Egypt's Household Expenditure Pattern: Does It Alleviate a Food Crisis?

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Abstract

We estimated a system of Engel functions for two survey periods, 1999/2000 and 2004/2005, to quantify the impact of changes of income on household expenditure behavior and to investigate how expenditure responsiveness changes with income.

We found that rural households have a higher expenditure share for food categories but a lower share for non-food categories compared to urban households. The expenditure share did not change so much between the two survey periods, with only a slight decline in the share of cereals-bread and the non-food category and an increase in the meat-fish-dairy category.

All estimates have a good fit, and the total expenditure explanatory variable is significant in all equations. In general, households with lower incomes are more responsive to changes in income for food categories, and less responsive for non-food categories. This is evident with the higher income elasticity of lower-income rural households compared to urban households for food categories. Moreover, elasticities in the 2004/2005 survey period are higher compared to the 1999/2000 period. Per capita real income declined by 37.2% in 2004/2005. This consumption expenditure pattern has an alleviating effect on the impact of a food crisis since a lower real income associated with a food crisis is accompanied by greater responsiveness of households to reduce their demand for food as their real incomes shrink. This adjustment behavior is most obvious in the case of bread and cereals in rural areas, in which the expenditure elasticity increased from 0.50 to 0.91 as per capita income declined.

Keywords: Engel function, household consumption pattern, income elasticity.

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1. Introduction

Recent increases in world commodity prices have been large, somewhat sustained, and have led to what many label as a food crisis situation. Hard hit by this food crisis are developing countries, whose households allocate a substantial proportion of their incomes to food expenditures. Like similar households in this category, households in Egypt allocate around half of their incomes for food. It was no surprise, then, that public response to the food crisis resulted in civil unrest in many countries.

Several explanations for the commodity price increases have been given; most notably, expansion in the use of food commodities for biofuels in major exporting countries has received much of the blame. Although there is still a lack of agreement on whatever is causing the price hike, there is a common consensus that the upward pressure on prices is not expected to soften in the short run. In fact, prices in the futures market for most major traded agricultural commodities remain at elevated levels in all the foreseeable contract periods.

The food crisis has raised strong public interest in the agricultural sector in general and has brought into sharp focus the mix of food policies adopted by countries, particularly those that influence food markets. For example, in Egypt, consumer price subsidies on wheat flour and bread are now under increasingly closer public scrutiny. To be productive and constructive, however, any public debate on food policy must be well informed. Both the public and policymakers need solid, science-based information to go beyond slogans and craft a policy response that is effective and efficient.

Also, the food crisis has rekindled interest in studies pertaining to household consumption patterns. A key piece of information for examining the impact of a food crisis is to understand how households respond to these large and sustained price changes. It is important in this examination to consider not only household response based on a single-point elasticity estimate but also the likely change in household response as these households face large income changes.

The objectives of this study are as follows:

(a) Characterize the household expenditure pattern in Egypt.

(b) Estimate Engel's function for food and non-food categories for two periods, i.e., 1999/2000 and 2004/2005, in order to quantify the impact of income on household expenditure and the likely changes in this responsiveness over time.

(c) Using the estimated income elasticity, project likely changes in the consumption pattern in the future with the expected economic growth in Egypt.

2. Model

The data of the most recent publicly available Household Income, Expenditure, and Consumption Survey reported only very highly aggregated household expenditure and contained no information on quantity. Therefore, not even even prices could be derived. This limits the model we can use to examine the consumption and expenditure behavior of households in Egypt. For this purpose, we employ the Working (1943) and Leser (1963) specification of the Engel model, which uses only expenditure data, that is,

[1] $$w_i = \alpha_i + \beta_i \log(E) + \varepsilon_i ,$$

where w is the expenditure share of good i, E is the total household expenditure, α and β are unknown parameters to be estimated, and ε is the independently identically distributed error with a normal distribution of zero mean and standard deviation of sigma. This model specification allows luxuries ($\beta>0$), necessities ($\beta<0$), and inferior goods. An extension of this model when prices are available can easily lead to the commonly used Almost Ideal Demand System (AIDS) developed by Deaton and Muelbauer (1980).

To ensure theoretical consistency of the Engel functions, we impose the adding-up restriction in the estimation of the model. That is,

[2] $$\sum_i w_i = 1, \quad \text{or} \quad \sum_i \alpha_i = 1, \quad \text{and} \quad \sum_i \beta_i = 0.$$

The expenditure elasticity can then be derived from [1] even without any price or quantity data by using the formula given in [3]:

[3] $$\varepsilon_i = \left(1 + \frac{\beta_i}{w_i}\right).$$

3. Data and Results

This study uses the 1999/2000 and 2004/2005 Household Income, Expenditure, and Consumption Survey. These two recent surveys are the most comparable in terms of survey methodology and sample size. The Government of Egypt has conducted this type of survey, which was originally called the Household Budget Survey (HBS), since 1955. It was first conducted on an experimental basis and designed and implemented by the statistical committee under the council of public services, covering only three villages in the Giza governorate with a sample size of 750 households out of a population of 4,000 households in the three villages. The second survey, conducted in 1958/1959, covered all governorates of Egypt. Therefore, it was considered the first statistically valid household

budget survey. The sample size was increased to 6,373 households, with 51.5% from urban and 48.5% from rural. The sampled households were fixed along the 12 months of the survey period. The second HBS, conducted in 1964/1965 was a much larger one, covering 13,818 households, with 67.6% from urban and the rest from rural. A new sampling approach was introduced, in which the visited households were changed each quarter — four visits a year (Soliman, 1973). Because of the political situation in Egypt, the third survey was delayed until 1974/1975. It was conducted following the same sampling technique as the second survey (Soliman, 1978). However, the sample was smaller, at 11,995 households. The fourth survey covered the year 1981/1982. The sample was larger, at 17,000 households, and distributed equally between urban and rural. The questionnaire technique was adjusted in this survey, whereby a subsample of 1,000 households was not changed throughout the year while 16,000 were changed. Unfortunately, most researchers have ignored this survey because of data issues reported to lead to significant bias in parameter estimates (Soliman and Eid, 1995a).

In 1990/1991, the name of the survey was changed from the Household Budget Survey to the Household Income, Expenditure, and Consumption Survey (HIECS). The fifth survey included 15,000 households, with 60% from urban and 40% from rural areas. The technique changed the households monthly (Soliman and Eid, 1995a). The same technique was followed for the sixth survey in 1995/1996. Its sample size was 15,090 households, with 45.1% from urban and 54.9% from rural (Soliman and Eid, 1995b). The 1999/2000 survey was much larger than any of the previous surveys, at 48,000 households, with 60% from urban and 40% from rural. Also, the questionnaire was given to different households of the sample each moth (CAPMAS, 2000).

The most recent survey (CAPMAS, 2006) is the eighth in the series, with a sample size of 48,000 households representing all governorates in Egypt, conducted from July 2004 to the end of June 2005 by the Central Agency for Public Mobilization and Statistics (CAPMAS). The CAPMAS officially releases the survey results in a five-volume publication. This is the only version of the survey results available to the public. It should be noted that all surveys except the 2004/2005 have included data of quantities consumed of major food items for urban and rural households. Table 1 lists the main groups and sub-groups of food and non-food expenditure categories, and table 2 lists the economic and demographic factors covered in the survey. For the purpose of this study, we use the household expenditure data from the income groups for urban and rural households in the 1999/2000 and 2004/2005 HIECS. We estimated the urban and rural households separately. With the limited number of observations in the published results, we needed to further aggregate the expenditure categories into four major groups: (1) bread and cereals; (2) meat, fish, seafood, milk, cheese, and eggs; (3) other foods;[1] and (4) non-food.[2] The system of Engel functions is estimated using a Seemingly Unrelated Estimator (SUR) with the adding-up restriction imposed on the parameters, as given in [2]. This means that one equation (in this case the non-food category) was dropped in the estimation because the system becomes singular when the adding-up restriction is imposed. However, all the parameters of this dropped equation can be fully recovered using the information in the adding-up restriction. The number of households in each

[1] Other food categories include oils, fats, fruit, vegetables, sugar, jam, honey, chocolate, confectionery, other food products, and non-alcoholic beverages.
[2] The non-food expenditure category includes alcoholic beverages, tobacco, narcotics, clothing, footwear, housing, water, electricity, gas, other fuel, furnishings, household equipment, routine maintenance of the house, health, transport, communication, recreation and culture, education, restaurant and hotel, and miscellaneous goods and services.

expenditure group relative to the total number of households is used as weights in the estimation.[3]

Several studies have been conducted to estimate income elasticity using the HIECS (Soliman, 1992; Shapouri and Soliman, 1985). These studies used a consumption-income relation specified with a double log functional form. Studies by Soliman (1973, 1978) and Soliman and Eid (1995a) compare the changes in expenditure elasticity over a long period, including the dramatic change in the Egyptian economy from a central planned system to an open market system**.** The expenditure elasticities of animal products (meat and fish) from the four household surveys conducted in 1958/1959, 1964/1965, 1974/1975, and 1990/1991 are reported in table 3.

The household expenditure pattern in Egypt is examined in this study using the two most recent HIECS. They have comparable sample size and survey methodology. The mean expenditure shares are given in table 4a and 4b. Rural households show a higher expenditure share in all food categories compared to urban households in both the 1999/2000 and 2004/2005 HIECS. That is, in the more recent survey, rural households had a 9.7% share in bread and cereals compared to the 6.4% share for urban households; 22% in the meat, fish, and dairy category compared to 21.7%; and 19.6% in the other food category compared to 16.7%. In contrast, the rural household expenditure share of 48.7% in the non-food category is lower than the 55.2% share of urban households.

The expenditure shares did not change substantially between the 1999/2000 and 2004/2005 HIECS for both urban and rural households. In the more recent HIECS, the

[3] It should be noted that the data for rural households appear suspect. First, there is no data reported for households in the L.E. 75,000 annual expenditure category. Second, food and non-alcoholic beverage expenditures were higher for households in the L.E. 25,000 annual household expenditure category compared to households in the next higher expenditure category of L.E. 30,000.

share of the cereals and bread category declined slightly, as did the share of the non-food category. Only the share of meat-fish-dairy increased. The share of other food remained the same.

SUR estimates are given in tables 5 to 7 for urban, rural, and total Egyptian households. Table 5a shows that estimation results for urban households in the 2004/2005 HIECS have a good fit for the three Engel equations with an R^2 of 0.74 to 0.97. The total expenditure explanatory variable is highly significant, at the 1% significance level for all equations representing the consumption categories. The estimates of the Working-Leser model Engel functions suggest that the food expenditures for all three categories of food in the model decline in share for urban households as household income increases. Estimation using the 1999/2000 HIECS gives the same results and are reported in table 5b.

Estimates for rural households are shown in table 6. The weighted estimates have poorer fit and the total expenditure is not significant in the meat, fish, and dairy food category. This may be related to the data question on rural households raised earlier. However, the properties of the estimates are much improved when the weights are not used. The R^2 is 0.62 to 0.94 and the total expenditure explanatory variable is significant at the 1% level for the equations. It will be shown later that despite the difference in statistical properties of the weighted and non-weighted estimates, the resulting elasticities are not so different. Table 6b shows the estimates for rural households using the 1999/2000 HIECS data. The goodness of fit is much improved, and the total expenditure explanatory variable is significant in all equations.

Table 7 shows the aggregate income elasticities of Egypt derived from the 2004/2005 survey. Table 8 shows the estimated income elasticities for both urban (table 8a) and rural (table8b) households. Urban households show a larger differential in the elasticities for food and non-food categories, with much smaller elasticities for the food categories. Rural households, on the other hand, show higher elasticities in the food categories, especially for meat, fish, and dairy. Whereas, urban households are less responsive to income changes than are rural households in the food categories, they are more responsive in the non-food category. Rural households are especially responsive in the bread-cereals and meat-fish-dairy categories. In the case of urban households, bread-cereals is the least responsive to income changes at 0.71, while meat-fish-dairy has the highest elasticity of the three food categories at 0.86. For rural households, both bread-cereals and meat-fish-dairy have high elasticities at 0.91 and 0.99.

As a core objective of this study, we examined what happened to the elasticity estimates between the two survey periods of 1999/2000 and 2004/2005. The comparison reveals interesting patterns. In general, the elasticities for food categories are higher in the 2004/2005 period compared to the 1999/2000 period. This is particularly true in the case of bread-cereals for rural households, in which the elasticity in 1999/2000 is 0.50 and increases to 0.91 in 2004/2005. The meat-fish-dairy food category increased from 0.86 to 0.99, and the other food category increased from 0.69 to 0.84. The same pattern is shown for urban households, although with a lesser magnitude of change. The elasticity for the bread-cereals food category increased from 0.60 to 0.71, from 0.81 to 0.86 in meat-fish-dairy, and increased only slightly for the other food category, from 0.732 to 0.734. In contrast, the elasticities for the non-food category decreased between the two

periods for both urban and rural households; i.e., from 1.18 to 1.17 in urban households and from 1.32 to 1.09 in rural households.

We attribute these changes in elasticities between the two periods to changes in income. The per capita real GDP in 2004/2005 declined by 37.2% compared to 1999/2000. Or equivalently, the elasticity for food products declines with improvement in income. Since there was an actual decline in income in the more recent period, the elasticity estimates increased. The change is more evident in the case of the bread-cereals category in rural households. Figure 1 shows this inverse relationship of income elasticity and per capita income for food categories. We use the estimates of Soliman for red meat and poultry from the 1990/1991 HIECS to add one more observation, and the same inverse relationship of the income elasticity and real per capita income is evident for meat, although at a lower slope as shown in the figure.

With the differential income elasticity across categories, it is easy to show that over time, as Egypt develops its economy, bringing higher incomes to its households, the proportion of total expenditure spent on food will decline, as the non-food category responds much faster than all food categories. In urban households, we expect that the highest decline in expenditure share will be in the bread and cereals category, followed by other food, and then meat, fish, and dairy. In contrast, the expenditure share of the non-food category will continue to grow. In rural households, the other food category will decline the fastest, with only a marginal decline in bread-cereals and meat-fish-dairy since their elasticities are close to unitary. The expenditure share of the non-food category will increase only slightly for rural households, with an income elasticity close to unitary.

Finally, the household expenditure pattern in Egypt, in which household responsiveness changes with income, has implications for the impact of a food crisis, especially the most recent one. That is, since food products account for around half of total household expenditure, significant food price increases associated with a food crisis situation may actually be large enough to cause real household incomes to decline. As shown in our estimates, as their incomes decline, households become more responsive to changes in income, reducing their demand for food products, particularly cereals-bread, thereby alleviating the impact of a food crisis.

4. Conclusion

This study examined the changes in consumption and expenditure behavior of households in Egypt. With the limited data, we estimated a system of Working-Leser Engel functions for four expenditure categories, namely, (1) bread and cereals; (2) meat, fish, seafood, milk, cheese, and eggs; (3) other food; and (4) non-food. The data is from a report published by CAPMAS on the 1999/2000 and 2004/2005 Household Income, Expenditure, and Consumption Survey.

The data show that rural households spend a higher proportion of their income on bread and cereals and other food compared to urban households. They spend almost the same proportion on meat, fish, seafood, milk, cheese, and eggs, and a significantly lower proportion for the non-food category.

SUR estimation results have a good fit, have highly significant income explanatory variables, and have the expected signs in all equations of the system for both urban and rural households in the two survey periods. As shown by the negative income parameter in the Engel functions, the proportion of expenditure spent on food items will decline

with an increase in household income, while the proportion spent on the non-food category will increase by virtue of the adding-up parameter restriction on the total expenditure explanatory variable. This pattern is further evidenced by the income elasticity estimates: all food items have income elasticity estimates that are less than unity, and only the non-food category has an income elasticity greater than unity. This suggests that as household income increases, the expenditure increase in the food categories will be less than the increase in income, while the expenditure increase in the non-food category will be greater than the increase in income, resulting in a decline in the proportion of income spent on food items and an increase in the proportion of income spent on non-food items. The decline in expenditures of urban households will be larger, while the decline in expenditures of rural households will be marginal given that their elasticities are close to unitary for all categories except the other food category.

Changes in elasticities between the two survey periods suggest that the responsiveness of households to changes in income declines significantly when the level of their incomes rises. This expenditure pattern provides an alleviating effect when a food crisis happens because the lower real per capita income associated with a food crisis is accompanied by an increase in the responsiveness of households to further lower their demand for food, thereby alleviating the impact of a food crisis.

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Table 1. Main and sub-group categories of expenditures of food and non-food

Food and Non-Alcoholic Beverages
- Bread and cereals
- Meat
- Fish and seafood
- Milk, cheese, and eggs
- Oils and fats
- Fruit
- Vegetables
- Sugar, Jam, Honey, Chocolate, and Confectionary
- Other food products
- Non-alcoholic beverages

Alcoholic Beverages, Tobacco. And Narcotics

Clothing and Foot Wear
- Clothing material
- Garments
- Other articles of clothing and clothing accessories
- Cleaning, repair and hire of clothing
- Footwear
- Used Ready Made Clothes

Housing, Water, Electricity, Gas and Other Fuel
- Actual rental for housing
- Imputed rentals for housing
- Maintenance and repair for dwelling
- Water supply and miscellaneous services relating to the dwelling
- Electricity gas and other fuels

Furnishings, household equipment and routine maintenance of the house
- Furniture, furnishing, carpets and other floor coverings
- Household textile
- Household appliances
- Glassware, tableware and household utensils
- Tools and equipment for house and garden
- Goods and services for routing household maintenance
- Used furniture and household equipment

Table 1. Continued (main and sub-group categories of expenditures of food and non-food)

Health
- Medical products, appliances and equipment
- Out-patient services
- Hospital services

Transport
- Purchase of vehicles
- Operation of personal transport equipment
- Transport services

Communication

Recreation and culture
- Audio-visual, photographic and information processing equipment
- Other major durables for recreation and culture
- Other recreational items and equipment, gardens and pets
- Recreational and cultural services
- Newspapers, books, and stationary
- Package holidays
- Used durables for culture and recreation

Education

Restaurants and Hotels
- Ready meals
- Residence services

Miscellaneous goods and services
- Personal care
- Personal effects NEC
- Other services

Total actual consumption

Table 2. Economic and household demographic factors

Housing

i. Housing type
ii. Number of rooms
iii. Number of persons

Head of Household

iv. Age of household head
v. Marital status of household head
vi. Educational status of household head
vii. Employment status of household head
viii. Occupation of household head
ix. Economic activity of household head
x. Sector of household head

Urban-Rural Household Location

Male-Female Head of Household

Income Class

Table 3 Engel Curve model of animal products

		Urban		Rural		
		Expenditure		Expenditure		
Commodity	Year	Elasticity	R^2	Elasticity	R^2	Source
Red Meat and Poultry Meat	1958/59	1.07	0.99	0.77	0.87	IS, 73, 78
	1964/65	1.25	0.95	0.99	0.92	IS, 73, 78
	1974/75	1.03	0.97	0.98	0.98	IS, 73, 78
	1990/91	0.79	0.96	0.81	0.96	IS & Eid, 95a
Fish	1958/59	0.91	0.88	1.22	0.79	IS, 73, 78
	1964/65	0.92	0.96	1.03	0.88	IS, 73, 78
	1974/75	0.80	0.85	0.98	0.87	IS, 73, 78

Source: IS is Ibrahim Soliman.

Table 4a. Expenditure shares, 2004-2005 HIECS

Commodity	Urban		Rural		Egypt	
	Weighted	No Weight	Weighted	No Weight	Weighted	No Weightt
Bread and cereals	0.064	0.058	0.097	0.084	0.081	0.069
Meat fish and dairy	0.217	0.203	0.220	0.210	0.219	0.201
Other food	0.166	0.157	0.196	0.182	0.182	0.164
Non-food	0.552	0.580	0.487	0.524	0.518	0.566

Table 4b. Expenditure shares, 1999-2000 HIECS

Commodity	Urban		Rural	
	Weighted	No Weight	Weighted	No Weight
Bread-cereals	0.066	0.063	0.101	0.089
Meat-fish-dairy	0.200	0.188	0.208	0.191
Other food	0.166	0.171	0.196	0.185
Non-food	0.568	0.578	0.496	0.548

Table 5a. Urban Engel model estimates, 2004-2005 HIECS

Model	Weighted		Not Weighted	
	Coefficient	Std Error	Coefficient	Std Error
Bread and cereals				
R^2	0.887		0.894	
Intercept	0.235	0.014	0.209	0.012
Total expenditure	-0.018	0.002	-0.016	0.001
Meat fish and dairy				
R^2	0.742		0.861	
Intercept	0.492	0.038	0.561	0.034
Total expenditure	-0.029	0.004	-0.038	0.004
Other food				
R^2	0.970		0.974	
Intercept	0.577	0.017	0.548	0.015
Total expenditure	-0.044	0.002	-0.041	0.002

Table 5b. Urban Engel model estimates, 1999-2000 HIECS

Model	Weighted		Not Weighted	
	Coefficient	Std Error	Coefficient	Std Error
Bread and cereals				
R^2	0.477		0.754	
Intercept	0.315	0.063	0.268	0.029
Total expenditure	-0.027	0.007	-0.022	0.003
Meat fish and dairy				
R^2	0.656		0.821	
Intercept	0.496	0.052	0.534	0.040
Total expenditure	-0.032	0.006	-0.037	0.004
Other food				
R^2	0.693		0.942	
Intercept	0.580	0.067	0.670	0.030
Total expenditure	-0.045	0.007	-0.054	0.003

Table 6a. Rural Engel model estimates, 2004-2005 HIECS

Model	Weighted		Not Weighted	
	Coefficient	Std Error	Coefficient	Std Error
Bread and cereals				
R^2	0.251		0.623	
Intercept	0.172	0.031	0.232	0.028
Total expenditure	-0.008	0.003	-0.016	0.003
Meat fish and dairy				
R^2	0.078		0.643	
Intercept	0.249	0.024	0.378	0.031
Total expenditure	-0.003	0.003	-0.018	0.003
Other food				
R^2	0.960		0.946	
Intercept	0.479	0.014	0.505	0.019
Total expenditure	-0.031	0.002	-0.035	0.002

Table 6b. Rural Engel model estimates, 1999-2000 HIECS

Model	Weighted		Not Weighted	
	Coefficient	Std Error	Coefficient	Std Error
Bread and cereals				
R^2	0.975		0.966	
Intercept	0.469	0.014	0.411	0.015
Total expenditure	-0.051	0.002	-0.043	0.002
Meat fish and dairy				
R^2	0.577		0.845	
Intercept	0.422	0.044	0.599	0.043
Total expenditure	-0.029	0.006	-0.054	0.006
Other food				
R^2	0.741		0.838	
Intercept	0.763	0.081	0.910	0.078
Total expenditure	-0.078	0.011	-0.096	0.010

Table 7. Egypt Engel model estimates, 2004-2005 HIECS

Model	Weighted		Not Weighted	
	Coefficient	Std Error	Coefficient	Std Error
Bread and cereals				
R^2	0.732		0.814	
Intercept	0.283	0.029	0.260	0.022
Total expenditure	-0.022	0.003	-0.020	0.002
Meat fish and dairy				
R^2	0.479		0.792	
Intercept	0.380	0.040	0.520	0.039
Total expenditure	-0.018	0.004	-0.034	0.004
Other food				
R^2	0.949		0.969	
Intercept	0.582	0.022	0.581	0.018
Total expenditure	-0.044	0.002	-0.044	0.002

Table 8a. Income elasticity using 2004-2005 HIECS

	Urban		Rural		Egypt	
Commodity	Wt	No Wt	Wt	No Wt	Wt	No Wt
Bread-cereals	0.711	0.728	0.914	0.813	0.730	0.707
Meat-fish-dairy	0.864	0.814	0.985	0.914	0.920	0.832
Other food	0.734	0.736	0.840	0.810	0.760	0.732
Non-food	1.166	1.164	1.088	1.131	1.161	1.173

Table 8b. Income elasticity using 1999-2000 HIECS

Commodity	Urban		Rural	
	Weighted	No Weight	Weighted	No Weight
Bread-cereals	0.597	0.649	0.500	0.519
Meat-fish-dairy	0.841	0.800	0.859	0.718
Other food	0.732	0.686	0.601	0.482
Non-food	1.182	1.196	1.319	1.351

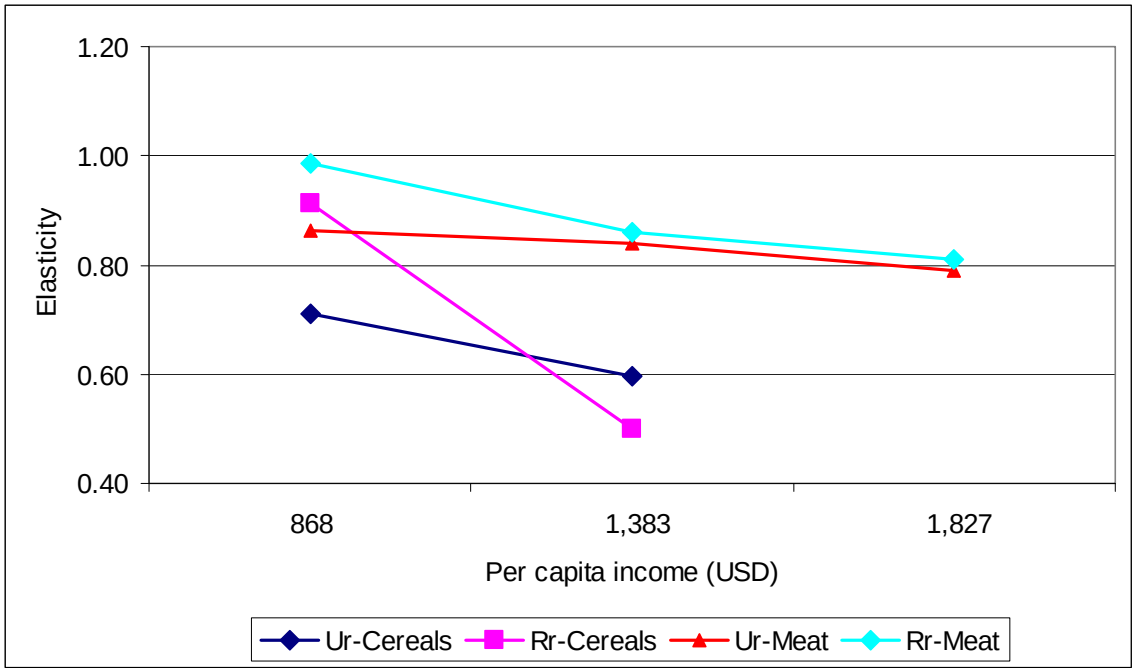

Figure 1. Per capita income and elasticity for cereals and meat in urban and rural households