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A HOUSEHOLD-LEVEL ANALYSIS OF FOOD EXPENDITURE PATTERNS IN URBAN CHINA: 1995-2000

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A HOUSEHOLD LEVEL ANALYSIS OF FOOD EXPENDITURE PATTERNS IN URBAN CHINA: 1995-2000

Jorge M. Agüero and Brian W. Gould*

Introduction

With China's admission into the World Trade Organization (WTO), there is the potential for dramatic increases in U.S. agricultural exports to China. For example, USDA's Foreign Agricultural Service estimates that China's participation in the WTO would result in substantial reductions in trade barriers and an increase of at least $2 billion per year in agricultural exports by 2005. Exports of grains, cotton, and oilseeds and related products, are projected to increase by $1.6 billion [3]. Not only would tariffs be reduced significantly for poultry, pork, beef, dairy products, fruits, forestry, and fish products, there may also be significant reductions in a variety of non-tariff barriers [2. 18, 20].

As China's economy continues to develop, there is general consensus that there will be an associated change in the population's diet [7, 18]. With rising incomes it is projected that the Chinese diet will become more diversified, will depend less on staples, such as rice and wheat flour, and will contain more livestock products [6]. Using the example of other Asian economies such as Japan, Korea, Hong Kong, and Singapore, most believe that consumption of dairy products in China will increase [13].

Currently, dairy products account for a small proportion of total food consumed, but they have been increasing in importance over the last two decades. Per capita fluid milk consumption in urban areas is less than two gallons per year, nearly the lowest in the world. The consumption of manufactured dairy products like cheese and butter is virtually nonexistent [17]. With increasing incomes, however, the growing middle class is demanding more convenience in their foods and the availability of greater value-added foods such as dairy products, fresh fruits, and processed foods [6]. For example the U.S. Dairy Export Council (USDEC) predicts an 8.5% annual average growth rate over 2000-2004 for cheese consumption in China. They estimate that the 360 million Chinese living in urban coastal areas are the most likely markets for U.S. dairy products. Of these urban individuals, approximately 100 million have sufficient income to afford U.S. dairy products [17, p.1].

With Chinese markets becoming more open to U.S. food products, it is important that U.S. manufacturers and traders obtain a better understanding of the determinants of food expenditures in China. For example, how does household income impact food choice? In particular, how does income affect the consumption of dairy products? Such information is important for potential exporters, especially since the projected seven to eight percent annual GDP growth projected for China over the near term may result in increased demand for foods that in the past were considered luxuries [18].

This discussion paper will address the question of how changes in household income (and other characteristics) may impact food demand in general and dairy products in particular. In Section I of this report we describe agricultural trade policy changes likely to occur in China due

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to its entrance into the WTO. We also review the level of U.S. agricultural exports to China paying particular attention to dairy products. We then describe the changes in the Chinese patterns of food consumption from a macro-economic perspective. In Section II we describe the household survey data that forms the basis of our econometric analysis of food expenditures. In section III we review our econometric results. A set of final comments is presented in section IV followed by two appendixes. Appendix A provides an overview of the provincial economies from which the households contained in the survey data used in our econometric analysis reside. Given the type of econometric model used in our analysis, the estimated coefficients are difficult to interpret by themselves. In Appendix B we present estimates of the marginal impacts of changes in our explanatory variables on food (dairy product) expenditure shares.

Table 1. Summary of China's WTO Membership Commitments for Agricultural Products and Dairy-Based Commodities

Changes Impacting All Agricultural Products	
1	Reduce tariffs on agricultural goods from a 1997 average of 31% to 14%.
2	Establish annual tariff-rate quotas (TRQs) for imports of selected key commodities. TRQs are set quantities that may be imported within a year at low tariffs ranging from 1 to 9%. Over-quota imports may be assessed much higher tariffs. Quotas were initially set for years 2002-04 for most commodities.
3	Set aside specified shares of TRQs for state trading enterprises (STE) and also for private and other non-state enterprises.
4	Eliminate export subsidies.
5	Eliminate nontariff barriers. Inspection, testing, domestic taxes, and other measures must comply with WTO rules.
6	Limit non-commodity-specific trade-distorting domestic agricultural support to no more than 8.5% of total agricultural output value. China must limit commodity-specific support for any given commodity to no more than 8.5% of that commodity's total value of production.
7	Agree to an annual Aggregate Measure of Support (AMS) level of zero. This does not mean that China has agreed to no trade-distorting domestic subsidies. Rather, it has agreed to limit such subsidies to the *de minimis* level.
8	Apply science-based sanitary and phytosanitary standards to all agricultural goods, including grains, meats, and fruits.
9	Publish regulations governing trade and policy that were previously not available to the public.
10	Open China's distribution and service sectors to foreign-owned firms
Changes Specific to Dairy Products	
11	Tariff for fresh, processed and grated cheese reduced from 42-44% to 12-15%.
12	Tariff for lactose reduced from current 35% to 10%.
13	Tariff for yogurt reduced from current 50% to 10%.
14	Tariff for ice cream reduced from current 45% to 19%.
15	Tariff for whey will remain at 6%.
16	Allow for direct importation of cheese through ports close to final market instead of requiring transshipment through Hong Kong.
17	Facilitate importers ability to move through official channels.

* Source: General WTO commitments obtained from the Economic Research Service of USDA, http://www.ers.usda.gov/Briefing/China/wto-commitments.htm. Information concerning tariff reductions for dairy products was obtained from U.S. Dairy Export Council [16, 17].

I. WTO Membership, Chinese Dairy Imports and Food Consumption Patterns

An Overview of China's WTO Commitments

China became a member of the WTO in December 2001. A summary of the major changes in agricultural trade policy in general and specific implications for the dairy sector are presented in Table 1. From this table we see a number of impacts, including changes in both tariff and non-tariff barriers to trade. One of the major changes is the promised decreased importance of state trading enterprises in the importation of dairy product and import quotas.[1] For dairy products, the impacts of WTO accession are unclear. Officially, as shown in Table 1, there will be significant reductions in tariffs on dairy products. There is some debate as to whether these tariff reductions will translate into dramatically lower prices for dairy products, however. For example, the US Dairy Export Council notes that cheese is currently imported "…through grey channels [implying an] effective rate of 25 to 30% total tariff (including VAT[2])." They predict that the price impact of the WTO commitments may only be two to three percent reduction [16, p.143]. They conclude that the main effects of WTO membership may be the increased ability of cheese to be traded through official channels, and 100% foreign owned companies should be able to import and distribute cheese directly to the final purchaser.

An Overview of Chinese Dairy Product Imports

Table 2 provides a recent summary of the value of U.S. agricultural and dairy exports to China. Two obvious trends are apparent in this table. First, the dairy sector contribution to the US exports is relatively minor. Second, in contrast to agricultural exports in general, there are continual year-to-year increases in the dairy sector.

Table 2. U.S. Agricultural and Dairy Exports to China, 1997-2001 (000, 1997 $)

Year	Total Ag. Exports	% Change	Total Dairy Exports	% Change	Dairy % of U.S. Total
1997	1,604,187	-	7,764	-	0.48
1998	1,319,036	-17.8	10,787	38.9	0.82
1999	822,401	-37.7	11,976	11.0	1.46
2000	1,599,430	94.5	12,232	2.1	0.76
2001	1,756,840	9.8	22,232	86.6	1.30

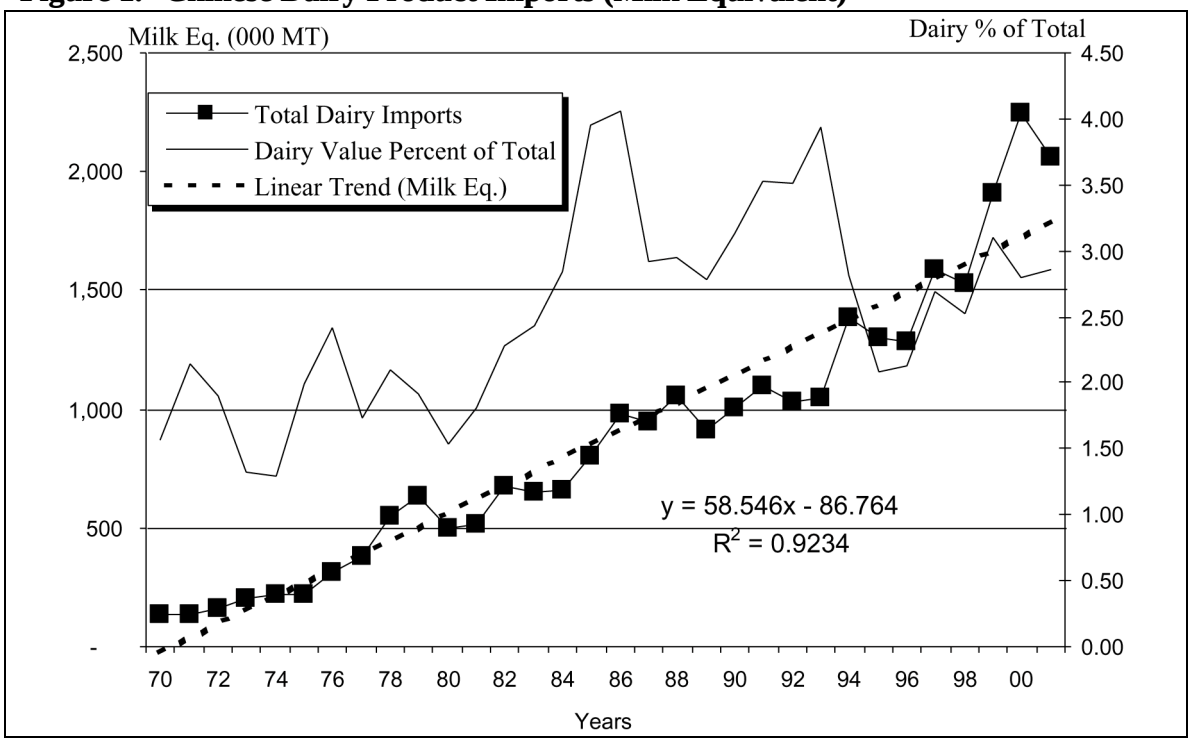
* Source: U.S. Department of Agriculture (2002).

Figure 1 provides a summary of the quantity of dairy product imports (defined in terms of milk equivalents) into China from 1970 to 2001. The steady, linear increase in imports is evidenced by the significance of the linear trend relationship between calendar year and imports also shown in this figure. The R^2 value of 0.923 indicates that more than 92% of the variation in milk equivalent imports is explained by this simple trend relationship. The growth in imports over the 32-year period represented in Figure 1 corresponds to a 10.4% average annual growth rate. Over the 1990-2001 period, the average growth rate was 7.8%. Figure 1 also shows the relatively small share of total agricultural imports made up by dairy products. Dairy products

[1] For a detailed discussion of the implications of Chinese WTO membership and tariff/non-tariff barriers to trade see Colby, Diao and Tuan [2].

[2] Value Added Tax

Figure 1. Chinese Dairy Product Imports (Milk Equivalent)



Source: United Nations (2002) [5].

represent about 2.5% of total agricultural imports, with a general increase over the last three decades.

Figure 2 shows the quantity of Chinese imports of specific dairy products over the years from 1970 through 2001. The importation of condensed and evaporated milks has remained at approximately its mean level of 2,884 metric tons. Dry milk product imports have experienced a steady increase over the 1970-2001 period. The U.S. accounts for less than one percent of these imports, with most of these exports originating through the Dairy Export Incentive Program (DEIP) [17]. US Dairy Export Council is not optimistic about the potential for increased U.S. share of this market given the relatively high skim milk powder prices provided by the U.S. support program.[3]

With the November 2002 reduction in the "butter-powder" tilt, there is a higher probability that domestic powder prices will approach the levels present in international markets.[4] These changes may imply a greater possibility for U.S. exporters to compete in the dry milk market in China than in the past.[5] Figure 3 provides evidence that during the November 2002-January 2003 period, international NFDM prices have been approaching domestic (U.S.) prices that are beginning to adjust to lower support prices. Figure 3 shows biweekly domestic, Northern European and Oceania prices over this two-month period.[6]

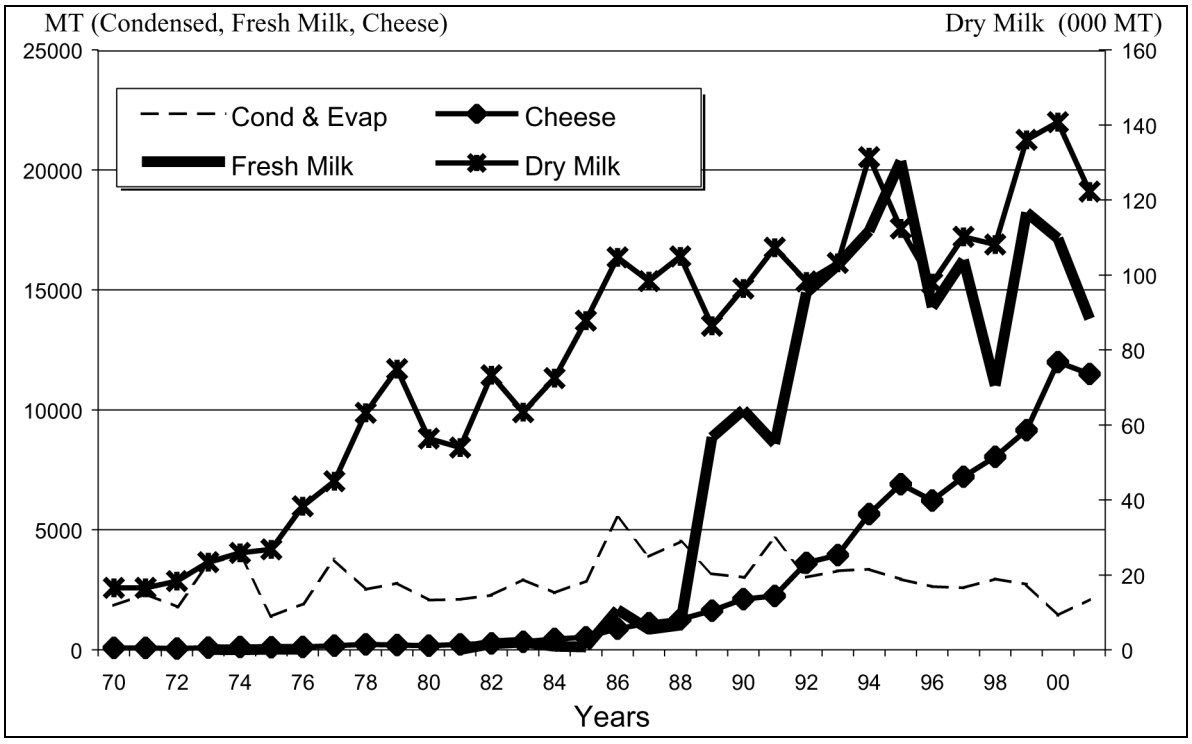
[3] For a review of the DEIP program, refer to Dobson [4].

[4] Prior to November 2000, the support price for butter was $0.8548 and for skim milk powder (bulk, nonfortified) was $0.9000. After November these support prices were changed to $1.0500 and $0.8000, respectively.

[5] For an overview of the international market for dry milk products, refer to Gould and Villareal [9].

[6] The recent increases in the Oceania prices are due to severe drought conditions in Australia and to a limited degree in New Zealand. Current (2003) production levels in Australia are projected to be 10% lower than the previous year and New Zealand's dairy industries growth is projected to be only 1.5%.

Figure 2. Chinese Imports of Specific Dairy Products



Source: United Nations (2002) [5].

Also shown in Figure 2 is the dramatic increase in imports of fluid milk and cheese during the 1990's. In terms of U.S. dairy manufacturers the trend for increased cheese imports is significant. The U.S. Dairy Export Council in 2001 [16] anticipates that over 85% of the 8.5% annual growth rate in cheese consumption will be met through increased cheese imports given limited production capacity.[7]

A Summary of Food Consumption Patterns in Urban China

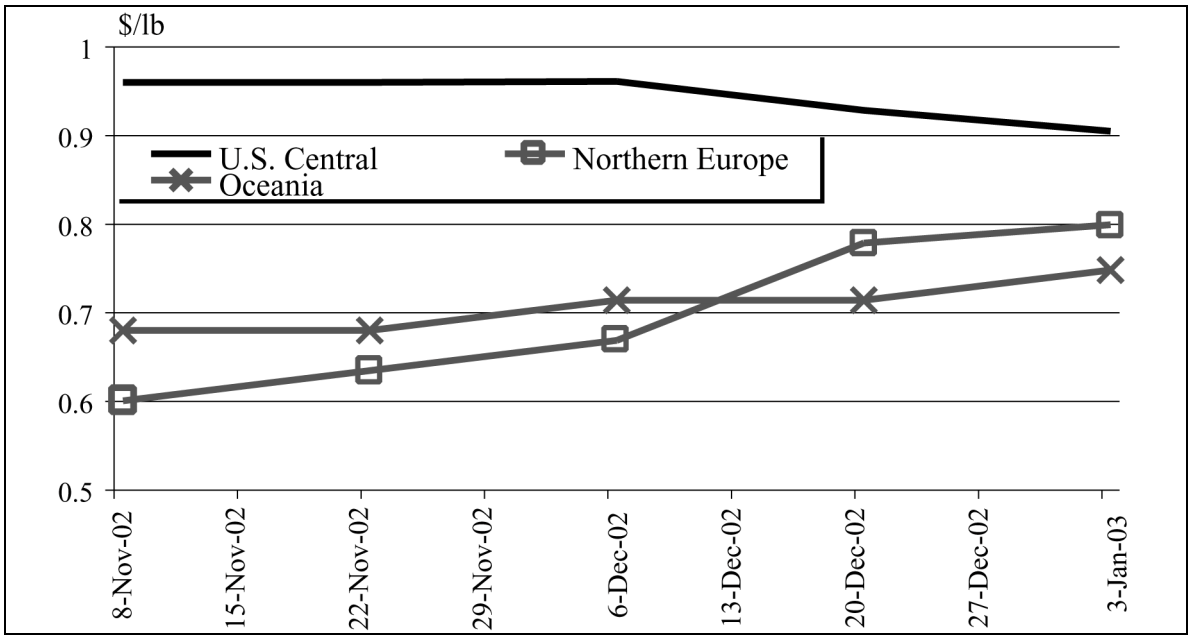
Figure 4 provides a general overview of recent consumption patterns of the Chinese urban population on the major food groups from 1981 to 1997. Again, as noted above, this figure shows a reduction in the consumption of traditional foods (e.g. rice and vegetables) and an increase in the consumption of previous goods thought to be luxuries, namely beef and poultry. Compared to 1981 levels, from 1993 to 1997 the consumption of beef and poultry increased an average 189% and 215%, respectively.

II. Description of the Household Survey Data Used in the Econometric Analysis

The previous section provided an overview of dairy product imports and food purchases in China. We now turn to a detailed analysis of food (dairy product) expenditures that is based on household surveys of annual food purchases by a sample of urban Chinese households. The use of this household survey data will enable us to answer specific questions as to the role of

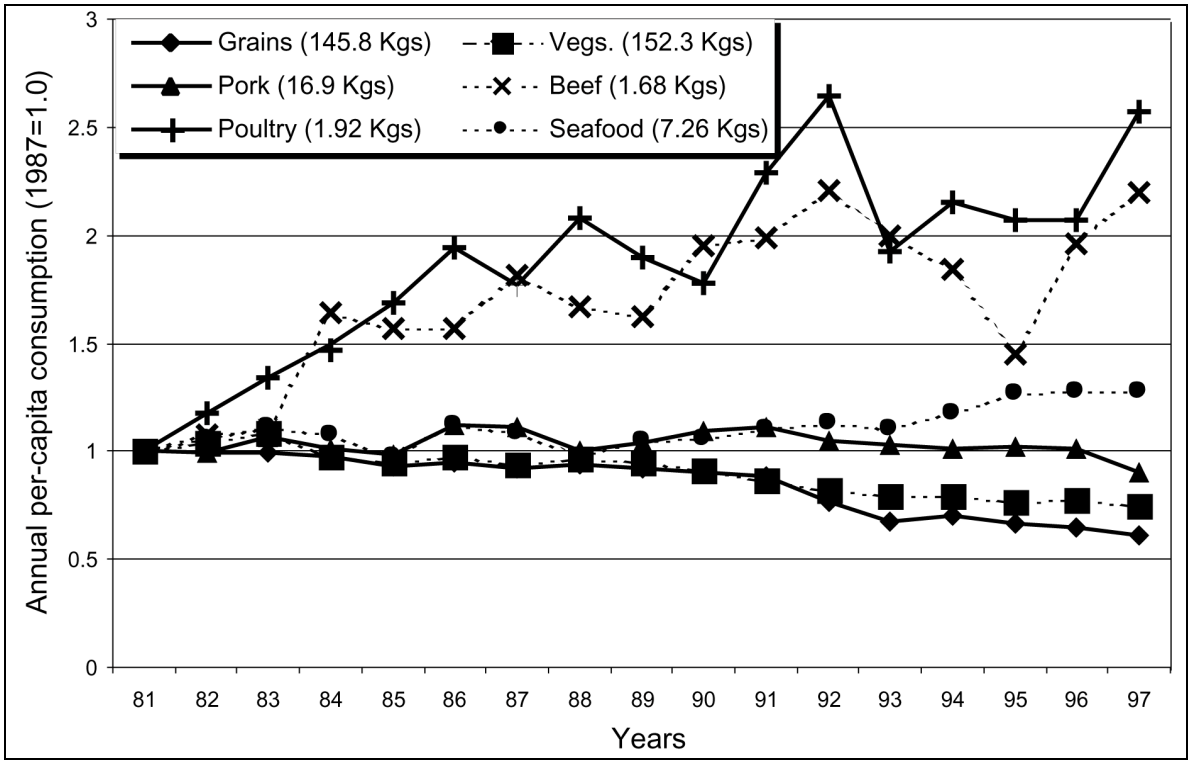
[7] As an example of the opportunity for U.S. manufacturers to capture some of the potential from increased cheese consumption in China, in December 2000, Leprino Foods plans on building a cheese plant in the province of Hebei. When completed, the plant will produce 60,000 tons of cheese annually.

Figure 3. U.S., European and Oceania NFDM prices



household income and economic well-being on food purchase behavior. Answers to such questions are important to the U.S. agricultural sector given the forecasted growth in the Chinese economy.

Figure 4. Per-Capita Consumption of Major Foods by Urban Consumers: 1981-1997



* Source: 1981 amounts in parenthesis [15].

Figure 5. Map of China

Source: http://www.chinatour.com/maps/maps.htm

The data used in this analysis was obtained from annual household surveys conducted by the State Statistical Bureau (SSB) for 1995 and 2000.[8] This agency has a relatively long history of collecting such data and has separated its data collection efforts into rural and urban components. For this analysis we used the results of the urban survey for Jiangsu, Shandong, and Guangdong provinces. These provinces are coastal provinces with Jiangsu and Shandong being contiguous to one another and located on the East China Sea (Figure 5). Quangdong province is located on the South China Sea and is impacted by its close proximity to Hong Kong. Appendix A provides a brief overview of the economic, social and political characteristics of these three provinces.

In addition to purchase quantity and value information, data as to each household member's age, gender, educational attainment, household income and labor force participation characteristics were also collected. The unique aspect of this expenditure survey is that households were required to keep detailed records concerning household expenditures and income over the survey year. The 365-day diaries were summarized by regional statistical offices and aggregate results for each expenditure item and household reported to SSB. This is in contrast to typical household food expenditure surveys that are composed of diaries

[8] For a discussion of the availability and reliability of food consumption data for China see Chern [1].

Table 3. Allocation of Annual Per Capita Food Expenditures (Yuan/Year)

Food Type	1995			2000 (1995 Yuan)		
	Jiangsu	Shandong	Guangdong	Jiangsu	Shandong	Guangdong
All Food	2123	1499	3726	2159	1478	3823
Food for Home Consumption (FAH)	1900	1351	2929	1770	1255	2624
Pork	301	165	346	217	128	281
Beef/Mutton	144	121	334	158	114	320
Fish/Seafood	203	107	439	219	110	386
Poultry	141	67	318	130	88	269
Rice	210	43	217	111	25	135
Other Grains	76	175	121	60	125	101
Vegetables	232	157	368	221	131	308
Fats & Oils	78	58	90	74	43	69
Dairy Products	43	35	69	92	77	128
Eggs	91	108	70	64	69	48
Fruits	121	111	236	117	110	223
Other Foods	259	205	321	306	237	357
Food Consumed Away From Home (FAFH)	222	147	796	389	224	1199

* Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].
Note: On July 1, 1995, 8.28 Yuan was equivalent to 1 $U.S. On July 1, 2000, this conversion was 8.32:1. The 2000 expenditures have been deflated to represent 1995 Yuan.

encompassing 1-2 weeks of expenditures. Such short diaries usually mean that there are significant percentages of surveyed households that do not purchase specific foods. From an econometric perspective, this censoring of food expenditures can result in biased estimates of the relationship between food purchases and household income/demographic characteristics if traditional regression techniques are used.

Tables 3 and 4 provide an overview of the purchase characteristics for a disaggregated list of foods for the surveyed households used in our econometric analyses.[9] There are some differences in purchase patterns across provinces and time. First, we see that residents of Guangdong province spend more than twice as much on food as do residents of Shandong province. These absolute values are deceiving given the relative per capita income levels in each province. If we divide total food expenditures by annual per capita household income we see in the second row of Table 4, the similarity of the ratio of total food expenditures to total household income. The major difference in this ratio is the dramatic decrease in all provinces of these relative expenditures.[10]

A second pattern to obtain from Table 3 is the small share in food-at-home expenditures allocated to dairy products. Dairy products represented less than three percent of food budgets in 1995. However relative dairy product expenditures more than doubled between the 1995 and

[9] On July 1, 1995, 8.28 Yuan was equivalent to 1 $U.S. On July 1, 2000, this conversion was 8.32:1.

[10] As a comparison, total food expenditures in the U.S. in 2001 represented 10% of total personal disposable income. In 1950, 20.5% of U.S. personal disposable income was spent on food.

2000 period. By 2000, more than 4.5% of total food-at-home (FAH) expenditures was directly associated with the purchase of dairy products. This compares with the role of dairy products in the U.S. diet. In 1998, in the U.S. an average 11.0% of FAH expenditures was spent on dairy products (ERS, 2002).

In terms of expenditures on other types of foods we see that there are some regional differences. For example, residents of Guangdong province spend a relatively large portion of their food-at-home (FAH) budget on fish/seafood. Alternatively, Shandong residents surprisingly spend very little on rice but much more on other grain products, compared to the other two provinces.

The direct purchase of dairy products for consumption at-home is only one source of the demand for dairy products. For example, the USDEC notes that in the short run, the demand for cheese will continue to be dominated by the food service sector. In 2000, they estimate that more than 85% of total cheese sales occur through the food service sector and half of these sales occur in fast food outlets and more than a quarter in hotels [14, p.24]. Thus it is our hypothesis that for the immediate term, the demand for dairy products will more than likely be tied to increased westernization of the Chinese diet, especially as it relates to expenditures on food-away-from home.

We see that for the three provinces analyzed here, the purchase of food-away-from-home (FAFH) as represented by purchases in restaurants, street vendors, etc, represent a significant

Table 4. Percentage Distribution of Per Capita Food Expenditure

Food Type	1995			2000		
	Jiangsu	**Shandong**	**Guangdong**	**Jiangsu**	**Shandong**	**Guangdong**
All Food	100.0	100.0	100.0	100.0	100.0	100.0
All Food as % of Total Income	40.6	32.8	38.8	30.1	27.2	30.4
FAH	90.2	90.4	80.9	84.7	85.5	72.9
Pork	15.6	12.4	12.0	12.5	10.3	10.9
Beef/Mutton	7.6	8.8	11.4	9.2	8.7	12.1
Fish/Seafood	10.2	7.0	14.6	11.5	7.6	14.4
Poultry	7.1	4.8	10.9	7.0	7.1	10.3
Rice	11.2	3.1	7.7	6.4	1.9	5.3
Other Grains	4.4	13.8	4.2	3.8	10.6	3.9
Vegetables	12.0	11.8	12.7	12.4	10.8	11.8
Fats & Oils	4.1	4.3	3.1	4.3	3.3	2.7
Dairy Products	2.3	2.5	2.3	4.9	6.0	4.8
Eggs	4.9	8.0	2.5	3.8	5.8	1.9
Fruits	6.5	8.1	7.8	6.6	8.7	8.4
Other Foods	13.9	15.4	10.9	17.7	19.1	13.5
FAFH	9.8	9.6	19.1	15.3	14.5	27.1

* Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].

Note: The percentages of the disaggregated food categories sum to 100% and show the allocation of the Food-at-Home (FAH) consumption expenditures. The Other Foods category is composed of beans and bean products, dry vegetables, sauces, sugar and candy products, nuts, cakes and cookies, nonalcoholic beverages and a miscellaneous category.

Table 5. Distribution of Household Income, 2000*

	Jiangsu	Shandong	Guangdong
	Average Annual Income Level (Yuan/Capita)		
Total Sample	7846	5939	13730
	Income Decile Means		
Lowest 10%	2639	2473	4657
10-19%	3965	3557	6447
20-29%	4824	4251	7789
30-39%	5609	4779	9273
40-49%	6368	5247	10857
50-59%	7291	5727	12535
60-69%	8413	6437	14615
70-79%	9759	7184	17109
80-89%	11880	8243	21533
Top 10%	17712	11493	32488

* Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].
Note: Decile-specific means were calculated by sorting regional data by income level and then calculating mean income level for each decile. On July 1, 1995, 8.28 Yuan was equivalent to 1 $U.S. On July 1, 2000, this conversion was 8.32:1.

Table 6. Distribution of Food Expenditures by Households in the Lowest and Highest Income Quintile, 2000

	Jiangsu		Shandong		Guangdong	
Total Food Expenditures (Yuan/Capita)	**Lowest**	**Highest**	**Lowest**	**Highest**	**Lowest**	**Highest**
	1371	3661	1175	2331	2803	5775
	Distribution of Food Expenditures (%)					
All Food	100.0	100.0	100.0	100.0	100.0	100.0
FAH	91.1	77.4	88.5	82.3	86.6	65.1
Pork	15.2	10.3	10.5	8.9	14.1	9.3
Beef/Mutton	9.6	8.3	7.2	10.2	12.1	11.2
Fish/Seafood	10.0	12.8	6.9	9.6	16.0	13.0
Poultry	6.5	7.3	7.2	6.7	12.0	9.4
Rice	7.5	4.6	2.1	1.5	6.5	4.7
Other Grains	4.5	3.2	13.0	8.8	3.1	4.1
Vegetables	13.1	12.0	11.7	10.4	11.7	11.9
Fats & Oils	5.3	3.1	3.8	2.4	3.0	2.2
Dairy Products	2.7	7.3	4.9	7.2	2.5	6.6
Eggs	4.5	3.1	7.0	4.4	2.1	1.8
Fruits	5.1	8.3	8.1	9.7	6.5	10.2
Other Foods	15.9	19.9	17.6	20.4	10.5	15.6
FAFH	18.9	22.6	11.5	17.7	13.4	34.9

* Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].

component of the consumer's food budget. Jiangsu and Shangdong provinces display a similar pattern of FAFH purchases, representing approximately ten percent of total expenditures. In contrast, residents of Guangdong province spent approximately 27% of their total food budget on FAFH

It is our hypothesis that one of the major factors impacting the relative FAH versus FAFH expenditures and the demand for specific foods is determined, in part, by the level of household income. Table 5 shows the average level of per capita income and the distribution of this income across the sampled households for the most recent survey year, 2000. There is obviously a tremendous range in income levels across deciles. Grouping the bottom two deciles and the top two deciles, Table 6 shows the distribution of food expenditures for the highest and lowest quintiles for the year 2000. There is a clear positive relationship between household income and FAFH expenditures. For example, in Jiangsu province, for households in the lowest income quintile, only 8.1% of their food expenditure is associated with FAFH purchases. This compares with 22.6% for households in the highest income quintile.

From Table 6 we also see a positive relationship between household income and purchases of dairy products. For the highest income quintile, more than seven percent of FAH expenditures were associated with dairy products in Jiangsu and Shandong provinces. This compares to 2.7% and 4.9% for households in the lowest quintiles.

Table 7. A Summary of Detailed Dairy Product Expenditures

Dairy Product	Average Expenditure (Yuan/Capita)					
	1995			2000 (1995 Yuan)		
	Jiangsu	**Shandong**	**Guangdong**	**Jiangsu**	**Shandong**	**Guangdong**
All Dairy	43.5	35.3	68.8	92.0	76.4	127.7
Fluid Milk	22.4	14.3	21.0	64.6	44.8	65.1
Milk Powder	7.0	6.3	23.8	9.4	8.9	33.5
Yogurt	3.3	0.6	4.0	9.2	6.5	11.7
Other Dairy	10.9	14.0	20.1	8.8	16.3	17.5
	Percent Purchasing (%)					
All Dairy	86.9	93.1	90.2	87.9	96.8	92.7
Fluid Milk	43.0	49.1	62.2	71.4	81.7	79.3
Milk Powder	36.5	43.8	53.5	34.7	47.1	50.2
Yogurt	24.4	11.5	24.2	41.0	52.5	46.5
Other Dairy	71.4	82.2	80.0	59.1	85.5	77.8
	Conditional Expenditures (Yuan/Capita)					
All Dairy	50.0	37.9	76.2	104.7 (109.4)	78.9 (108.3)	137.8 (80.8)
Fluid Milk	52.1	29.1	33.7	90.6 (73.8)	54.8 (88.4)	82.0 (143.2)
Milk Powder	19.0	14.4	44.4	27.1 (42.8)	18.9 (31.4)	66.7 (50.2)
Yogurt	13.5	5.6	16.5	22.6 (67.2)	12.4 (121.9)	25.0 (51.7)
Other Dairy	15.2	17.1	25.1	14.9 (-2.0)	19.0 (11.1)	22.6 (-10.1)

* Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].
Note: The numbers in parenthesis represent percent change from 1995 values.

Table 7 provides the most detailed disaggregation of annual dairy product expenditures available from our household data sets. Given the level of detail there are significant numbers of households that do not purchase a particular product. Thus in Table 7 we show not only average expenditure levels but also the percent of households purchasing and the average level of conditional expenditures (i.e., the average dairy product expenditures calculated only for those households where there are positive expenditures). For these three provinces we see a dramatic increase in the proportion of households purchasing specific dairy products over the six-year study period. For example, less than 25% of the households reported purchasing yogurt in 1995 in Jiangsu and Guandong provinces. The percent of households purchasing yogurt in 2000 increased to more than 40%. The increase is even more dramatic for Shandong province with the market penetration increasing from 11.5% to 52.5% of households.

For purchasing households we also find dramatic percentage increases in direct dairy product expenditures. For all dairy products, real (1995 Yuan) expenditures more than double over the 1995 to 2000 period for surveyed Jiangsu and Shandong households. In Guangdong province, real conditional dairy product expenditures (e.g., expenditures by purchasing households) increased by more than 80%. Conditional per capita fluid milk consumption more than doubled in Guangdong province. Conditional fluid milk consumption increased by approximately 75% in the other two provinces. Surprisingly, we find that per capita conditional expenditures on milk powders, which may be considered a food stable, increased more than 30% in Shandong province and by 50% in Guangdong province. Conditional yogurt expenditures more than doubled in Shandong province.

Table 8. Percent of Households Purchasing Dairy Products by Income Decile 2000 (% of Decile Households)

Dairy Products	Income Decile									
	1	2	3	4	5	6	7	8	9	10
	Jiangsu									
All Dairy	68.7	78.7	86.2	91.2	87.5	88.7	90.0	95.0	95.0	97.5
Fluid Milk	41.2	58.7	67.5	78.7	73.7	65.0	80.0	85.0	82.5	81.2
Milk Powder	23.7	31.2	37.5	33.7	38.7	36.2	33.7	38.7	43.7	28.7
Yogurt	20.0	38.7	40.0	40.0	37.5	35.0	46.2	50.0	61.2	41.2
Other Dairy	40.0	46.2	55.0	60.0	58.7	56.2	63.7	70.0	72.5	68.7
	Shandong									
All Dairy	87.6	96.9	96.9	96.9	98.4	96.9	98.4	100.0	96.9	98.4
Fluid Milk	60.0	75.3	73.8	80.0	83.0	92.3	89.2	87.6	83.0	92.3
Milk Powder	44.6	55.3	49.2	58.4	41.5	41.5	49.2	40.0	41.5	49.2
Yogurt	41.5	53.8	49.2	55.3	50.7	40.0	50.7	60.0	55.3	67.6
Other Dairy	75.3	80.0	90.7	87.6	87.6	81.5	81.5	87.6	92.3	90.7
	Guangdong									
All Dairy	83.3	85.0	91.6	91.6	91.6	96.6	96.6	96.6	98.3	95.0
Fluid Milk	60.0	60.0	80.0	83.3	80.0	80.0	83.3	86.6	90.0	90.0
Milk Powder	38.3	50.0	51.6	58.3	51.6	43.3	53.3	56.6	41.6	56.6
Yogurt	26.6	28.3	36.6	48.3	40.0	58.3	60.0	60.0	58.3	48.3
Other Dairy	66.6	51.6	75.0	81.6	81.6	86.6	80.0	86.6	83.3	85.0

* Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].

To examine the role of income in determining specific dairy product expenditures Tables 8 and 9 show how market penetration and conditional expenditures vary across households in various income deciles using data from the 2000 survey. For the disaggregated dairy products delineated above, we find a positive relationship between the percent of sample households purchasing and household income. For example, for fluid milk, 60% of the households in the lowest income decile purchased fluid milk some time during 2000 in Shandong and Gaungdong provinces. More than 95% of the highest decile households purchased fluid milk. There are some differences across provinces, however. Less than 82% of households in the highest income decile in Jiangsu province purchase fluid milk. One-fifth of the lowest decile households in this province purchased yogurt during 2000. This compares to 27% and 42% of similar households in Guangdong and Shandong, respectively. The percentage of households purchasing milk powders for each income decile is the lowest in Jiangsu province.

Even more pronounced than the trends observed with respect to the percent of surveyed households purchasing a particular dairy product is the relationship between conditional expenditures and income. For the three provinces included in this analysis, households that purchased some type of dairy product in 2000 and were in the lowest income decile spend about the same amount on all dairy products, 45 Yuan/capita ($US 5.4/capita). For households in the highest income decile, conditional per capita expenditures in Jiangsu province was the highest at 233 Yuan/capita ($US 28.0/capita). Shandong has the lowest expenditure level at 130 Yuan/capita ($US 15.6/capita). For households purchasing fluid milk, households in Jiangsu province with higher incomes tend to spend the most and purchasing households in Guangdong

Table 9. Conditional Dairy Product Expenditures by Income Decile 2000 (Yuan/Capita)

	Income Decile									
	1	2	3	4	5	6	7	8	9	10
					Jiangsu					
All Dairy	39.8	51.6	74.1	80.7	91.3	70.9	146.5	145.4	169.4	233.0
Fluid Milk	43.0	37.4	63.2	60.3	75.3	68.6	130.3	120.7	146.5	183.7
Milk Powder	19.7	11.3	15.9	23.3	17.4	18.5	17.8	26.6	25.4	139.0
Yogurt	6.9	25.7	21.6	21.9	23.7	11.6	21.7	24.3	24.2	53.9
Other Dairy	8.9	11.3	12.0	15.8	15.0	13.5	18.2	18.8	19.6	23.0
					Shandong					
All Dairy	45.3	56.7	62.2	68.2	99.6	80.7	90.2	106.2	118.9	129.9
Fluid Milk	23.8	32.9	47.5	43.9	77.2	53.6	53.1	78.4	93.2	79.5
Milk Powder	26.6.	23.3	17.0	13.8	23.0	24.0	19.9	16.7	24.3	20.1
Yogurt	8.0	7.4	9.1	8.8	18.3	10.2	18.3	17.7	14.8	19.0
Other Dairy	13.6	16.4	13.5	20.6	17.1	18.0	27.5	22.8	21.2	35.0
					Guangdong					
All Dairy	46.8	90.2	105.8	118.2	128.1	160.4	179.2	163.8	221.8	221.8
Fluid Milk	27.6	44.3	63.7	82.2	78.0	94.4	120.9	89.2	110.9	110.9
Milk Powder	32.2	77.2	39.4	27.4	55.2	99.5	86.4	64.6	152.8	152.7
Yogurt	15.2	16.0	27.8	14.7	25.6	30.2	16.7	39.3	38.9	38.8
Other Dairy	9.3	13.5	20.4	20.4	19.8	21.7	20.5	24.1	38.5	38.5

* Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].

Table 10. Percent of Food-At-Home Expenditures Spent on Dairy Products by Purchasing Household

	Income Decile										
	1	2	3	4	5	6	7	8	9	10	Total
Jiangsu	3.6	3.7	4.8	5.7	5.0	3.8	6.6	6.5	7.0	8.0	5.6
Shandong	5.0	5.6	5.5	5.4	6.7	5.8	6.5	7.1	8.0	6.8	6.3
Guangdong	2.4	3.5	4.0	4.2	4.5	7.4	5.4	5.7	6.6	7.2	5.1

* Source: Derived by the authors from the 2000 Urban Food Expenditure Surveys [15].

households in the lower income deciles purchase the most relative to low income households in the other provinces. In Jiangsu province, purchasing households in the highest income decile spent four times the amount spent by the lowest decile households on fluid milk.

There are significant regional differences in the relationship between household income level and conditional dairy product purchases. For example for milk powder we find that in Shandong province there is little income effect.

In summary, Table 10 shows the changing importance of dairy products in the urban Chinese food budget. In this table we show the percent of total food-at-home expenditures associated with all dairy products. We compare this percentage across households of alternative income levels. In Jiangsu province on average, 5.6% of FAH expenditures for dairy purchasing households was associated with dairy products. There is a clear positive relationship between this percentage and household income increasing from 3.6% for the lowest decile households and eight percent for the highest.

III. An Econometric Analysis of Food Expenditures in China

The above overview of food (dairy product) purchases provides a basis for our econometric analysis of the determinants of such purchases. We need to use a more formal econometric analysis to control for the multiple sources of determinants of food expenditures in addition to family income. Our desire is to quantify the determinants of how households allocate their annual food budget. To this end the variables whose values we want to explain (i.e., our dependent variable) is the *share* of food expenditures allocated to particular food groups and for FAFH. That is, the general relationship we want to examine is the following:

$$Share_i = f(TOTINC, HHSIZE, PER\_LT6, PER6\_13, PER14\_21, PER\_SENIOR, MP\_LTHS, MP\_GTHS)$$

where $Share_i$ represents the share of food expenditures of the i^{th} food type, TOTINC is total annual household per capita gross income, HHSIZE is a measure of household size, PER_LT6 represents the percent of household members less than six years of age, PER6_13 is the percent of household members between six and 13 years of age, PER14_21 is the percentage of household members between 14 and 21 years of age, PER_SENIOR is the percentage of household members over 60 years of age, MP_LTHS is a dichotomous 0/1 variable equal to 1 if the meal planner had less than a high school education and MP_GTHS is a dichotomous 0/1 variable equal to 1 if the meal planner has more than a high school education. Table 11 provides a summary of these exogenous variables.

Depending on the food analyzed, the value of $Share_i$ is calculated as the ratio of expenditures on that food group to total FAH expenditures. In addition we analyzed the relationship between

Table 11. Mean Values of Exogenous Variables Used in the Econometric Analysis

		Jiangsu		Shandong		Guangdong	
Variable	**Units**	**1995**	**2000**	**1995**	**2000**	**1995**	**2000**
PERCAPINC	Yuan	5231	7169*	4576	5427*	9612	12546*
HHSIZE	#	3.12	2.96	3.17	3.16	3.45	3.36
PERLT6	%	3.5	2.7	3.7	4.8	4.3	4.1
PER6_14	%	10.3	7.4	13.4	10.2	10.9	10.0
PER14_21	%	10.1	8.6	11.3	13.2	12.4	13.6
PER_SENIOR	%	17.4	21.5	8.5	5.7	9.1	8.1
MP_LTHS	0/1	0.591	0.591	0.440	0.357	0.476	0.310
MP_GTHS	0/1	0.163	0.178	0.303	0.374	0.232	0.320

Source: Derived by the authors from the 1995/2000 Urban Food Expenditure Surveys [15].
* The income variable PERCAPINC for 2000 is converted to 1995 Yuan.

the variables shown in Table 11 and the share of total food expenditures (TOTFD) spent on FAFH. The dependent variable in this case is defined as FAFH/TOTFD.

The dependent variables in all analyses have the characteristic that they fall in the 0-1 range. If one were to use traditional regression techniques to quantify the relationship between the allocation of food expenditures across commodities and the above household characteristics one could obtain a predicted share value outside this range. To avoid this problem, we use a sophisticated estimation technique commonly referred to a "two-limit Tobit model" to quantify the above relationship and to incorporate the above restrictive range of expenditure shares in the parameter estimation process.

The Tobit model is used to obtain parameter estimate for 78 commodity specific models of expenditure shares (i.e., 13 commodity groupings, 2 years and 3 provinces). Given our use of the Tobit specification, the parameter estimates are not directly interpretable. We therefore use Appendix B to present our estimates of the marginal impacts of changes in exogenous variables on our dependent variables, expenditure shares. To assist with the interpretation of our econometric results, Table 12 shows the sign and statistical significance of the marginal effect of a change in the explanatory variables on unconditional expected commodity expenditure shares. A positive (negative) sign in a particular cell implies that the marginal effect of that explanatory variable on food group shares is significantly positive (negative) for a positive change in the explanatory variable. A blank cell implies no statistical significance.

The importance of household income in determining food expenditures can easily be seen from Table 12. For FAFH, Fruits, Pork, Eggs and Dairy Products all of the year and province specific income-based marginal effects are statistically significant. In fact 64 of the 78 estimated marginal impacts are statistically different from zero. The marginal coefficients for Pork and Eggs were consistently negative across year and province. Not surprisingly, FAFH, Fruit and Dairy Product expenditure shares are consistently positively impacted by household income.

Besides household income, the age composition of the household appears to have a significant impact on a number of the foods analyzed here. For the 312 estimated marginal impacts of changes in household age composition, 124 were found to be statistically different from zero. In terms of dairy products, having children in the household clearly increases expenditure shares as seen by 11 of the 12 estimated children related marginal effects being positive and statistically significant.

Table 12. Sign and statistical significance of marginal effects of exogenous variables used in the econometric analysis

	Jiangsu		Shandong		Guangdon		Jiangsu		Shandong		Guangdong	
Variable	**1995**	**2000**	**1995**	**2000**	**1995**	**2000**	**1995**	**2000**	**1995**	**2000**	**1995**	**2000**
	FAFH						**Pork**					
PERCAPINC	+	+	+	+	+	+	-	-	-	-	-	-
HHSIZE			+	+	-			+	-			+
MP_GTHS		+		+				-		-		
MP_LTHS						-						
PERLT6	+	+								-		
PER6_14		+								-		
PER14_21		+					-			-		
PER_SENIOR	-	-		-				+				
	Beef/Other Meat						**Fish/Seafood**					
PERCAPINC			+	+	-	-	+	+	+	+		-
HHSIZE								+				
MP_GTHS			-		-							
MP_LTHS												
PERLT6				+				-			-	-
PER6_14				+							-	-
PER14_21				+				-	+		-	-
PER_SENIOR	-	-	-			-						-
	Poultry						**Rice**					
PERCAPINC	+		+		-	-	-	-		-	-	
HHSIZE	-				-						+	+
MP_GTHS				+						-		
MP_LTHS	-								+		+	+
PERLT6		-				-	-	-	-	-		
PER6_14	+			+		-	-	-				
PER14_21						-		-				
PER_SENIOR												
	Other Grains						**Vegetables**					
PERCAPINC	-	-	-	-						-	-	
HHSIZE				+		-		+		-		
MP_GTHS	+								+			
MP_LTHS	+		+		-							
PERLT6			-	-			-	-		-	-	-
PER6_14		+	-			+	-			-		
PER14_21	+	+			+	+						
PER_SENIOR						+						

The overall performances of the above share models are evaluated by comparing the predicted values of expected commodity expenditure shares with the actual commodity shares. We calculate the correlated coefficient between these predicted and observed values. The range of these correlation coefficients is 0-1 with a value of 1 indicated a perfect prediction using the estimated model parameters. A value of zero would indicate our model has no explanatory

Table 12. Continued

Variable	Jiangsu 1995	Jiangsu 2000	Shandong 1995	Shandong 2000	Guangdon 1995	Guangdon 2000	Jiangsu 1995	Jiangsu 2000	Shandong 1995	Shandong 2000	Guangdong 1995	Guangdong 2000
	Fats & Oils						**Dairy Products**					
PERCAPINC	-	-	-	-		-	+	+	+	+	+	+
HHSIZE												-
MP_GTHS				-					+		+	+
MP_LTHS	+		+		+		-	-		-	-	
PERLT6	-	-	-				+	+	+	+	+	+
PER6_14	-	-	-	-			+	+	+	+		+
PER14_21	-			-				+		+		
PER_SENIOR			+							+		
	Eggs						**Fruits**					
PERCAPINC	-	-	-	-	-	-	+	+	+	+	+	+
HHSIZE							-	-	-	-	-	-
MP_GTHS								+			+	
MP_LTHS		+		+			-			-		
PERLT6			-	-			+	+	+	+		+
PER6_14			-	-			+	+	+	+		
PER14_21			-				+					
PER_SENIOR							-	-				
	Other Foods											
PERCAPINC	+	+	+	+	+	+						
HHSIZE				+								
MP_GTHS	+				+							
MP_LTHS				-								
PERLT6	+	+	+	+		+						
PER6_14	+	+	+		+	+						
PER14_21	+					+						
PER_SENIOR		-										

power. Table 13 shows the correlation coefficients for our 78 separate regressions. Though low, the obtained values are typical of cross-section based models.

Using the estimated coefficients shown in Appendix B and the formulas provided by Gould, Saupe and Klemme we calculate unconditional income expenditure elasticities [8]. These elasticities provide a unit-free measure of the relationship between the share of total food expenditures on a particular commodity and household income. Table 14 shows the estimated income elasticities. A negative income elasticity for a particular food group implies that this food group is "inferior" (e.g., expenditures will decrease with an increase in household income). An income elasticity greater than 1.0 identifies a luxury good. Expenditures will increase at a percentage rate greater than the rate of income change.

A couple of patterns are evident in Table 14. First, there is an overall pattern of consistency of elasticity estimates across years and province. Second, all of the estimated relationships exhibit an "inelastic" response to a change in income (e.g., the income elasticities are

significantly less than one). Finally, for all provinces we see that Rice and Pork are inferior goods (e.g., negative income elasticities).

Table 13. Correlation coefficients between predicted and actual expenditures shares

	Jiangsu		Shandong		Guangdong	
Commodity	**1995**	**2000**	**1995**	**2000**	**1995**	**2000**
Pork	0.143	0.344	0.168	0.273	0.272	0.273
Beef/Mutton	0.239	0.166	0.210	0.253	0.191	0.163
Fish/Seafood	0.319	0.229	0.220	0.255	0.213	0.282
Poultry	0.240	0.136	0.166	0.169	0.164	0.222
Rice	0.350	0.388	0.210	0.210	0.318	0.284
Other Grains	0.251	0.224	0.346	0.379	0.251	0.237
Vegetables	0.203	0.229	0.136	0.285	0.219	0.146
Fats & Oils	0.372	0.312	0.375	0.306	0.168	0.164
Dairy Products	0.327	0.373	0.386	0.347	0.382	0.378
Eggs	0.226	0.271	0.219	0.339	0.209	0.149
Fruits	0.340	0.355	0.338	0.277	0.390	0.359
Other Foods	0.293	0.307	0.253	0.282	0.382	0.289
FAFH	0.396	0.398	0.256	0.321	0.418	0.425
Maximum	FAFH	FAFH	Dairy	Dairy	FAFH	FAFH
Minimum	Pork	Poultry	Veg.	Poultry	Poultry	Veg.

Table 14. Estimated income elasticities

	1995			2000		
Commodity	**Jiangsu**	**Shandong**	**Guangdong**	**Jiangsu**	**Shandong**	**Guangdong**
FAFH	***0.678***	***0.371***	***0.409***	***0.529***	***0.374***	***0.346***
Pork	***-0.089***	***-0.132***	***-0.132***	***-0.176***	***-0.199***	***-0.146***
Beef/Mutton	0.000	***0.212***	***-0.074***	-0.073	***0.299***	***-0.072***
Fish/Seafood	***0.319***	***0.299***	-0.030	***0.157***	***0.308***	***-0.155***
Rice	***-0.383***	-0.172	***-0.170***	***-0.341***	***-0.294***	-0.069
Other Grains	***-0.305***	***-0.304***	0.078	***-0.155***	***-0.300***	0.073
Poultry	***0.247***	***0.220***	***-0.074***	0.023	-0.046	***-0.152***
Vegetables	-0.018	-0.025	***-0.057***	***-0.034***	***-0.172***	0.005
Fats & Oils	***-0.444***	***-0.619***	0.015	***-0.324***	***-0.437***	***-0.138***
Dairy Products	***0.513***	***0.518***	***0.231***	***0.464***	***0.329***	***0.339***
Eggs	***-0.275***	***-0.215***	***-0.184***	***-0.256***	***-0.355***	***-0.089***
Fruits	***0.260***	***0.291***	***0.339***	***0.241***	***0.183***	***0.284***
Other Foods	***0.190***	***0.133***	***0.226***	***0.146***	***0.148***	***0.193***

* Note: Values can be interpreted as the percentage change in shares (not percentage point change) resulting from a 1% change in household income. Elasticity estimates were obtained using the mean values of the exogenous variables. Values that are italicized indicate the elasticity estimates that are statistically different from zero.

The income elasticities for dairy products are positive and statistically significant across the three provinces and two years. To provide some interpretation to these elasticities, for example,

we estimate that for Jiangsu province in 2000 a five percent increase in household per capita income will increase the percentage of Dairy Product expenditures by 2.3% (e.g., 5*0.464). The income elasticities for Dairy Products are similar to FAFH income elasticities in that they are positive and tend to be relatively large though still exhibiting an inelastic response. Both of these trends should provide some positive evidence of the potential for increased exports of U.S. dairy products to China should the projected growth path in income actually occurs.

IV. Summary

Dairy products are currently not an important part of the Chinese diet. There are some instances of developing countries in this region where increased development generated increase consumption of dairy products. The analysis provided in this report supports the general hypothesis of increased dairy product demand. Immediate growth in the dairy sector will no doubt occur as a result of increased westernization of the Chinese diet and the increasing importance of FAFH as a food source. Most industry experts agree that in terms of manufactured dairy products that a majority of the increased demand for these products will not originate from domestic sources. Our econometric results support the above both in terms of the relationship between household income and the direct purchases of dairy products and the relationship between FAFH and income.

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Appendix A

Table A.1. Profiles of Provinces Used in the Present Analysis

Variables	Jiangsu	Shandong	Guangdong
Population	62.7 million	77.8 million	56.5 million
Urban Pop.	20.6 million	44.5 million	17 million
Nationalities	Han, Hui, and Manchu	Han, Hui, and Manchu	Han, Yao, Zhuang, Hui, Manchu, and She.
Area	100,000 sq. kms.	150,000 sq. kms.	180,000 sq. kms.
Coastline	1,000 km long	3,000 km long	4,300 km long
Climatic Features	Spans the warm-temperate/semi-humid and subtropical/humid zones; clear-cut seasonal changes; frequent plum rains between spring and summer; typhoons with rainstorms in late summer and early autumn; occasional frost, dry and hot winds, and hailstorms.	Warm-temperate, semi-humid, monsoonal climate; influenced by the ocean, it is warmer and more humid than inland provinces; rainy summers; dry winters.	Subtropical, humid, monsoonal climate; rainy season from April to September; typhoons from May to November.
Average Temperature	-2 to -4°C. in January, 26 - 29°C. in July.	-5 to -1°C in January, 24 to 28°C in July.	8 to 17°C. in January, 27 to - 29°C. in July.
Annual Average Rainfall	800 - 1,200 mm; high precipitation in the southeast and low in the northwest; 60% of the rains fall during the summer in the northwest.	560 - 1170 mm; precipitation decreases from the southeast to the northwest; 60 – 70% of the rains fall during the summer.	Over 1,500 mm; high precipitation on the southern side of mountains; 40% of the rains fall during the summer.
Physical Features	Plains cover 95% of the province's total area with well-developed water systems; the Grand Canal traverses all the east-west river system; borders the Yellow Sea.	Situated in the lower Yellow River Valley; hills in the central region and on the eastern peninsula; plains in the north, west, and central east; narrow lowlands in the south and along the southeastern coast; faces the Bohai gulf in the north and the Yellow Sea in the east.	Situated on the Tropic of Cancer; hills in the north and lowlands in the south; hills scattered along the coastline; faces the South China Sea; includes the Pearl (Zhujiang) River Delta; the Leizhou Peninsula extends to the southwest.
Products	Rice, wheat, corn, sorghum, millet, potatoes, soybeans, peanuts, rapeseed, sesame, tea; cotton, ambary hemp, silk cocoons, jute; peppermint, spearmint, bamboo, and medicinal	Wheat, corn, millet, potatoes, sorghum, sweet potatoes, rice, peanuts, soybeans, tea, sesame; cotton, tussah, ambary hemp; flue-cured tobacco; peaches, walnuts, chestnuts, persimmons; sea; coal,	Rice, corn, potatoes, millet, sorghum, wheat, sugar cane, peanuts, soybeans, sesame, tea; silk cocoons, ambary hemp, jute; sun-cured tobacco; bananas, oranges, lychees, pineapples, longans, and

Variables	Jiangsu	Shandong	Guangdong
	herbs; apples, pears, peaches, loquats, gingko; coal, phosphorus, salt, pottery clay; aquatic Gaoyou duck and duck eggs, Langshan chicken, Taihu whitebait, shad and anchovy of the Yangtze, crabs of Yangcheng Lake.	petroleum, salt. antai apples, Leling jujubes, Laiyang pears, Pingdu grapes, Dezhou watermelons.	other tropical and subtropical fruits; rubber, oil palm, sisal hemp; coffee, cocoa, lemongrass, pepper, oyster, abalne, pearl, sea horse, and other sea products; timber; wolfram, tin, antimony, bismuth, molybdenum, copper, lead, zinc, oil shale, salt, sulphur.
Administrative Divisions	21 cities, 54 counties.	25 cities, 86 counties.	15 cities, 73 counties, 3 autonomous counties.
Capital	Nanjing	Jinan	Guangzhou (Canton)
Neighboring Areas	Zhejiang, Anhui, and Shandong Provinces; Shanghai Municipality.	Hebei, Henan, Anhui, and Jiangsu.	Hunan, Jiangxi, Fujian, and Hainan Provinces; Guangxi Zhuang Autonomous Region; Hong Kong and Macao.
Major Cities	Nanjing, Wuxi, Suzhou, Xuzhou, Lianyungang, Changzhou, Nantong, Zhenjiang	Jinan, Yantai, Weifang, Qingdao, Zibo, Zaozhuang, Jining, Dongying, Qufu.	Guangzhou, Shantou, Foshan, Zhanjiang, Shenzhen, Zhuhai, Shaoguan
Tourist Attractions	Yangtze River Bridge in Nanjing; Suzhou gardens; Lake Taihu in Wuxi; the Grand Canal.	Confucius' Temple in Qufu; Mount Tai, one of the historic Five Mountains in eastern China, in Tai'an; Qingdao, a summer resort city.	Seven Star Crags in Zhaoqing
Comments			Shenzhen, Zhuhai, and Shantou are 3 of China's 4 special economic zones established in early 1980's

* Source: Atlas of the Peoples Republic of China, Beijing, 1989
Available at http://www.fas.usda.gov/pecad/remote/china/chatlas.html

Appendix B

Table B.1. Estimated Marginal Effects Derived from Tobit Parameter Estimates

Variable	Jiangsu		Shandong		Guangdong	
	1995	2000	1995	2000	1995	2000
	FAFH					
PERCAPINC	***0.01272***	***0.01033***	***0.00778***	***0.00913***	***0.00815***	***0.00684***
HHSIZE	0.00668	-0.00301	***0.01850***	***0.01726***	***-0.01280***	-0.01601
MP_GTHS	0.01516	***0.02760***	-0.00471	***0.02429***	0.02119	0.02005
MP_LTHS	-0.00711	-0.00267	-0.00708	-0.01057	-0.01998	***-0.03885***
PERLT6	***0.00110***	***0.00117***	0.00055	0.00044	0.00108	-0.00071
PER6_14	0.00028	***0.00095***	-0.00033	0.00025	-0.00014	0.00011
PER14_21	0.00043	***0.00077***	-0.00033	0.00030	0.00018	0.00014
PER_SENIOR	***-0.00036***	***-0.00054***	-0.00023	***-0.00048***	-0.00028	-0.00050
	Pork					
PERCAPINC	***-0.00266***	***-0.00280***	***-0.00357***	***-0.00345***	***-0.00164***	***-0.00115***
HHSIZE	-0.00082	***0.00595***	***-0.01084***	-0.00517	0.00400	***0.01074***
MP_GTHS	-0.00104	***-0.01596***	-0.00426	***-0.01326***	-0.00606	-0.00055
MP_LTHS	0.00511	0.00785	-0.00423	-0.00320	0.00907	0.00240
PERLT6	-0.00032	-0.00047	-0.00038	***-0.00105***	-0.00002	-0.00002
PER6_14	-0.00030	-0.00033	-0.00016	***-0.00075***	0.00036	0.00022
PER14_21	***-0.00046***	-0.00030	-0.00003	***-0.00041***	0.00015	0.00016
PER_SENIOR	-0.00005	***0.00014***	0.00007	-0.00023	0.00007	0.00027
	Beef/Other Meat					
PERCAPINC	0.00000	-0.00085	***0.00405***	***0.00441***	***-0.00087***	***-0.00064***
HHSIZE	0.00060	-0.00044	0.00521	-0.00166	0.00049	-0.00043
MP_GTHS	-0.00526	0.00757	***-0.01070***	0.00425	***-0.01472***	-0.00429
MP_LTHS	-0.00355	0.00154	-0.00738	0.00646	-0.00582	0.00126
PERLT6	0.00007	-0.00009	0.00009	***0.00055***	0.00018	-0.00042
PER6_14	0.00022	0.00007	0.00021	***0.00058***	0.00007	-0.00023
PER14_21	-0.00019	-0.00002	-0.00005	***0.00039***	-0.00006	-0.00014
PER_SENIOR	***-0.00020***	***-0.00017***	***-0.00019***	0.00000	-0.00009	***-0.00029***
	Fish/Seafood					
PERCAPINC	***0.00622***	***0.00230***	***0.00455***	***0.00392***	-0.00045	***-0.00163***
HHSIZE	0.00368	***0.00532***	-0.00134	-0.00192	-0.00191	0.00643
MP_GTHS	-0.00791	-0.00928	-0.00659	-0.00027	-0.00805	0.00798
MP_LTHS	-0.00434	-0.00152	-0.00853	0.00580	0.00388	0.00838
PERLT6	-0.00026	***-0.00058***	0.00005	-0.00005	***-0.00054***	***-0.00128***
PER6_14	-0.00011	-0.00015	0.00014	-0.00021	***-0.00062***	***-0.00091***
PER14_21	***-0.00033***	***-0.00055***	***0.00036***	0.00005	***-0.00073***	***-0.00089***
PER_SENIOR	0.00008	0.00004	-0.00006	0.00018	-0.00002	***-0.00043***
PERCAPINC	***0.00335***	0.00020	***0.00232***	-0.00055	***-0.00084***	***-0.00114***
HHSIZE	***-0.00395***	-0.00034	0.00252	0.00051	***-0.00580***	0.00003
MP_GTHS	-0.00715	-0.00697	-0.00010	***0.00975***	-0.00418	-0.00023
MP_LTHS	***-0.00814***	-0.00489	-0.00351	0.00484	0.00358	-0.00280
PERLT6	0.00005	***-0.00038***	-0.00009	-0.00005	-0.00019	***-0.00058***
PER6_14	***0.00027***	-0.00012	0.00013	***0.00034***	-0.00024	***-0.00057***
PER14_21	0.00018	0.00008	0.00000	0.00004	-0.00009	***-0.00043***
PER_SENIOR	0.00001	0.00003	-0.00006	-0.00008	-0.00007	-0.00013

Variable	Jiangsu		Shandong		Guangdong	
	1995	2000	1995	2000	1995	2000
	Rice					
PERCAPINC	***-0.00819***	***-0.00279***	-0.00115	***-0.00095***	***-0.00136***	-0.00027
HHSIZE	0.00333	0.00131	-0.00056	0.00108	***0.00418***	***0.00508***
MP_GTHS	0.00046	-0.00265	0.00428	***-0.00392***	0.00006	-0.00499
MP_LTHS	-0.00011	0.00664	***0.00585***	0.00042	***0.00756***	***0.00533***
PERLT6	***-0.00120***	***-0.00114***	***-0.00041***	***-0.00019***	-0.00023	-0.00006
PER6_14	***-0.00056***	***-0.00049***	-0.00002	-0.00012	-0.00004	-0.00005
PER14_21	-0.00030	***-0.00034***	0.00007	-0.00003	0.00009	0.00007
PER_SENIOR	0.00009	0.00007	-0.00001	0.00003	0.00004	0.00014
	Other Grains					
PERCAPINC	***-0.00258***	***-0.00075***	***-0.00916***	***-0.00537***	0.00034	0.00021
HHSIZE	0.00069	-0.00242	0.00668	***0.00816***	-0.00012	***-0.00471***
MP_GTHS	***0.00978***	0.00202	-0.00183	-0.00463	0.00474	-0.00034
MP_LTHS	***0.01114***	0.00190	***0.01312***	0.00506	***-0.00611***	-0.00309
PERLT6	0.00013	0.00025	***-0.00079***	***-0.00056***	0.00000	0.00014
PER6_14	0.00005	***0.00023***	***-0.00059***	-0.00013	0.00004	***0.00021***
PER14_21	***0.00023***	***0.00042***	-0.00020	0.00001	***0.00026***	***0.00023***
PER_SENIOR	0.00007	0.00005	0.00014	-0.00008	0.00003	***0.00013***
	Vegetables					
PERCAPINC	-0.00042	-0.00054	-0.00064	***-0.00313***	***-0.00075***	0.00004
HHSIZE	-0.00151	***0.00476***	0.00393	***-0.00756***	0.00235	0.00255
MP_GTHS	-0.00299	-0.00830	***0.00815***	0.00160	-0.00509	-0.00137
MP_LTHS	0.00093	0.00708	-0.00113	-0.00013	0.00091	0.00003
PERLT6	***-0.00068***	***-0.00066***	-0.00026	***-0.00063***	***-0.00050***	***-0.00042***
PER6_14	***-0.00044***	-0.00028	-0.00014	***-0.00040***	-0.00021	-0.00006
PER14_21	-0.00003	-0.00012	-0.00007	-0.00017	-0.00004	0.00005
PER_SENIOR	-0.00001	0.00010	0.00005	0.00015	0.00001	0.00014
PERCAPINC	***-0.0035***	***-0.0018***	***-0.0058***	***-0.0024***	0.0000	***-0.0003***
HHSIZE	0.0015	0.0003	-0.0012	0.0008	0.0010	0.0004
MP_GTHS	-0.0021	0.0008	-0.0006	***-0.0098***	-0.0009	-0.0018
MP_LTHS	***0.0045***	0.0042	***0.0073***	0.0033	***0.0039***	-0.0002
PERLT6	***-0.0003***	***-0.0004***	***-0.0006***	-0.0002	-0.0001	0.0000
PER6_14	***-0.0003***	***-0.0002***	***-0.0004***	***-0.0003***	0.0001	0.0000
PER14_21	***-0.0002***	-0.0001	-0.0001	***-0.0002***	0.0001	0.0001
PER_SENIOR	0.0000	0.0001	***0.0002***	0.0000	0.0001	0.0001
	Dairy Products					
PERCAPINC	***0.00227***	***0.00291***	***0.00285***	***0.00335***	***0.00055***	***0.00118***
HHSIZE	-0.00105	-0.00084	0.00088	0.00014	0.00113	***-0.01084***
MP_GTHS	-0.00145	0.00756	***0.00579***	0.00423	***0.00670***	***0.01031***
MP_LTHS	***-0.00540***	***-0.01269***	-0.00270	***-0.01132***	***-0.00589***	-0.00456
PERLT6	***0.00070***	***0.00104***	***0.00051***	***0.00123***	***0.00065***	***0.00116***
PER6_14	***0.00037***	***0.00057***	***0.00017***	***0.00079***	0.00004	***0.00044***
PER14_21	0.00012	***0.00036***	-0.00009	***0.00034***	-0.00003	0.00018
PER_SENIOR	0.00002	0.00002	0.00001	***0.00023***	0.00001	0.00003

Variable	Jiangsu		Shandong		Guangdong	
	1995	2000	1995	2000	1995	2000
	Eggs					
PERCAPINC	***-0.00256***	***-0.00123***	***-0.00375***	***-0.00348***	***-0.00048***	***-0.00012***
HHSIZE	-0.00192	-0.00112	-0.00225	-0.00040	-0.00061	-0.00044
MP_GTHS	0.00378	0.00420	-0.00006	0.00536	-0.00039	0.00106
MP_LTHS	0.00343	***0.00567***	0.00387	***0.01025***	-0.00210	-0.00040
PERLT6	-0.00018	-0.00015	***-0.00059***	***-0.00028***	0.00003	-0.00001
PER6_14	-0.00008	-0.00012	***-0.00035***	***-0.00022***	0.00000	0.00005
PER14_21	0.00001	-0.00004	***-0.00039***	-0.00004	0.00003	0.00005
PER_SENIOR	0.00002	0.00001	0.00002	-0.00002	0.00005	0.00004
	Fruits					
PERCAPINC	***0.00324***	***0.00203***	***0.00516***	***0.00269***	***0.00275***	***0.00173***
HHSIZE	***-0.00330***	***-0.00583***	***-0.00204***	***-0.00359***	***-0.00253***	***-0.00334***
MP_GTHS	-0.00024	***0.01074***	-0.00311	0.00022	***0.01093***	-0.00520
MP_LTHS	***-0.00600***	-0.00568	-0.00438	***-0.00698***	-0.00345	-0.00323
PERLT6	***0.00076***	***0.00078***	***0.00106***	***0.00051***	0.00005	***0.00057***
PER6_14	***0.00031***	***0.00028***	***0.00042***	***0.00030***	0.00008	0.00022
PER14_21	***0.00040***	0.00023	0.00022	0.00014	0.00000	0.00005
PER_SENIOR	***-0.00009***	***-0.00015***	-0.00012	-0.00007	0.00004	0.00002
PERCAPINC	***0.00507***	***0.00328***	***0.00448***	***0.00475***	***0.00258***	***0.00190***
HHSIZE	0.00264	-0.00533	-0.00154	***0.01079***	-0.00275	-0.00418
MP_GTHS	***0.01096***	0.00537	0.00761	0.00445	***0.01462***	-0.00420
MP_LTHS	0.00067	-0.00980	0.00275	***-0.01541***	-0.00434	-0.00434
PERLT6	***0.00108***	***0.00154***	***0.00131***	***0.00064***	0.00041	***0.00059***
PER6_14	***0.00050***	***0.00043***	***0.00049***	0.00007	***0.00040***	***0.00051***
PER14_21	***0.00048***	0.00030	0.00026	-0.00011	0.00029	***0.00055***
PER_SENIOR	0.00001	***-0.00018***	0.00000	-0.00013	-0.00015	-0.00001

Note: Italicized and bold values indicate the marginal effects statistically different from zero