

Household Expenditure Analysis

Food's share of household spending typically falls as income and expenditures increase, a relationship known as "Engel's law." In rural China, the share of household expenditures attributable to cash food purchases actually increased slightly from 26 percent in the early 1990s to 28 percent in 2003, which means that spending on cash food purchases kept up with the 70-percent real increase in all household expenditures over the past decade (fig. 8). On the other hand, the noncash food share of rural household expenditures fell sharply from over 30 percent in 1993 to under 20 percent in 2003. The trend in the nonfood share of household budgets was the mirror image of the decline in noncash food share, rising from around 40 percent in 1993 to over 50 percent in 2003. Thus, rural household spending shifted from noncash food to cash food and nonfood expenditures.

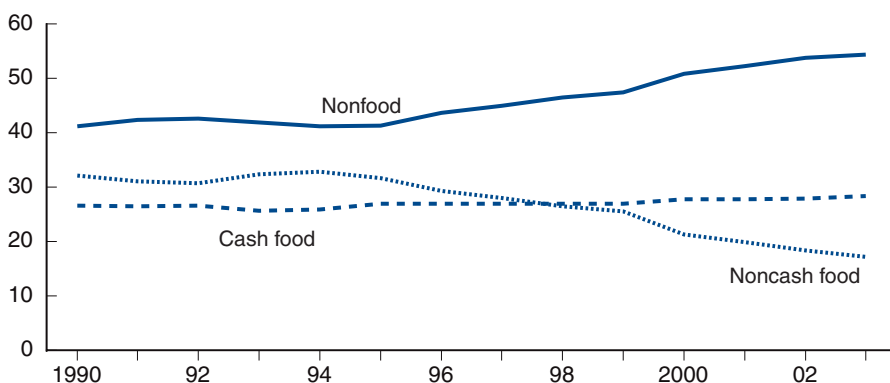
To gain a better understanding of these trends, ERS analyzed changing expenditure patterns of a large sample of rural households for 1995 and 2001 (see appendix). The cross-sectional relationship between various expenditure categories was estimated for each year to ascertain changes in relationships. Household-level data enable researchers to identify changes in different categories of food expenditures as incomes rise and the relationships between household characteristics and expenditure patterns change. ERS also investigated the effects of household characteristics such as landholdings, family size, presence of children, educational attainment, and refrigerator ownership on food expenditure patterns.

Finally, ERS investigated patterns of change in different categories of cash expenditure. Do some food items attract proportionately more expenditures than others as expenditures rise? Which nonfood categories consume the most expenditure?

Figure 8

Chinese rural household budget shares, 1990-2003

Percent



Source: Compiled by ERS from China National Bureau of Statistics, 2004b.

Model

ERS employed the Working-Leser model, a simple model with desirable properties which expresses the household's budget share of each item, j , as a linear function of the logarithm of household expenditures (Wu; Seale et al.). The model provides information on the tendency of households at different income levels and with different characteristics to allocate expenditures among different budget categories. Demographic characteristics were added to the model. We did not include prices as explanatory variables.¹

ERS estimated the following regression model:

$$w_{ij} = a_j + b_j \ln(Y_i) + \sum_k c_{jk} X_{ik} + e_i \quad (3)$$

where w_{ij} is the share of expenditures made on category j by household i ($p_j q_{ij} / Y_i$),

Y_i is per capita total living expenditure made by household i ,

X_{ik} are household characteristics,

e_i is a random error term,

a_j, b_j, c_{jk} , are parameters to be estimated for each expenditure item j .

When $b_j=0$, the item's budget share remains constant as expenditures increase. If $b_j<0$, the item's budget share falls as expenditures rise and $b_j>0$ indicates that the item's budget share increases. Since the budget shares always sum to 1, an increase in one item's budget share must be offset by a decreasing share for other items.

According to this model, the expenditure elasticity for item j , n_j , is expressed as:

$$n_j = 1 + (b_j/w_j). \quad (4)$$

The falling budget share for noncash food expenditures observed in figure 8 suggests that this expenditure category has a low (possibly negative) expenditure elasticity, while the stable cash food expenditure share suggests an expenditure elasticity of approximately 1.0 for cash food purchases. The rising budget share for nonfood expenditures suggests an elasticity exceeding 1.0 for the nonfood category.

The model also includes household demographic characteristics, X_{ik} , that may affect food expenditures. These characteristics include the area of land cultivated by the household, the area of the household's family plot, refrigerator ownership, number of family members residing in the household, the number of small children (under age 6), the number of school-age children (ages 6-15), and the education level of laborers in the household.

First, ERS estimated the model using three expenditure categories—cash food, noncash food, and nonfood—to compare the expenditure elasticities.² The model used total household living expenditures as an explanatory variable. It was expected that cash food spending would have a larger expenditure elasticity than noncash food spending. The time series analysis in the previous

¹ The effect of prices on food consumption is complex because rural households are both consumers and producers of food (Singh et al.; Yan). See box, "Volatile Prices Had Little Effect on Food Consumption," for details.

² ERS did not separate nonfood expenditures into cash and noncash spending since our interest is mainly in food expenditures and noncash spending for nonfood items was small. Noncash expenditures on nonfood items averaged 57 yuan (\$7) per person in 2001, most of which was devoted to housing.

section suggests that noncash food spending may have a negative expenditure elasticity. ERS also investigated changes in elasticities over time.

Second, ERS investigated allocations of cash expenditures among different food and nonfood categories. Engel functions were estimated for cash food expenditure items using total cash expenditure by the household as the independent variable. This analysis provided insight on the types of food that are purchased most frequently as China's rural households increase their participation in cash markets. Food expenditure elasticities were compared with nonfood elasticities to provide perspective on the role of food expenditures in households' cash budgets. Finally, ERS examined the association between various expenditures and household characteristics.

Cash/Noncash Food Expenditure

The analysis compared expenditure allocations among cash food, noncash food, and nonfood items by rural households at different income levels. Results from the 2 years studied show how expenditure relationships may have changed during the period of rapid commercialization of food consumption identified earlier in this report.

The model used household data from Heilongjiang, Henan, and Jiangsu Provinces for 1995 and 2001. Data for over 9,000 households in the three provinces were available for each year to estimate budget share equations for cash food, noncash food, and nonfood expenditures, a total of six equations. F-statistics indicated that the independent variables added significant explanatory power to the models, and t-statistics indicated that most regression coefficients were significantly different from zero. R^2 values were about .20 for the cash food equations and .35 for the noncash food and nonfood equations.³

The trends in mean expenditure shares in the sample of households are consistent with the national data shown in figure 8. The cash food share rose slightly, the noncash food share fell sharply, and the nonfood expenditure share rose sharply between 1995 and 2001 (table 5). However, the expenditure coefficients and elasticities estimated from the cross-section data appear to be inconsistent with the trends in budget shares over time. Between 1995 and 2001, the mean cash food share rose, but the estimate of the cash food expenditure elasticity is less than 1, suggesting that the budget share devoted to cash food expenditures should fall as total expenditure rises. The estimated cash food expenditure elasticity was .85 for 1995 and was even lower, at .77, in 2001.

Not surprisingly, the noncash food expenditure elasticity is even lower, at .52. While this elasticity is clearly less than 1 (implying a sharply declining budget share), it is also significantly greater than 0, suggesting that noncash food expenditure increases as income rises, as observed in figure 3. However, the aggregate data for 1996-2003 showed that inflation-adjusted noncash food expenditures decreased not only as a share of household budgets, but also in absolute terms (see fig. 6), suggesting that the noncash food expenditure elasticity would be negative. The nonfood expenditure elasticity is significantly greater than 1, as expected.

³ Descriptions of variables and expenditure categories are provided in appendix table 1. Full results of the regression estimates are reported in appendix tables 2 and 3.

Table 5

Summary of estimated expenditure elasticities for rural households, 1995 and 2001

Item	Year	Expenditure category		
		Cash food	Noncash food	Nonfood
Mean share of household expenditure	1995	.254	.377	.369
	2001	.284	.239	.477
Expenditure coefficient*	1995	-.037	-.181	.218
	2001	-.065	-.115	.180
Expenditure elasticity	1995	.85	.52	1.59
	2001	.77	.52	1.38

* = Effect of a one-unit change in Ln (total expenditure) on the expenditure share. All coefficients are statistically significantly different from zero, with 95 percent confidence.

Note: Data are from Jiangsu, Henan, and Heilongjiang Provinces.

Source: Estimated by USDA's Economic Research Service from unpublished data compiled by China National Bureau of Statistics (1995, 2001).

The elasticities obtained from the cross-section analysis under-predict the growth in household expenditures on cash food and nonfood purchases. For example, actual cash food expenditures grew 19 percent from 2000 to 2003, about the same rate as growth in total household expenditures. However, the cash food expenditure elasticity of .77 estimated from 2001 data suggests that cash food expenditures would have grown less than 15 percent. Similarly, the model also fails to predict the absolute decline in noncash food expenditures. The model predicts a falling budget share for noncash food expenditure, but it does not predict the absolute decline in noncash food expenditures that actually occurred.

Inconsistency between positive cross-sectional grain expenditure elasticities and secular decline in grain consumption over time was noted by Huang and David. The apparent inconsistency can be resolved if changes in other factors offset the effects of rising expenditures over time. For example, Huang and David attributed declining grain consumption in Asia to rising urbanization.

It is likely that the switch from self-produced to purchased food was driven by structural changes in the rural economy over the past decade—a phenomenon referred to as “market development” by Huang and Rozelle. Better access to food markets as a result of better transportation and communications, greater mobility of the rural population, expansion of food retail outlets into rural areas, and the rising ownership of home refrigerators and other factors enabled rural households at a given income level to consume a larger share of purchased food in 2001 than in 1995.⁴

Factors representing ease of access to food markets are difficult to observe and could not be captured well in the model. Between 1995 and 2001, rural markets and retail establishments increased in number, rural retail sales per capita rose, rural households received more income in cash, and they obtained more complementary items, such as electricity, refrigerators, and other appliances.

The model did include several household characteristics, including refrigerator ownership, migration, land holdings, and family composition, that

⁴ The sharp decline in grain prices from their peak in 1996 reduced the imputed value of noncash grain expenditure (since expenditure equals price times quantity). However, the fall in grain prices does not explain the decline in quantity of self-produced grain consumed. The fall in grain prices should have encouraged households to consume larger quantities of grain, but our analysis indicates that the quantity consumed—both self-produced and purchased—decreased during this period.

provide additional insights about rural household expenditure decisions (table 6). Households that own refrigerators tend to allocate more of their budgets to cash food and less to noncash food expenditure. The rise in refrigerator ownership may be one factor that contributed to rising food purchases. The number of migrants working outside their home town increased sharply from 11 to 36 per 100 households between 1995 and 2001. Migrants are associated with a small shift of expenditures from cash food to nonfood expenditure. Other household characteristics affected cash and noncash food expenditures in 2001, but changes in these factors do not explain the shift from noncash to cash food expenditures. Larger households spend more on nonfood items, households with larger farms tend to consume more self-produced food, families with school-age children shift expenditures from cash food to nonfood items, and households with more educated members tend to spend slightly less on noncash food.

Cash Expenditure Elasticities

Estimates of cash expenditure shares show shifts in cash food expenditures among different categories of food and nonfood items as cash expenditures grow. Patterns of cash expenditures are particularly important since they determine the growth in market demand for various types of food and nonfood items.

Food was the largest single use of cash for China's rural households, accounting for 45.7 percent of cash expenditures in the sample during 1995 (table 7). Food remained the largest single cash expenditure item in 2001, but its share of household budgets fell by 4.8 percentage points to 40.9 percent. Clothing had the second-largest share of budgets, 14.1 percent, in 1995, but its share fell by nearly 5 percentage points by 2001. In 2001, education and recreation (primarily school fees and education-related expenses)⁵ accounted for the second-largest share of budgets, at 11.7 percent. Spending on durable goods was low, on average, at 2.5 percent of budgets. Other expenditures were distributed relatively evenly across other

⁵ For this study, we made some changes to the usual categorization of household expenditures used by China National Bureau of Statistics (see app. table 1). A "durable goods" category was created, which includes electrical and mechanical devices (usually included in the education and recreation category) and household appliances and furniture (usually categorized with household items). This study's "education and recreation" category includes primarily education-related services and goods, while the "durable goods" category includes primarily consumer goods. Utilities and housing were categorized separately. Nondurable household items were included in the "other non-food" category.

Table 6

Changes in household characteristics and estimated effects on cash and noncash food expenditures

Characteristic	Unit	Sample mean		Effect on household budget share (2001):		
		1995	2001	Cash food	Noncash food	Nonfood
Log of household expenditure	Logarithm	7.42	7.57	-.0650	-.1150	.1800
Refrigerator owned	Number	.04	.12	.0400	-.0310	-.0100
Migrants working outside hometown	Number	.11	.36	-.0070	-.0020	.0100
Size of household	Persons	4.30	4.00	-.0150	-.0090	.0240
Cultivated land area	Mu	10.80	12.10	-.0006	.0010	-.0003
Family plot size	Mu	.70	.30	.0001	.0018	-.0020
Children under age 6	Number	.21	.19	-.0040	-.0020	.0060
Children age 6-15	Number	.74	.72	-.0200	-.0060	.0260
Persons with senior high school education or higher	Number	.32	.34	.0076	-.0144	.0068

Note: Coefficients were estimated from 2001 data using ordinary least squares. Coefficients in bold type are significantly different from zero with 95 percent confidence. Effects for the three budget shares sum to 0 for each characteristic. Data are from Jiangsu, Henan, and Heilongjiang Provinces.

Source: Estimated by USDA's Economic Research Service from unpublished data compiled by China National Bureau of Statistics (1995, 2001).

Table 7

Estimated effects of rural household characteristics on cash budget shares for food and nonfood items, 2001

Item	Cash expenditure category ¹								
	Food	Clothing	Utilities	Durable goods	Housing	Health and medical	Transportation and communication	Education and recreation	Other goods and services
	<i>Share</i>								
Mean budget share:									
1995	.457	.141	.045	.0350	.0710	.0560	.0290	.0870	.080
2001	.408	.093	.061	.0250	.0610	.0740	.0760	.1170	.085
Expenditure elasticity	.690	.830	.670	1.810	2.370	1.260	1.270	1.250	.930
-----Effects on household budget shares-----									
Regression explanatory variables:									
Log cash expenditures	-0.125	-0.016	-0.020	.012	.064	.019	.021	.032	-0.006
Refrigerator ownership	.036	.006	.021	.002	-0.015	-0.015	.023	-0.037	-0.001
Persons w/ high school education	.0045	.0052	-0.00230	-.00110	-0.0005	-0.0106	.0072	.0125	-.0006
Cultivated land area	-0.0003	.0001	-0.00027	.00005	-.0001	-.0001	.0002	.0001	.0000
Family plot size	.0007	-.0009	.00002	.00060	.0028	-.0014	-.0012	-.0024	.0017
Migrants working elsewhere	-0.011	.000	-0.0032	.0028	.007	-0.004	.014	-0.008	-0.001
Children age 7-16	-0.034	.008	-0.0034	-.0011	-0.007	-0.007	-.002	.049	-0.006
Children age 0-6	-.003	.005	.0014	-.0001	.001	.023	.003	-0.027	-0.001
Household size (persons)	-0.025	-0.005	-0.005	.0015	.013	.002	.003	.011	.000
	Cash food expenditure category ¹								
Item	Grains	Vegetables	Edible oils	Meats and eggs	Fish	Other foods	Tobacco/ alcohol	Food away from home	
	<i>Share</i>								
Mean budget share:									
1995	.068	.039	.034	.105	.020	.088	.085	.018	
2001	.056	.034	.026	.093	.018	.069	.073	.038	
Expenditure elasticity	.600	.540	.320	.660	.670	.600	.660	1.540	
-----Effects on household budget shares-----									
Regression explanatory variables:									
Log cash expenditures	-0.023	-0.016	-0.018	-0.032	-0.006	-0.028	-0.025	.020	
Refrigerator ownership	-.002	.005	.000	.018	.007	.013	.007	-0.012	
Persons w/ high school education	-.0022	.0001	-0.0011	-.0011	.0004	.0017	.0005	.0062	
Cultivated land area	-0.0004	.0000	-0.0001	-.0001	.0000	.0000	.0002	.0001	
Family plot size	.0006	-.0003	.0000	-.0003	-.0001	.0003	.0010	-.0006	
Migrants working elsewhere	-0.003	-0.005	-0.002	-0.004	-0.001	-0.003	-0.005	.011	
Children age 7-16	-0.003	-0.003	.000	-0.009	-0.002	-0.003	-0.012	-.002	
Children age 0-6	-0.004	.000	-0.001	.000	.000	.014	-0.005	-0.006	
Household size (persons)	-0.004	-0.003	-0.003	-0.009	-0.001	-0.008	-0.002	.005	

¹See appendix table 1 for description of expenditure categories.

Note: Table shows coefficients from Engel regressions. Coefficients in bold type were significantly different from zero with 95 percent confidence. Data are from Jiangsu, Henan, and Heilongjiang Provinces, 2001. The elasticities for "other food at home" and "other services and nonfood items" were calculated using the Engel aggregation condition that the elasticities of all items weighted by their budget shares sum to 1. Data are from Jiangsu, Henan, and Heilongjiang Provinces.

Source: Estimated by USDA's Economic Research Service from unpublished data compiled by China National Bureau of Statistics (1995, 2001).

categories. Housing accounted for only 6.1 percent of expenditures in 2001. Most rural Chinese households build or refurbish their own houses, often with unpaid help from neighbors and friends, on land allocated by their village. Few rural Chinese families pay rent or mortgages. Housing expenses may be unusually high in a year when construction takes place and minimal in other years.

Engel regressions for various cash expenditure categories indicate that rural households tend to spend additional cash disproportionately on nonfood items, such as housing, education and recreation, health care, transportation and communications, and durable goods.⁶ Food, clothing, and utilities (electricity, fuel, and water) are “necessities” for which the budget share declines as expenditures rise. The food cash expenditure elasticity was .69, significantly less than 1. All nonfood items except clothing and utilities had cash expenditure elasticities of 1 or higher. Housing had the largest cash expenditure elasticity of any major item, at 2.37, followed by durable goods, at 1.81. The elasticities for health, transportation and communications, and education and recreation were in a narrow range of 1.25 to 1.27. The elasticity for other goods (mainly household goods and services, jewelry, cosmetics, and funerals and other services) was .93.

The changes in mean budget shares between 1995 and 2001 are not entirely consistent with the expenditure elasticities. The mean per capita cash living expenditure in the sample rose more than 50 percent between 1995 and 2001. The budget shares devoted to food and clothing fell sharply, consistent with their low expenditure elasticities, but the budget shares for housing and durable goods—the categories with the highest elasticities—also fell. Price changes and cyclical factors may have influenced the budget shares for the 2 years. China’s rural economy was growing rapidly during 1995, but it was in a period of retrenchment in 2001. Rural housing construction and purchases of “big ticket” durable goods, such as home appliances, televisions, and furniture, may have been unusually low during 2001 due to slow income growth that year.⁷ Declining food and clothing prices may have exaggerated the decline in food and clothing budget shares. Wider availability of electricity, water, and fuels in rural areas and increased fees for utilities may have boosted the utilities budget share. Transportation and communication’s share of budgets rose sharply as the rural population became more mobile, thus paying more bus and rail fares and purchasing bicycles and scooters. Telephones and other communications systems also became more widely available in rural China by 2001.

Food away from home clearly stands out as the one food expenditure item that is taking a larger share of household budgets as expenditures rise (see box, “Rapid Growth in Away-From-Home Food Spending”). Between 1995 and 2001, all at-home food items had decreasing cash budget shares and cash expenditure elasticities mostly in the range of .6 to .8, significantly less than 1. Food away from home’s share doubled from just 1.8 percent of expenditures in 1995 to 3.7 percent in 2001. Food away from home’s cash expenditure elasticity was one of the largest of any category, food or nonfood. Food away from home’s expenditure elasticity was about equal to that of durable goods, but the food away from home share of rural budgets exceeded that of durable goods in 2001.

⁶ Results estimated from data for 1995, but not reported here, were mostly similar to the estimates for 2001.

⁷ Data on fixed asset investment show that rural household investment increased sharply in 1995 and fell in 2001 (China National Bureau of Statistics, Rural Survey Organization, 2003).

Rapid Growth in Away-From-Home Food Spending

The fastest growing component of rural food consumption is food consumed away from home. During the 1990s, the number of restaurants, cafeterias, and other food vendors grew rapidly, even in rural areas. It became easier to travel to towns and cities for restaurant meals, and rural people ate more meals at factory canteens and other work sites.

In 1995, just 3.2 percent of rural food spending was on food away from home, but the away-from-home share more than tripled to 11.2 percent in 2003. Away-from-home food was the only component of food spending to capture a larger share of total household living expenditures during the period. By 2003, away-from-home-food spending accounted for 5 percent of all rural household expenditures and 18 percent of rural cash expenditures. ERS estimates indicate that food away from home has one of the largest cash expenditure elasticities of any budget item and is associated with migration.

China National Bureau of Statistics household surveys report only total expenditures on food consumed away from home; no information is collected about what foods are purchased. The only information about away-from-home food purchases is available from a survey of urban consumers conducted by China's Academy of Sciences (Ma et al.) in 1998, which showed that away-from-home meals included a higher proportion of meat (38 percent of away-from-home expenditures) and "other foods" (24 percent) than did at-home meals (28 percent meat and 15 percent "other foods"). At-home meals include a higher proportion of staple food grains. Similar consumption patterns likely hold for rural households' away-from-home spending.¹ Thus, the rising consumption of food away from home tends to raise demand for meat and other high-value foods and probably increases intake of fat and protein.

¹ While there is no statistical evidence, casual observation suggests that much food away from home consumed by rural persons is at worksites as well as restaurants. Rural meals away from home may include a smaller proportion of meat and high-value foods than do urban meals away from home.

Rural per capita expenditures on food away from home, 1990-2002

Year	Amount	Share of food expenditures	Share of cash food expenditures	Share of all expenditures
	<i>Yuan</i>	<i>Percent</i>		
1990	8.29	2.4	5.3	1.4
1995	24.88	3.2	7.0	1.9
2000	63.97	7.8	13.8	3.8
2002	89.61	10.6	17.5	4.9
2003	99.28	11.2	18.0	5.1

Source: Compiled by USDA's Economic Research Service from China National Bureau of Statistics (2004b).

All at-home food items had decreasing shares of cash budgets between 1995 and 2001, and their cash expenditure elasticities were all .67 or lower. Among specific at-home food items, meat and eggs accounted for the largest share of cash expenditures, followed by tobacco and alcohol. While grain and vegetables accounted for the largest part of the rural Chinese diet, their share of cash expenditures was relatively low because these commodities were largely self-produced, not purchased. Edible oils (.32) and vegetables (.54) had the smallest cash expenditure elasticities. Other cash expenditure elasticities of at-home food items ranged from .60 to .67.

The cash expenditure models also estimated the effects of household characteristics. As in the earlier analysis, refrigerator ownership tends to be associated with greater cash food expenditures. The expenditure equations for specific food categories show that refrigerator ownership is most strongly associated with meat expenditures, followed by “other foods” (including milk and processed foods) and fish. This pattern suggests, not surprisingly, that households owning refrigerators tend to spend more on perishable foods.

Households with larger cultivated land area tended to make slightly lower cash expenditures on food, especially on grain, but family plots were not significantly associated with food expenditures. Households with migrant members working elsewhere tended to spend more on food away from home and transportation/communications and less on at-home food items. Households with high school-educated members (most rural people have a junior middle school or primary school education) tended to spend slightly more on food away from home and “other food” (dairy, fruit, and processed foods) and less on health care. Lower health care spending may reflect access to subsidized health care for more educated persons who are more likely to be employed by government organizations.

Family composition affects how households allocate their spending. The presence of school-age children is associated with larger cash expenditures on education and less on food and most other categories. This reflects rising school fees in rural areas, which apparently has induced families with school-age children to divert cash away from other items to pay for education. The negative effect associated with school-age children is strongest for tobacco and alcohol. The presence of children under age 7 is associated with greater spending on “other food” (probably reflecting greater spending on dairy products) and health care. Larger family size is associated with greater budget shares devoted to housing and education and less devoted to at-home food and most nonfood items.

Summary of Household Expenditure Analysis

This analysis confirms that rural households in China tend to spend a disproportionate amount of their incremental income on nonfood goods and services, especially housing and education. The shift in food expenditures from noncash (self-produced) to cash (purchased) food occurred faster than can be explained by growth in expenditure. The shift might be explained in part by rising refrigerator ownership (which boosts spending on perishable foods) and migration (which shifts spending to food away from home and

transportation and communications), but most of the change was due to factors not included in the model, which may have included the spread of markets and retail stores to rural areas, better transportation, and more information about markets and food products. Spending on food away from home is one of the fastest rising expenditure items in rural China. In 2001, expenditures on food away from home exceeded expenditures on durable goods. Changes in China's rural economy over time seem to have resulted in shifting of expenditures to education, transportation, communications, electricity, water, and fuel.