Changes in Income and Welfare Distribution in Urban China

and Implications for Food Consumption and Trade

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Abstract

While China's economic reform has brought about significant economic growth, there is a considerable debate about the impact of such market-oriented reform on income and welfare distributions. This paper examines the changes in income and welfare distributions in urban China from 1981 to 1998 and discusses implications for China's food consumption patterns and trade behavior. While the Lorenz curves estimated using Kakwani's interpolation method indicate that the level of income inequality in urban China has increased significantly since 1981, welfare comparisons based on generalized Lorenz curves suggest that the rise in real average income has more than compensated for the increase in inequality and has therefore brought about continuous improvement in welfare since 1981, except in 1988 and 1989 due to high inflation rates. Nevertheless, it becomes very critical for China to develop welfare programs and a social security system to provide a guaranteed living standard for low-income households. China's increasing income will continue to shift its food consumption from grains to animal products and, at the same time, the increasing income inequality will make food demand significantly different across regions and income groups.

Introduction

While the relationship between economic growth and income distribution has been a major concern of social scientists and policymakers, many theoretical and empirical studies have focused on the question of how inequality is generated and how it reproduces over time (e.g.,

Kuznets 1955, Kakwani 1980, Lambert 1989, Aghion et al. 1999). Kuznets (1955, 1963) began the search for a general relationship between economic growth and income inequality and found an inverted U-shape relation between income inequality and per capita GNP based on both cross-country and time-series data. Although the Kuznets hypothesis seemed to account for the experience of several countries such as the US and United Kingdom up to the 1970s, the downward trend in inequality experienced by these countries during 1870s to 1970s has reversed sharply in the past two decades. For example, the share of total wealth owned by the 10% richest households in the US rose from 50% around 1770 to about 75% around 1870, then receded back to 50% in 1970, but has increased significantly in the 1980s and 1990s (Aghion et al. 1999). For developing countries, the relevance of the Kuznets hypothesis has been challenged since the early 1970s (e.g., Adelman and Morris 1973, Anand and Kanbur 1993).

Although many empirical studies have been conducted and new theories have been developed, yet the relationship between inequality and the process of economic development is far from being well understood, especially for developing countries (Aghion et al. 1999). This is partially due to the lack of consistent data and partially due to the significant differences in socioeconomic structures and development policies across countries. On the other hand, the rapid economic growth in countries like China in the past two decades may provide new evidence to examine the relationship between economic growth and inequality. With a booming economy since the early 1980s, China's recent experience provides an excellent case to study the changes in income and welfare distributions under the transition towards a market economy. Such a case study is interesting because many countries have been under economic transition since the early 1980s but there has been considerable uncertainty and debate about the impacts of such market-oriented reforms on income and welfare distributions.

The major objective of this study is to examine the changes in average income, inequality and social welfare in urban China since 1981 and derive economic and policy implications for food consumption and trade. This paper presents two quantitative analyses: First, Lorenz curves are estimated from China's urban household survey data for 1981 to 1998 using the interpolation method proposed by Kakwani (1980) and Gini coefficients are then calculated from the Lorenz curves. Second, a welfare index is constructed from generalized Lorenz curves to examine the changes in social welfare over the study period. As suggested by Lambert (1989), the inequality and welfare analyses compensate each other because Gini coefficients provide information on the changes in inequality or how a cake is divided and the welfare analysis provides information on changes in the overall social welfare or the size of the cake.

Trend in average income and inequality in urban China

With more than 20 percent of the world's population and significant socioeconomic changes in the past five decades, China's economic growth and income distribution have been the focus of many studies (e.g., Adelman and Sunding 1988, Zhang and Tam 1990, Khan et al. 1993, Griffin and Zhao 1993). Although data on China's income distribution have been very limited, especially for the period prior to 1980, previous studies generally suggest that China's income inequality decreased significantly around 1950, remained at a low level from the early 1950s to around 1980, and has shown an upward trend since the early 1980s. Such changes in income inequality have been closely related to China's political and economic systems. For example, while the decrease in inequality around 1950 was largely due to the establishment of the new system in which almost every rural household was allocated a piece of land to farm and many urban residents were offered jobs in state-owned enterprises, the low level of inequality in

the next three decades was a result of China's development policies that focused on state-owned industries in urban areas and collective production and distribution systems in rural areas. China's low level of inequality and unemployment rate prior to the 1978 economic reform was achieved through a host of measures such as the rationing of housing and even food in urban areas and strict restrictions for people to move from rural to urban areas. China's socialist system was quite successful in reducing poverty and providing a guaranteed living standard but was also responsible for the slow economic growth due to the lack of incentives and economic efficiency. According to Adelman and Sunding (1988), the Gini coefficient in urban China remained at a low level of about 0.165 during 1958 to 1977 but the increase in nominal per capita income was very limited, from 280 yuan in 1958 to 339 yuan in 1977.

As a result of the economic and political pressures after the death of Chairman Mao and several other senior communist leaders in the mid 1970s, China started its economic reform in the agricultural sector in 1978 and has gradually expanded the market-oriented reform to all other sectors. China's economic reform has been considered successful as compared with many other reforming countries such as the former Soviet Union that have been struggling with low economic growth rate and high inflation rate. For example, as shown in Figure 1, China's urban per capita nominal income has increased steadily since 1981, from 498 yuan in 1981 to 5,458 yuan in 1998. Figure 1 also shows that the real per capita income in 1990 Chinese yuan increased from 985.4 to 2,696.5 over the same period. Note that the real income is calculated from the nominal income and the urban living cost index published by the State Statistical Bureau of China (SSB) (1999).

Although China's market-oriented economic reform has been quite successful, it has also raised some socioeconomic concerns about such problems as an increasing unemployment rate

and widening gaps in income across households and regions (Zhang and Tam 1990, Khan et al. 1993). For example, the ongoing reform in the state-owned industries has resulted in a steady increase in unemployment rate in urban areas, especially in big cities that are highly dependent on state-owned enterprises. The increasing unemployment rate and limited social supports for unemployed workers and their families have contributed to the increasing inequality in urban areas.

While several reports have suggested that China's income inequality has increased since the early or mid 1980s (e.g., Zhang and Tam 1990, Khan et al. 1993, Griffin and Zhao 1993, World Journal, October 25, 1998), most of the studies were based on data from the 1980s and few quantitative estimations have been reported for the 1990s. This study estimates Lorenz curves and Gini coefficients for urban China by applying the interpolation method proposed by Kakwani (1980) to income data published by the SSB. SSB has conducted the nationwide annual urban household survey since 1980. Sample households were selected by using a three-stage stratified sample scheme: cities were first selected from each province, enterprises and institutions were then selected from each city, and finally households were selected from each enterprise and institution. The participating households were requested to keep detailed records of their daily income and expenditures by using the account books provided by the SSB. The account books were collected, examined, aggregated, and reported by local statistical agencies every month. Although the SSB has not published the survey data by households, it has published the average income, number of households, and average household size by income groups. Such data allow us to estimate the population in each group and construct the group distribution data for each of the 18 years from 1981 to 1998.

Because such group data are not detailed enough to permit accurate construction of Lorenz curves, we use the interpolation method proposed by Kakwani (1980) to construct the Lorenz curves and then estimate the Gini coefficients. This method involves constructing a continuous differentiable function within each income group except the lowest and highest groups, and then fitting a Pareto function for the lowest income group and highest income with an open end (Kakwani 1980, Lambert 1989). As compared to the traditional linear interpolation method of constructing a Lorenz curve from group data, Kakwani's approach results in a smooth Lorenz curve and therefore a more accurate estimate of Gini coefficient (Kakwani 1980, Lambert 1989).

As Kakwani's technique is directly available in several publications, its mathematical procedures are not included in this paper. A smooth Lorenz curve is estimated for each of the 18 years from 1981 to 1998 by applying the technique to the grouped data for urban China. With a smooth and continuous Lorenz curve for each year, the area under the curve can be estimated accurately through integration. It can also be estimated by dividing the curve or population into 20 or more groups, then calculating the area under the curve for each group by approximating the curve as a straight line or assuming income is equally distributed within the group, and finally adding the estimated areas together. It is straightforward to show that the difference between the two estimation methods becomes insignificant when the number of groups is large. In this study, we have used the linear approximation method with 20 groups because it is much easier and generates results that are very close to those by the integration method. After the area under each Lorenz curve is estimated, the Gini coefficient is calculated as the ratio of the area between the curve and the straight line connecting the two end points of the curve to the area under the

straight line. While the group data and estimation procedures are available from the authors, the estimated Gini coefficients for 1981 to 1998 are presented in Figure 2.

Results presented in Figure 2 clearly show that the estimated Gini coefficient increased from around 0.16 in the early 1980s to 0.233 in 1998. This suggests that the income inequality in urban China has increased significantly since the early 1980s, especially since the early 1990s. On the other hand, the income inequality level in urban China is still relatively low as compared with that in many other countries (Aghion et al. 1999). Because almost all the published studies on China's income distribution were based on data prior to 1990, this may be the first study based on data from both 1980s and 1990s and quantitatively shows that income inequality in urban China has increased significantly in the past decade.

Changes in social welfare

While the Lorenz curves and Gini coefficients provide useful information on the changes in income inequality or how the cake is divided, they do not reflect the size of the cake or welfare of the population in each income group. In this section, a welfare approach developed by Atkinson (1970) and Lambert (1989) is used to examine the changes in social welfare in urban China. As a major procedure of this approach, a generalized Lorenz curve is constructed by multiplying the ordinary Lorenz curve by the mean income (Lambert 1989). The rationale of this approach is to assign a level of utility $U(x)$ to each income level (x) and the average utility across the distribution is then used as an indicator of "social welfare."

Lambert (1989) stated that, given two income distributions, the generalized Lorenz curves can by constructed by multiplying the ordinary Lorenz curves by the mean incomes and the social welfare can then be compared according to the generalized Lorenz curves. If one

generalized Lorenz curve dominates over the other one without any intersection except at the starting point, it can be concluded that the first distribution will be ranked as welfare superior to the other under the assumption of a concave utility function. However, when the generalized Lorenz curves intersect each other, it becomes more complex because the conclusion will be different for different income groups. While Lambert (1989) presented the economic theory and mathematical framework for this approach, the technical details are not included in this paper.

Following this welfare approach, we constructed a generalized Lorenz curve for each of the 18 years from 1981 to 1998 according to the real mean income and ordinary Lorenz curves estimated in the previous section. Because an examination of each possible pair of these generalized Lorenz curves indicates no clear intersection, we are able to make conclusions about the changes in welfare.

With the generalized Lorenz curves, a social welfare index is constructed based on the area under the generalized Lorenz curves. We first estimated the area under each generalized Lorenz curve and then constructed an index with the area under the 1981 curve being 100. Results presented in Figure 3 clearly show that the social welfare in urban China improved continuously from1981 to 1998, except in 1988 and 1989 due to high inflation rates.

Figure 2 and Figure 3 together may suggest that the rise in real average income in urban China has more than compensated for the increase in inequality and has therefore brought about continuous improvement in welfare since 1981, except in 1988 and 1989.

Implications for food consumption and trade

Because income has been identified as an important factor of China's changing food consumption patterns and urban households still spend an average of more than 35% of their

income on food, changes in China's urban income distribution have significant implications for its food market. They may also affect China's food imports because urban households are the primary buyers of imported food products, especially high value products such as meats and fruits. While Carter (1997) discussed China's urban-rural income gap and implications for global food market, this study examines the changes in income inequality in urban China and discusses their implications.

As shown in Table 1, food consumption patterns in urban China are significantly different across income groups. While high-income households tend to consume more meats, dairy products, fruits milk and meats, low-income households are likely to purchase more grains and animal oils. As the income differences across households continue to increase, China's food demand will be more diversified across income groups. For example, the demand for meats and dairy products will increase at a higher rate for high-income households and high-income areas and, on the other hand, it will increase at a lower rate for low-income households and low-income areas. This will also affect the supply and demand in each city or even in each district of the same city.

For the US and other countries that want to expand their food exports to China, the income effects and the changes in China's income distribution must be considered in developing effective marketing strategies. Because most imported food products are relatively more expensive and more likely to be purchased by high-income households, marketing and promotion programs should focus more on high-income groups or districts. Also, studies should be conducted to identify other socioeconomic factors that may affect the preferences and demand for imported food products. The future of the Chinese market for U.S. food products depends to

a large extent on Chinese consumer demand for food and preference for U.S. food products as China moves towards a market economy.

China is commonly viewed as a tough market to enter because of its many institutional restrictions and socioeconomic characteristics that are not well understood by U.S. exporters. Institutional barriers such as import quotas are often to blame, but the lack of information and studies of the underlying mechanisms of the Chinese market also contribute to the difficulty faced by U.S. exporters. For example, findings from a consumer survey we conducted in the city of Guangzhou in January 1996 indicate that 63% of the respondents would increase their purchase of imported food products as their income increases, but 91% of them preferred live chicken over frozen chicken meat. This finding has a direct implication for U.S. poultry exporters who are primarily shipping frozen poultry to China. While U.S. poultry exports to China have been mainly specialty parts such as wings and feet and purchased by south China consumers, one interesting question is whether consumers in northwest China who have significantly different food consumption patterns will exhibit a similar preference for chicken feet and wings.

There is increasing evidence to support the contention that China's food trade is becoming increasingly determined by consumer demand. For example, increased consumer demand for livestock products has been identified as a key factor for the rapid growth in China's livestock industry and dramatic change in China's corn trade, from a net export of 11.1 mmt in 1993 to a net import of 5.1 mmt in 1995. As another example, China's rapid growth in barley imports, from less than 0.1 mmt in 1988 to 1.3 mmt in 1995, was mainly due to increased consumer demand for beer (Crook 1992, Wang et al. 1997). The increasing impacts of consumer demand on China's food imports and declining effectiveness of the state trade restrictions are

also reflected in the increase in China's unofficial food imports. Although China has long maintained a ban on U.S. fruits (except for small quantities imported by joint venture hotels), U.S. fruits have been widely available in China's urban markets in the past several years. One estimate indicates that Chinese consumers already consume $10 million of U.S. fresh fruits annually (West 1994). Aho (1995) and the U.S. Census Bureau (1995) reported that a large proportion of U.S. food exports to Hong Kong ended up in China.

Conclusions

This study used recent data from urban China to examine the changes in income and welfare distributions since 1981. While the Lorenz curves estimated using Kakwani's interpolation method indicate that the level of income inequality in urban China has increased significantly since 1981, welfare comparisons based on generalized Lorenz curves suggest that the rise in real average income has more than compensated for the increase in inequality and has therefore brought about continuous improvement in welfare since 1981, except in 1988 and 1989 due to high inflation rates.

While Adelman and Sunding (1987) speculated in their study that a new inverted U-shaped relationship should be observed when the reform spread to the urban area, our results suggest that the inverted U-shaped relationship may be likely but China is still in the heading-up period. Recent data from China suggest that income inequality is still increasing as more and more state-owned enterprises are put in the market and more and more workers are losing their jobs. On the other hand, our results show that the rise in real average income in the past two decades has more than compensated for the increase in inequality and has therefore brought about continuous improvement in welfare since 1981, except in 1988 and 1989 due to high

inflation rates. This finding is quite different from the results of Zhang and Tam (1990) who argued that both rural and urban China in the late 1980s were not better than in the early 1980s. However, we did notice that the welfare level in 1988 and 1989 was a little bit lower than that of the previous year and that was mainly due to the high inflation rates or lower average real income. The reversed trend for these three years was consistent with findings from some studies done by the World Bank and the International Fund for Agricultural Development (Khan 1993).

This study also suggests that the comparison of Gini ratios over time or across countries should be adjusted for the differences in real income. Our analysis indicates that Gini ratios derived from Lorenz curves and welfare comparison based on generalized Lorenz curves together can provide a better picture of the changes in both inequality and social welfare.

With a socialist economic system for many years, China's market-oriented economic reforms have brought about many socioeconomic problems and challenges. For example, the ongoing reform in state-owned enterprises has significantly increased the unemployment rate and resulted in difficulties for many families. While the living costs have been increasing and state subsidies in housing and health care have been decreasing, it becomes very critical for China to develop welfare programs and a social security system to provide a guaranteed living standard for low-income households.

Since income has been identified as an important factor of the ongoing changes in China's food consumption patterns and trade behavior, it becomes increasingly important to study the changes in China's income and distribution. It is also important to study the impacts of other socio-demographic variables such as education and population structure on China's food supply, demand and international trade.

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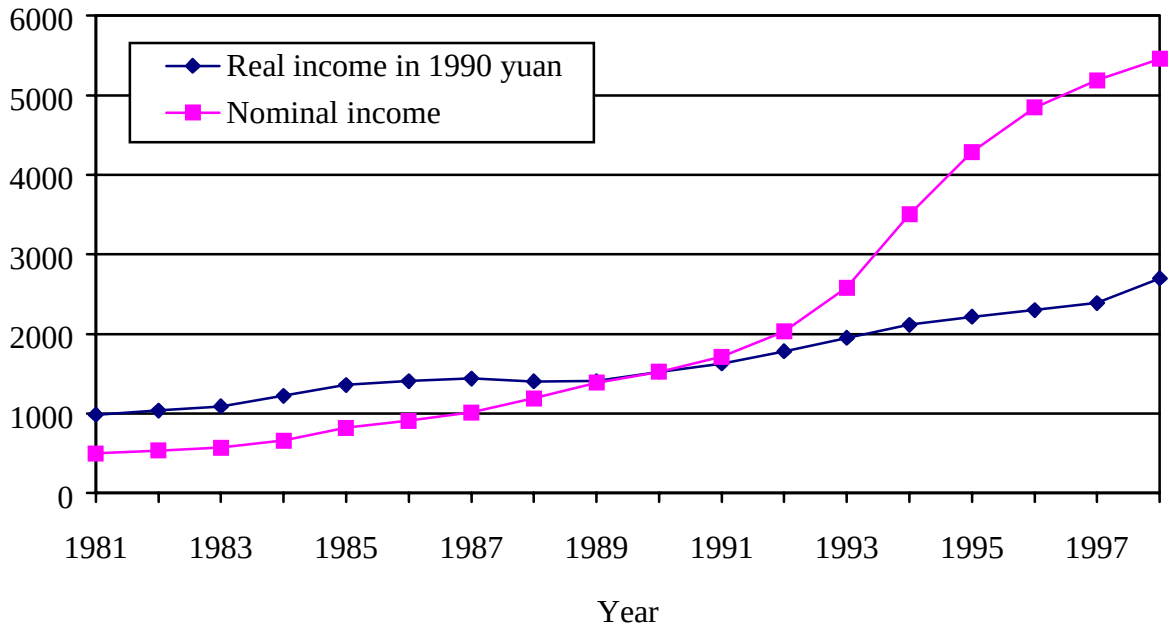

Figure 1. Changes in China's urban per capita income, 1981-1998

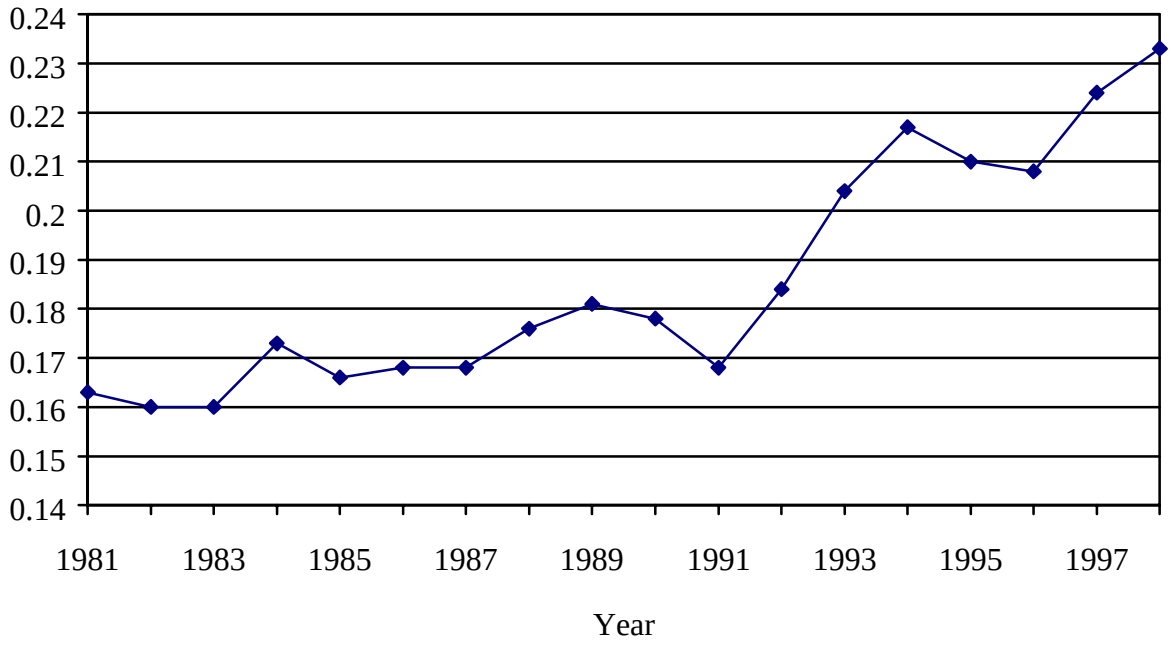

Figure 2. Changes in China's urban Gini coefficients, 1981-1998

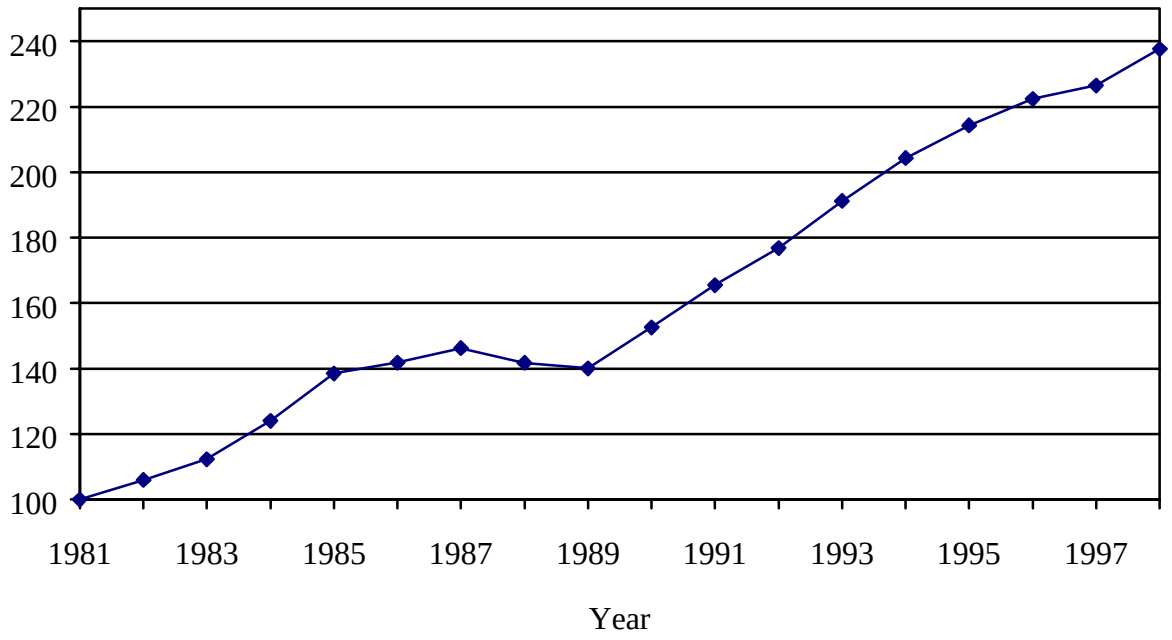

Figure 3. Changes in social welfare in urban China, 1981-1998

Table 1. 1998 Per Capita Food Consumption in Urban China by Income Groups (kilogram)

	Income groups						
Products	Lowest	Low	Lower middle	Middle	Upper middle	High	Highest
Vegetable oil	7.13	7.68	7.67	7.67	7.45	7.59	7.58
Animal oils	0.54	0.52	0.49	0.49	0.48	0.48	0.49
Pork	12.43	13.96	14.98	16.12	17.16	18.32	19.05
Beef	1.48	1.76	1.97	2.14	2.30	2.52	2.61
Poultry	3.13	3.86	4.31	4.80	5.08	5.77	5.98
Eggs	8.25	9.10	10.03	10.22	10.63	11.18	12.01
Fish	3.03	3.50	3.85	4.19	4.45	4.82	5.08
Shrimp	0.68	0.81	0.93	1.05	1.14	1.31	1.48
Vegetables	97.82	104.50	108.78	114.15	118.25	126.24	134.78
Sugar	1.54	1.71	1.73	1.78	1.77	1.86	1.99
Dairy products	2.87	3.72	4.95	6.17	7.48	9.03	10.66
Melons & fruits	31.20	39.11	43.52	48.83	53.96	58.87	63.37
Beer	3.75	4.87	5.81	6.41	7.31	8.14	8.13