and milk except import of concentrated and sweetened milk and cream. When it came to know that milk and milk products from China contained melamine most of the countries banned entry of dairy products or products that contained milk from China in their markets. The incident affected public health and trust of

consumers both in domestic and foreign countries and resultantly the dairy industry incurred huge economic losses. During the post melamine period, the neither concentrated nor sweetened milk and cream has been growing at compound rate of growth of 10.85%, contrary to the pre-melamine period where the rate of growth has been 7.68%. The import for concentrated and sweetened milk and cream has experienced the compound rate of growth of -1.98%. However, a sky rocketing increase has been observed during the post-melamine period with compound rate of growth of 99.77%. The import for milk and cream neither concentrated nor sweetened has increased at the compound rate of growth of 3.46% during the pre-melamine period while increasing at the instantaneous rate of growth of 26.20% and compound rate of growth of 29.95%.

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