

**An Analysis of Consumption
and Expenditures for Lithuanian
Households Using Budget Survey Data**

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The contents of this paper may be cited with proper credit to the author and to the Center for Agricultural and Rural Development, Iowa State University.

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ABSTRACT

Recent household budget survey data for Lithuania provide a profile of expenditure patterns for households by income level and living in either urban or rural areas. This paper provides an overview of expenditures and gives estimates of Engel functions and income elasticities for major expenditure groups and for food commodities. Food commodities are relatively important to households in both urban and rural areas and show relatively inelastic response to income levels. Based on an assumed reduction in income for 1991 of 41 percent, food shares are projected to increase by nearly 36 percent from 1989 levels. This is likely to be a lower bound for the anticipated changes.

AN ANALYSIS OF CONSUMPTION AND EXPENDITURES FOR LITHUANIAN HOUSEHOLDS USING BUDGET SURVEY DATA

This study analyzes household expenditure patterns in Lithuania, and predicts how these patterns may shift in view of recent economic reforms.

Lithuania is one of the three Baltic Republics. It is bordered by Poland on the south, Byelarus on the east, Latvia to the north, and the Baltic Sea on the west. In 1940, Lithuania became a republic of the Soviet Union, and at this time, its economic system became highly centralized, being planned and directed by republic and all-union officials and ministries from Moscow (Nove 1986, 53). In 1991 Lithuania regained its independence, and is currently engaged in reforming its political and economic systems. These reforms are likely to have significant economic and social impacts both in the country and elsewhere.

The rapid changes underway have led to new demands for data and information. This study provides some relevant data derived from published tables on Lithuanian consumer expenditures. The data are analyzed through the use of Engel functions to obtain estimates of consumption parameters. Engel function specification has been studied by many scholars and results from some of these studies are presented for comparison of the income parameters.

The data, from 1986 and 1989 household budget surveys, provide the position of Lithuanian households with respect to income, expenditure, size, and composition. This study employs standard econometric techniques to estimate Engel functions. The estimated parameters of the Engel functions are then used to obtain shifts expected in household expenditures to reforms initiated in 1990.

One of the objectives of this study is to make the budget survey data available in English to facilitate further analysis. In addition, the analysis of the data indicates the methods and use of data for better understanding of consumption patterns and application to the policy dialogue.

Profile of Income and Expenditure

The income and expenditure patterns of Lithuanian households are discussed in terms of relative comparisons of the observations on the variables by levels of household income, and urban or rural household location. Graphs and tables are used to depict the patterns.

Data Set Description

The data for this study come from two years of published data from national household budget surveys conducted in Lithuania. The surveys have been conducted periodically to establish baseline information on household budgets. The survey data for 1986 were published in Russian in a series of tables; the survey data for 1989 were a series of tables that were published in Lithuanian. The published survey tables were translated into English, and used in the analysis. Because the data used in this report come from published, aggregated tables, the data used here are referred to as “survey tables” when general reference is made; or “survey tables 1986” and “survey tables 1989” when more specific reference is required, with a page number included when referring to a specific table.

The surveys were conducted by the Central Statistical Department of Lithuania and centrally administered. Families were selected in order to obtain representation of the occupational and social strata in Lithuania. Surveyors were instructed to conduct bimonthly interviews with families as well as to gather information on salaries, payments-in-kind, and pensions from the household members’ place(s) of employment.

The purpose of the household budget survey was to provide data for analyzing the patterns of consumption and the level of well-being of people in different occupational, economic, and social groups (including size, composition, and physical location of household as well as the source and level of income). The survey tables summarize individual household observations on 313 variables covering family size and composition, family employment, income sources, expenditures, consumption, nutrient intake (the percentage of total calories and protein derived from animal products), retail prices, household inventory of food commodities, and holdings of land and livestock.

The survey tables, and those adapted from them, present the data by dividing the sample of households into seven groups according to household per capita monthly income. The variables used in this study are the mean values reported within each one of the seven income groups. The observations were further delineated by their designations as urban or rural since the tables report data for urban and rural households separately. This structure provided 28 observations for most of the variables: four household specifications (urban 1986, rural 1986, urban 1989, and rural 1989) reporting average values for seven income groups.

Income and expenditure levels for 1986 are not directly comparable with 1989 data because they are given in different units. The 1986 observations on income and expenditure are reported in average *per family per year*, and for 1989 in average *per capita per month*. In order to make the two comparable, all values for income and expenditure were converted into *per capita* units by dividing

the observations on family income and expenditure for 1986 by average family size; and, where appropriate, monthly data were converted to annual data by multiplying the monthly per capita observations by 12. The expenditure data and total income in units of per capita per year are the common units for analysis.

The 1989 survey tables report values for the seven income groups for urban and rural households, and an average value for "all families." These observations for all families are not available for the 1986 data. The 1989 values for all families appear in the tables presented here under the heading "All."

Income Groups and Population Distribution

Table 1 defines the income groups to which households were assigned according to income per capita per month. The ranges of the income groups differed slightly between the 1986 and 1989 classifications. For either year the income groups are referred to by category (I through VII), ranging from lowest to highest group.

The distribution of households over the income groups was not reported for 1986. It was reported for 1989 (Table 2) and the data indicate that for 1989 there was a relatively small portion of the population in the lowest income groups. Specifically, the lowest income group contained only 4.3 percent and 2.9 percent of urban and rural households. In contrast, the highest income group contained 31.5 percent and 40.7 percent of urban and rural households. Throughout this study comparisons are made across these income groups, so it should be remembered that these groupings do not divide the population into groups containing an equal share of the total households sampled.

A weakness of the published survey tables is that they do not provide the total number of households in each income group, nor the total number of households in the sample, nor the sampling design. The data on the total number of urban and rural families in Lithuania for 1989 (Table 2) were obtained directly from government census estimates by Natalie Kazlauskiene, lead scientist and head of the Research Group, Lithuanian Institute of Agrarian Economics.

Family Employment and Income

Family Employment. Table 3 provides data that describe the employment status of family members in Lithuanian households for 1989. The budget survey and Table 3 categorize family members according to their employment status as: working, working pensioners, nonworking pensioners, students, and other. "Working pensioners" is a subset of "working." The other

categories are mutually exclusive. Initial inspection of these data indicates that the level of income is positively associated with "working pensioners," and negatively associated with other. In 1989, the average per capita income for both urban and rural households rose steadily with the average number of working pensioners per family. On the other hand, the number of persons in the "other" category declined noticeably as per capita income rose. This is consistent with the fact that the family members classified as "other" are, most likely, children and nonworking adults.

The survey data also indicate that a substantially higher percentage of people collected pensions in rural households than in urban households. This can be seen in the final column of Table 3 as the sum of the amount for working pensioners and the amount for nonworking pensioners. The average number of those collecting a pension in urban households is .25; the average number of people per rural household collecting a pension is .73. As a result, only 9 percent of total family members in urban households received a pension, while 25 percent of total family members in rural households received a pension.

Family Income. Tables 4 and 5 show a breakdown of average family income with respect to its sources for 1986 and 1989. The sources of income for which data are reported are: (1) salaries of urban workers, (2) salaries of rural workers, (3) pensions/stipends/grants, (4) income from individual plots, and (5) other sources. Tables 4 and 5 list data on income per family, and show that the level of total family income was higher for rural families. For 1989, average total income for "all" rural households is 7544.5 rubles per year and the average total income for "all" urban households was 6482.3 rubles per year (Table 5). Adjusting for household size brings the values for urban and rural income closer together. Dividing total family income values in Table 5 by the average family size from Table 3 yields a per capita income level for "all" rural families of 2619.6 rubles per year, and a per capita income level for urban families at 2383.2 rubles per year.

Figure 1, created from the data in the first column of Table 5, shows differences in the sources of income between urban and rural families for 1989. One difference was the amount of income generated from individual plots, which was, as expected, much greater for rural households, and accounted for nearly 39 percent of total income on average. This compares with approximately 6 percent for urban households. Urban families, however, received 76.2 percent of total income in the form of salaries, while salaries made up only 49 percent of total income for rural households. Urban households also received a relatively larger percentage of their income from "other sources" (9.9 percent) than did rural households (2 percent).

Expenditure Profile. The data set from the budget survey tables gives a detailed description of household spending patterns in Lithuania. This section presents the expenditure patterns across income groups. The breakdown of total expenditure into expenditure groups and comparison of the levels and shares of these groups for urban households with those of rural households is followed by a description of the composition of each expenditure group.

Expenditure Level. Tables 6 and 7 reproduce data available in the two surveys. These data were converted to the standard average per capita per year basis and are reported in Tables 8 and 9.

Tables 8 and 9 present the initial breakdown of total expenditures for these mutually exclusive groups: food, nonfood, alcoholic beverages, services, taxes-duties-payments, income, other expenditures, and savings (the 1989 survey data combined income with other expenditures). The nonfood expenditure group is not an expenditure classification referring to all items other than food, but is rather one of the eight mutually exclusive expenditure groups. Consumer durables (such as household furniture, appliances, and vehicles), cultural and recreation items, tobacco, fuel, clothing, and medicines comprise the nonfood group.

The nominal level of total expenditures for 1989 is higher than that for 1986 (Tables 8 and 9) for both urban and rural households and across all income groups. The increase in expenditures may come from an increase in prices, an increase in the quantity purchased, or an increase in both. The survey data provide price information for some food commodities, and indicate that these prices were higher in 1989. This would account for some of the increase in expenditures for food commodities. Prices were not available for any other expenditure items.

Expenditure Shares. The relative importance or share of each expenditure group in total expenditures is presented in Tables 10 through 13. The groupings correspond directly to categories of the budget surveys. In general, the share for food was greater than all other expenditure shares in the lowest three to four income groups. The nonfood expenditure share was typically higher than the other expenditure groups for income groups V, VI, and VII. Across all income groups, nonfood expenditures were consistently about 30 percent of total expenditures. The share of expenditures allocated to savings was especially large for rural households (Tables 11 and 13).

The data indicate that urban households, in general, spent a greater share of total income on services and taxes-duties-payments than did rural households. However, other expenditure shares seem to be greater for rural households. Expenditure patterns across the seven income groups shows that there was a steady decline in food expenditure shares as average income increased (Tables 10 through 13). Expenditure shares on the other and savings categories increased with income level.

Nonfood, services, alcoholic beverages, and taxes did not show any noticeable trend across income groups.

Figures 2 and 3 show the shares of five expenditure groups for urban and rural households for 1989. In these figures, food expenditures and savings are unchanged from the data in Tables 12 and 13; however, nonfood and services are different: in the figures, nonfood includes the share for alcoholic beverages, and the separate category for housing was obtained from components of services related to housing (expenditures for dwelling and public utilities and those for dwelling maintenance and construction; see Table 16). Services less housing includes the shares for both taxes-duties-payments and other, less the expenditure for housing, as a share of total expenditures.

Figures 2 and 3 depict patterns of expenditure shares for 1989 across income groups similar to those mentioned above: (1) the food expenditure share declined as income level increased; (2) the nonfood share remained fairly constant; (3) the share of housing and utility payments remained consistently below 5 percent of total expenditures across all income groups; (4) the group labeled services less housing and taxes, which also contains other expenditures, increased steadily but only slightly; and (5) the savings share by rural households was very high.

Food. Food expenditures as a percentage of total expenditures in 1989 urban households ranged from 46.6 percent in income group I to 23.4 percent in group VII, with an average of 29.4 percent (Table 12). For rural households the range was from 41 percent to 20 percent with an average of 24.8 percent (Table 13). Table 14 shows the composition of total per capita food expenditures by dividing total per capita food expenditure into 11 food commodity groups. The table also shows the share that each of the 11 food groups has in total food expenditures for each income group. There was little noticeable shift in shares from one food group to another across income groups.

Figure 4 is a representation of the data given in the final column of Table 14, and shows that there was little difference in shares of food commodities between urban and rural households. Meat and meat products represented the largest food expenditure share within total food (Figure 4). Meat products claimed nearly one-third of total food expenditures across all income groups (Table 14). Other important items in total food expenditures were milk and related products (approximately 15 percent), fruit and berries (10 percent), and sugar-confectionery-honey (10 percent).

Nonfood. The nonfood expenditure group, as already noted, is an expenditure category comprising clothing, household appliances, vehicles, and articles for education and leisure. It is completely separate from all other expenditure groups. As noted in Table 9, the level of this expenditure group in total expenditures was greater than all other groups for urban households in the

three highest income groups, and was similarly significant in the expenditures of rural households. As a share of total expenditures nonfood remained fairly constant, about one-third across income groups for urban households (Table 12), and approximately one-fourth of total expenditures for rural households (Table 13).

Table 15 provides the composition of nonfood expenditures for both urban and rural households in 1989. This table was derived from the 1989 survey tables (Lithuanian Central Department of Statistics 1989). The data indicate that expenditures for apparel (clothes, knitted wear, and shoes) had by far the highest budget share within total nonfood. Other important items within nonfood for 1989 from Table 15 were household furnishings (curtains and furniture), recreation, and vehicles (cars, motorcycles, and bicycles).

Alcoholic Beverages. The expenditure share for alcohol remained fairly consistent across all income groups. For rural households, the share of alcohol ranged from 5.5 percent to 7.3 percent of total expenditures (Table 13), slightly higher than the urban share, which ranged from 3.4 percent to 4.9 percent (Table 12).

Services. Per capita 1989 expenditures on services also remained fairly consistent across income groups; however, there were location differences (Table 16). Expenditure levels for services were lower for rural households. The share of total budget of urban households for services was 9.4 percent on average (Table 12); rural households allocated only 4.8 percent of total budget to services (Table 13).

Total expenditures on services in 1989 and the items that comprise this category are listed in Table 16 for urban and rural households and all income groups. The most significant items within the total service expenditure group were dwelling and public utility payments and transportation. Most of the other items within this group are related to education, recreation, repair, and maintenance.

Savings. Both the level and the share of savings as part of household expenditures are noteworthy. Savings were reported by households with no indication what types of savings these were. The savings shares are shown in Tables 10 and 11 for 1986, 12 and 13 for 1989, and in Figures 2 and 3.

In 1986 the share of savings was at its highest in income group VII, at 13.2 percent of total expenditures for urban households and 24.2 percent for rural households. Urban households in income group VII in 1989 allocated 11.2 percent of total expenditures to savings. The overall average savings share for urban households in 1989 was 8.4 percent (Table 12). For 1989 rural

households, however, the reported savings shares were very high. The lowest income group saved 21.2 percent, the highest income group's share was 32.0 percent, and the overall average was 27.5 percent.

Household Size and Composition

There are several observations to note related to household size and composition in the classification of data for 1986 and 1989. As described earlier, the seven income groups are defined on the basis of per capita household income. One obvious and expected relationship is that families with higher incomes per capita were smaller and had fewer children. The figures reported in Table 17 indicate that average family size decreased as average per capita income increased.

Based on the data in Table 17 it is possible to calculate the percentage of total family members that are pension-age, adult, or children. Pension-age was defined as women over 55 and men over 60; adults were those age 16 to 54; and children were under 16. Figure 5 depicts how family composition changed with respect to the level of per capita income. The data in Table 17 and Figure 5 indicate (1) that the percentage of pension-age family members increased for both urban and rural families as income rose, but the relationship was more pronounced in rural families; (2) the number of children as a percentage of total family members declined significantly with income for both urban and rural families; and (3) the percentage of adults in the family increased for urban families but remained fairly constant across income groups for rural families.

Table 18 shows the average number of children, adults, and pension-age people for all urban and all rural families. It is apparent (Figures 5 and 6) that there was a substantially higher proportion of pension-age persons in rural households.

Table 1. Income groups, Lithuania 1986 and 1989

Income Groups	Income Ranges	
	1986	1989
rubles per capita per month		
I	less than 75	less than 100
II	75 - 100	100 - 125
III	100 - 125	125 - 150
IV	125 - 150	150 - 175
V	150 - 175	175 - 200
VI	175 - 200	200 - 250
VII	greater than 200	greater than 250

Table 2. Distribution of households, Lithuania 1989

Income Group	Urban		Rural	
	Number	Percent ^a	Number	Percent ^a
Total	670,805 ^b	100.0	329,197 ^b	100.0
I		4.3		2.9
II		7.0		5.7
III		10.9		11.3
IV		11.9		9.3
V		11.5		11.1
VI		22.9		19.0
VII		31.5		40.7

^a All percentages are taken from the 1989 survey tables (Lithuanian Central Department of Statistics 1989)

^b Personal communication with Natalia Kazlauskienė 1991.

Table 3. Employment status of family members, Lithuania 1989

Employment Status	Income Groups							
	I	II	III	IV	V	VI	VII	All
Urban								
Total in Family	3.92	3.57	3.31	3.31	3.10	2.56	1.86	2.72
Working	1.59	1.72	1.67	1.80	1.82	1.74	1.54	1.68
Working Pensioners*	(.02)	(.05)	(.04)	(.05)	(.09)	(.15)	(.27)	(.14)
Nonworking Pensioners	.07	.01	.04	.06	.02	.03	.01	.03
Student	.03	.01	.04	.06	.02	.03	.01	.03
Other	2.23	1.70	1.45	1.33	1.18	.62	.25	.90
Rural								
Total in Family	4.35	4.60	3.97	3.65	3.28	2.55	2.08	2.88
Working	1.57	1.77	1.73	1.78	1.70	1.60	1.64	1.67
Working Pensioners*	(.09)	(.18)	(.31)	(.37)	(.42)	(.53)	(.64)	(.48)
Nonworking Pensioners	.18	.46	.32	.54	.19	.24	.16	.25
Students		.01	.01	.01	.05	.03	.01	.01
Other	2.60	2.36	1.91	.132	1.34	.68	.27	.95

SOURCE: Lithuanian Central Department of Statistics, 1989.

* Working Pensioners are included in Working.

Table 4. Average annual family income by source, Lithuania 1986

Income Source	Income Groups						
	I	II	III	IV	V	VI	VII
(rubles)							
Urban							
Total Income	2592.9	4103.8	5185.8	5597.2	5515.7	5898.6	5898.6
Salaries of Urban Workers	1357.5	3023.5	3923.5	4382.5	4382.5	4251.9	4191.9
Salaries of Rural Workers on Collective Farms	.	.	3.3	0.4	4.4	8.3	2.3
Pensions/Stipends/Grants	382.4	423.6	316.8	474.4	504.5	809.9	758.3
From Individual Plots	89.0	230.8	367.1	330.4	345.5	589.1	578.1
Other Sources	764.0	425.9	514.0	409.5	261.3	239.4	338.9
Rural							
Total Income	4134.6	5070.3	5391.0	6497.7	6294.7	5831.3	6939.6
Salaries of Urban Workers	84.0	96.5	233.1	479.1	240.4	188.9	141.2
Salaries of Rural Workers on Collective Farms	1930.5	2335.7	2428.9	3036.9	3097.2	2697.7	2991.4
Pensions/Stipends/Grants	293.4	634.5	527.6	688.6	508.7	641.0	855.8
From Individual Plots	1673.9	1801.9	2048.6	2147.4	2167.8	2192.3	2762.8
Other Sources	152.8	201.7	152.8	146.0	280.6	111.4	188.5

SOURCE: Lithuanian Central Department of Statistics 1986, 16 and 17.

Table 5. Average annual family income by source, Lithuania 1989

Income Source	Income Groups							
	All	I	II	III	IV	V	VI	VII
(rubles)								
Urban								
Total Income	6482.3	3981.1	4895.0	5389.5	6379.1	6989.3	6827.9	7283.5
Salaries of Urban Workers	4921.7	2852.7	3793.7	4152.5	4980.7	5458.8	5209.2	5316.6
Salaries of Rural Workers on Collective Farms	21.6	10.2	15.0	1.5	44.5	46.9	6.5	30.3
Pensions/Stipends/Grants	525.0	329.2	323.1	423.1	475.3	479.5	581.7	617.7
From Individual Plots	372.8	166.4	185.8	235.1	346.5	458.5	442.6	387.6
Other Sources	641.2	622.6	577.4	577.3	532.1	545.6	587.9	931.3
Rural								
Total Income	7544.5	4665.7	6343.4	6580.7	7161.6	7417.3	6874.9	8630.6
Salaries of Urban Workers	239.0	15.9	116.3	325.8	598.4	165.3	246.3	189.4
Salaries of Rural Workers on Collective Farms	3457.8	2550.9	3201.3	3234.6	2926.5	3674.0	2907.2	3833.4
Pensions/Stipends/Grants	775.6	378.3	563.6	554.1	820.8	708.3		.25
From Individual Plots		.01	.01	.01	.05	.03	.01	.01
Other Sources	2.60	2.36	1.91	.132	1.34	.68	.27	.95

SOURCE: Lithuanian Central Department of Statistics 1986, 18 and 19.

Table 6. Average annual family household expenditures, Lithuania 1986

Expenditure Groups	Income Groups						
	I	II	III	IV	V	VI	VII
(rubles)							
Urban							
Total Expenditures/Income	2592.9	4103.8	5185.8	5597.2	5515.7	5898.6	5898.5
Food	1357.8	1896.8	1992.9	1967.6	1807.9	1714.7	1577.4
Nonfood	735.2	1517.8	1558.6	2038.8	1674.1	1851.6	1765.5
Alcoholic Beverages	135.8	232.6	200.2	206.4	293.9	221.9	224.2
Services	353.7	471.3	482.7	517.0	469.1	593.6	471.4
Taxes/Duties/Payments	109.9	329.8	468.2	533.7	522.3	521.2	543.1
Unaccounted for Income	5.4	32.7	20.2	15.4	28.3	19.3	27.2
Other	70.0	160.0	172.0	215.3	233.7	315.9	486.7
Savings	-144.9	-537.2	291.0	103.0	556.4	660.4	774.0
Rural							
Total Expenditures/Income	4134.6	5070.3	5391.0	6497.7	6294.7	5831.3	6939.6
Food	1925.8	2048.5	1875.5	2045.6	1797.6	1525.2	1561.3
Nonfood	1636.5	1358.3	1722.5	1782.0	2051.3	1854.9	1620.2
Alcoholic Beverages	207.4	221.2	281.1	337.5	356.2	254.7	339.1
Services	161.6	184.2	264.4	318.9	421.4	313.8	340.1
Taxes/Duties/Payments	34.2	47.3	70.8	129.8	76.2	61.6	65.0
Unaccounted for Income	184.4	35.3	34.3	25.0	30.9	83.6	41.2
Other	266.6	391.4	512.0	398.2	694.2	900.8	1291.4
Savings	-281.9	784.2	630.4	1460.7	866.9	836.7	1681.3

SOURCE: Lithuanian Central Department of Statistics 1986, 20 and 21.

Table 7. Average monthly per capita household expenditures, Lithuania 1989

Expenditure Groups	Income Groups							
	I	II	III	IV	V	VI	VII	All
(rubles)								
Urban								
Total Expenditure/Income	84.5	114.3	135.9	160.8	188.1	222.1	325.8	198.5
Food	39.4	45.4	49.6	52.8	56.6	63.0	76.2	58.4
Nonfood	26.6	41.3	42.3	52.7	60.4	76.0	121.1	68.6
Alcoholic Beverages	4.1	4.4	4.6	6.6	7.6	9.2	11.0	7.6
Services	8.6	10.9	15.1	16.2	18.4	18.9	27.9	18.6
Taxes/Duties/Payments	6.6	10.6	12.5	15.9	18.5	21.7	32.6	19.4
Other	2.4	3.8	5.1	5.6	8.1	13.6	20.5	9.1
Savings	-3.2	-2.1	6.7	11.0	18.5	19.7	36.5	16.8
Rural								
Total	89.3	115.0	138.1	163.6	188.6	224.6	346.4	218.2
Food	37.3	40.1	44.2	48.1	48.0	57.6	69.5	54.1
Nonfood	18.9	37.3	37.0	48.5	46.2	60.1	73.7	53.9
Alcoholic Beverages	5.2	8.4	7.6	10.5	10.9	14.6	18.7	12.7
Services	3.8	6.0	5.9	8.3	10.1	12.0	14.9	10.4
Taxes/Duties/Payments	0.6	1.5	1.7	2.5	1.9	2.3	3.4	2.3
Other	4.7	10.4	12.0	16.5	17.5	26.6	55.3	24.9
Savings	18.8	11.3	29.7	29.2	54.0	51.4	110.9	59.9

SOURCE: Lithuanian Central Department Statistics 1989.

Note: Table replicated from 1986 survey (urban p. 20; rural p. 21).

Table 8. Average annual per capita household expenditures, Lithuania 1986

Expenditure Groups	Income Groups						
	I	II	III	IV	V	VI	VII
(rubles)							
Urban							
Total Expenditures/Income	747.2	1106.1	1364.7	1641.4	1942.1	2251.4	3105.6
Food	382.7	511.3	524.4	577.0	636.6	654.5	834.6
Nonfood	211.9	409.1	410.2	597.9	589.5	706.7	934.1
Alcoholic Beverages	39.1	62.7	52.7	60.5	103.5	84.7	118.6
Services	101.9	127.0	127.0	151.6	165.2	226.6	249.4
Taxes/Duties/Payments	31.7	88.9	123.2	156.5	183.9	198.9	287.4
Income Unaccounted for	1.6	8.8	5.3	4.5	10.0	7.4	14.4
Other	20.2	43.1	45.3	63.1	82.3	120.6	257.5
Savings	-41.8	-144.8	76.6	30.2	195.9	252.1	409.5
Rural							
Total	760.0	1067.4	1337.7	1657.6	1936.8	2242.8	3304.6
Food	354.0	431.3	465.4	521.8	553.1	586.6	743.5
Nonfood	300.8	286.0	427.4	454.6	631.2	713.4	771.5
Alcoholic Beverages	38.1	46.6	69.8	86.1	109.6	98.0	161.5
Services	29.7	38.8	65.6	81.4	129.7	120.7	162.0
Taxes/Duties/Payments	6.3	10.0	17.6	33.1	23.4	23.7	31.0
Income Unaccounted for	33.9	7.4	8.5	6.4	9.5	32.2	19.6
Other	49.0	82.4	127.0	101.6	213.6	346.5	615.0
Savings	-51.8	165.1	156.4	372.6	266.7	321.8	800.6

SOURCE: Lithuanian Central Department of Statistics 1986.

Table 9. Household expenditures, Lithuania 1989

Expenditure Groups	Income Groups							
	I	II	III	IV	V	VI	VII	All
(rubles)								
Urban								
Total Expenditure/Income	1014.0	1371.6	1630.8	1929.6	2257.2	2665.2	3909.6	2382.0
Food	472.8	544.8	595.2	633.6	679.2	756.0	914.4	700.8
Nonfood	319.2	495.6	507.6	632.4	724.8	912.0	1453.2	823.2
Alcoholic Beverages	49.2	52.8	55.2	79.2	91.2	110.4	132.0	91.2
Services	103.2	130.8	181.2	194.4	220.8	226.8	334.8	223.2
Taxes/Duties/Payments	79.2	127.2	150.0	190.8	222.0	260.4	391.2	232.8
Other	28.8	45.6	61.2	67.2	97.2	163.2	246.0	109.2
Savings	-38.4	-25.2	80.4	132.0	222.0	236.4	438.0	201.6
Rural								
Total	1071.6	1380.0	1657.2	1963.2	2263.2	2695.2	4156.8	2618.4
Food	447.6	481.2	530.4	577.2	576.0	691.2	834.0	649.2
Nonfood	226.8	447.6	444.0	582.0	554.4	721.2	884.4	646.8
Alcoholic Beverages	62.4	100.8	91.2	126.0	130.8	175.2	224.4	152.4
Services	45.6	72.0	70.8	99.6	121.2	144.0	178.8	124.8
Taxes/Duties/Payments	7.2	18.0	20.4	30.0	22.8	27.6	40.8	27.6
Other	56.4	124.8	144.0	198.0	210.0	319.2	663.6	298.8
Savings	225.6	135.6	356.4	350.4	648.0	616.8	1330.8	718.8

SOURCE: Lithuanian Central Department Statistics 1989.

Note: Table adapted from 1989 survey (urban p. 28; rural p. 29) as described in text.

Table 10. Budget share for household expenditures, urban 1986

Expenditure Group	Income Groups						
	I	II	III	IV	V	VI	VII
(percent)							
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food	51.2	46.2	38.4	35.2	32.8	29.1	26.9
Nonfood	28.4	37.0	30.1	36.4	30.4	31.4	30.1
Alcoholic Beverages	5.2	5.7	3.9	3.7	5.3	3.8	3.8
Services	13.6	11.5	9.3	9.2	8.5	10.1	8.0
Taxes-Duties	4.2	8.0	9.0	9.5	9.5	8.8	9.3
Other	2.9	4.7	3.7	4.1	4.7	5.7	8.8
Savings	-5.6	-13.1	5.6	1.8	10.1	11.2	13.2

Note: Adapted from Table 8.

Table 11. Budget share for household expenditures, rural 1986

Expenditure Group	Income Groups						
	I	II	III	IV	V	VI	VII
(percent)							
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food	46.6	40.4	34.8	31.5	28.6	26.2	22.5
Nonfood	39.6	26.8	32.0	27.4	32.6	31.8	23.3
Alcoholic Beverages	5.0	4.4	5.2	5.2	5.7	4.4	4.9
Services	3.9	3.6	4.9	4.9	6.7	5.4	4.9
Taxes-Duties	0.8	0.9	1.3	2.0	1.2	1.1	.9
Other	10.9	8.4	10.1	6.5	11.5	16.8	19.2
Savings	-6.8	15.5	11.7	22.5	13.8	14.3	24.2

Note: Adapted from Table 8.

Table 12. Budget shares for per capita expenditures, urban 1989

Expenditure Group	Income Groups							
	I	II	III	IV	V	VI	VII	All
(percent)								
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food	46.6	39.7	36.5	32.8	30.1	28.4	23.4	29.4
Nonfood	31.5	36.1	31.1	32.8	32.1	34.2	37.2	34.6
Alcoholic Beverages	4.9	3.8	3.4	4.1	4.0	4.1	3.4	3.8
Services	10.2	9.5	11.1	10.1	9.8	8.5	8.6	9.4
Taxes-Duties	7.8	9.3	9.2	9.9	9.8	9.8	10.1	9.8
Other	2.8	3.3	3.8	3.5	4.3	6.1	6.3	4.6
Savings	-3.8	-1.8	4.9	6.8	9.8	8.9	11.2	8.4

Table 13. Budget shares for rural household expenditures, 1989

Expenditure Group	Income Groups							
	I	II	III	IV	V	VI	VII	All
(percent)								
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Food	41.8	34.9	32.0	29.4	25.5	25.6	20.1	24.8
Nonfood	21.2	32.4	26.8	29.6	24.5	26.8	21.3	24.7
Alcoholic Beverages	5.8	7.3	5.5	6.4	5.8	6.5	5.4	5.8
Services	4.3	5.2	4.3	5.1	5.4	5.3	4.3	4.8
Taxes-Duties	0.7	1.3	1.2	1.5	1.0	1.0	1.0	1.1
Other	5.3	9.0	8.7	10.1	9.3	11.8	16.0	11.4
Savings	21.1	9.8	21.5	17.8	28.6	22.9	32.0	27.5

Table 14. Distribution of food expenditures, Lithuania 1989

Food Commodity	Income Groups						
	I	II	III	IV	V	VI	All
Urban							
Total Food Expenditure (rubles, average per capita per year)	472.5	544.7	594.9	633.5	678.6	835.0	700.4
(percentage of total food expenditure)							
Bread Products	6.9	6.2	6.0	5.3	5.3	5.0	5.4
Potatoes	2.9	2.9	2.8	2.5	2.6	2.5	2.6
Vegetables	7.0	6.8	7.0	7.4	7.4	7.5	7.4
Fruit/Berries	9.2	9.2	10.4	9.6	10.4	10.3	10.1
Meat/Meat Products	32.7	33.8	33.2	35.2	33.7	33.9	33.8
Milk/Milk Products	16.4	16.1	15.9	14.5	14.2	14.1	14.6
Eggs	3.6	3.4	3.4	3.4	3.3	3.0	3.2
Fish/Fish Products	2.7	2.7	2.9	2.9	2.9	2.7	2.8
Sugar/Confectionery/Honey	10.7	9.9	10.1	9.9	10.6	10.4	10.3
Vegetable Oil/Margarine/Other Fats	1.1	1.2	1.1	1.2	1.1	1.1	1.1
Other Food	6.6	7.8	7.2	8.1	8.5	9.5	8.7
Rural							
Total Food Expenditure	447.9	482.0	530.1	577.2	576.2	782.0	649.0
(percentage of total food expenditure)							
Bread Products	7.2	7.3	7.3	6.3	6.3	6.2	6.5
Potatoes	4.2	4.1	4.3	3.7	4.3	3.7	3.9
Vegetables	6.6	6.1	6.2	6.6	6.5	6.5	6.4
Fruit/Berries	10.1	8.8	10.2	9.1	9.3	11.1	10.4
Meat/Meat Products	33.7	34.4	33.1	34.8	35.5	34.9	34.7
Milk/Milk Products	16.0	16.7	16.7	16.0	15.9	15.2	15.7
Eggs	4.0	3.5	4.4	4.1	4.7	4.3	4.3
Fish/Fish Products	3.0	3.1	2.5	3.2	2.3	2.5	2.6
Sugar/Confectionery/Honey	9.2	10.5	9.5	9.6	9.2	9.3	9.4
Vegetable Oil/Margarine/Other Fats	0.8	0.8	0.9	0.8	0.7	0.7	0.4
Other Foods	5.2	4.7	4.9	5.8	5.3	5.6	5.4

Table 15. Nonfood average annual per family expenditures, Lithuania 1989

Nonfood Expenditures	Income Groups							
	I	II	III	IV	V	VI	VII	All
Urban					rubles			
Total Nonfood Expenditure	1209.7	1730.7	1642.6	2050.3	2193.3	2286.0	2660.9	2194.7
Cloth	34.4	35.1	47.6	49.5	73.0	79.9	82.0	67.6
Clothes	224.2	367.1	379.9	448.5	485.9	488.4	466.6	444.3
Knitted Wear	184.0	197.5	199.9	220.1	246.8	233.5	223.9	224.7
Shoes	149.2	176.2	194.3	204.6	218.8	214.3	222.7	209.4
Curtains	57.4	65.9	78.0	99.8	93.4	130.1	129.2	108.3
Furniture/Household	126.5	162.1	154.2	300.5	178.5	295.7	263.1	237.9
Cultural Needs/Recreation	126.8	144.9	180.0	218.1	233.3	259.7	236.6	223.0
Cars/Motorcycles/Bicycles	29.8	306.2	60.2	139.2	156.1	163.0	618.5	277.6
Tobacco Products	36.1	38.8	37.4	39.0	49.2	43.7	35.5	40.7
Building Materials	23.0	6.6	42.4	27.2	92.8	43.2	69.1	52.3
Fuel	4.2	3.7	8.3	6.1	5.5	5.4	3.8	6.0
Medicine/Sanitary/Hygiene	87.5	92.7	111.9	126.8	129.4	125.1	130.3	122.6
Rural								
Total Nonfood Expenditure	956.2	2013.7	1726.5	2086.0	1791.1	1802.3	1796.26	1826.7
Cloth	12.4	63.4	70.7	55.6	60.5	73.2	0.7	62.8
Clothes	260.6	449.6	403.4	400.3	386.5	358.9	409.0	392.8
Knitted Wear	153.0	215.5	220.4	186.4	198.5	161.8	143.9	171.2
Shoes	181.7	230.5	220.3	165.7	166.5	175.6	156.3	174.1
Curtains	26.7	49.4	66.7	53.8	62.9	55.9	61.5	59.0
Furniture/Household	83.0	156.0	194.7	268.1	296.5	244.5	186.5	219.0
Cultural Needs/Recreation	47.2	151.5	123.8	101.5	151.1	128.8	121.6	123.6
Cars/Motorcycles/Bicycles	2.0	351.5	113.5	472.7	154.2	265.6	277.2	272.2
Tobacco Products	48.9	35.2	45.8	38.4	45.8	33.4	31.9	36.5
Building Materials	8.6	25.4	47.3	28.2	14.7	70.5	89.4	61.3
Fuel	29.2	62.2	33.7	64.2	69.5	53.2	51.6	53.5
Medicine/Sanitary/Hygiene	56.6	104.3	98.6	103.5	76.0	78.8	78.2	83.9

Note: Table replicated from 1989 survey (urban p. 42; rural p. 43).

Table 16. Average service expenditures per family per year, Lithuania 1989

Services	Income Groups						
	I	II	III	IV	V	VI	All
Urban	(rubles)						
Total Services	440.7	499.2	637.8	680.7	727.8	651.2	647.9
Baths/Laundry	31.0	34.9	34.3	36.5	41.9	34.7	35.5
Dwelling Maintenance/Construction	13.9	7.6	13.5	21.7	57.4	28.2	28.2
Clothes/Shoes	29.2	20.7	30.4	27.8	33.7	35.9	32.9
Repair of HH Items/Furniture	5.4	13.4	6.2	10.8	11.3	9.1	9.5
Children Institutions	56.7	96.0	120.2	117.6	101.1	36.7	68.7
Accommodation in Holiday Houses, Sanitarium, etc.	3.0	17.5	23.0	23.7	33.4	34.2	29.3
Cinema, Theaters, Other Cultural	26.1	46.5	47.1	53.0	56.7	54.5	52.0
Transportation	75.9	81.8	95.2	147.8	117.0	142.4	129.4
Postal	28.4	23.1	41.8	39.3	35.5	37.2	36.7
Dwelling/Public Utility Payments	156.4	141.5	174.7	162.4	171.8	154.2	158.6
Other Services	14.7	16.2	51.4	40.1	68.0	84.1	67.1
Rural							
Total Services	210.7	366.4	298.4	390.4	420.2	394.0	382.3
Baths/Laundry	10.0	13.4	7.9	13.2	11.8	10.9	11.1
Dwelling Maintenance/Construction	0.9	0.6	8.6	8.3	47.3	32.8	27.3
Clothes/Shoes	7.5	21.0	11.2	17.9	15.3	16.2	15.9
Repair of HH Items/Furniture	7.3	16.7	5.7	7.0	7.4	7.5	7.6
Children Institutions	.	26.2	11.9	21.6	95.8	22.7	32.7
Accommodation in Holiday Houses, Sanitarium, etc.	.	8.2	22.7	.	.	1.4	3.8
Cinema, Theaters, Other Cultural	15.7	19.8	18.0	12.3	18.4	10.9	13.2
Transportation	62.1	77.4	70.3	71.6	63.2	53.5	59.2
Postal	1.8	14.8	12.5	15.1	15.5	24.0	19.6
Dwelling/Public Utility Payments	86.4	102.4	84.6	87.3	85.7	76.3	81.8
Other Services	19.0	65.9	45.0	136.1	59.8	137.8	110.1

Table 17. Family size and composition across income groups, Lithuania 1989

Category	Income Groups							
	I	II	III	IV	V	VI	VII	All
Urban	average per 100 families							
Total	272	392	357	331	331	310	256	186
Children < 7	29	65	60	39	45	36	22	6
Children 7-8	10	26	20	18	16	8	6	2
Children 9-15	36	102	80	66	54	44	22	11
Men 16-54	78	85	84	85	94	92	82	58
Women 16-54	99	111	111	107	110	114	101	83
Men 60+	5	0	0	3	1	5	8	7
Women 55+	15	3	12	14	11	11	15	20
Rural								
Total	288	435	460	397	365	328	255	208
Children < 7	27	143	81	24	56	37	18	4
Children 7-8	7	14	11	18	16	11	5	2
Children 9-15	43	54	126	120	56	60	21	13
Men 16-54	80	116	106	105	83	89	75	65
Women 16-54	71	99	113	91	85	86	64	50
Men 60+	19	0	9	7	26	16	25	22
Women 55+	41	9	14	32	43	29	47	52

Table 18. Composition of Lithuanian households, urban and rural 1989

Type	Urban	Rural
	(average per family)	(average per family)
Children	.75	.77
Adults	1.77	1.51
Pension-age	.20	.60
Total	2.72	2.80

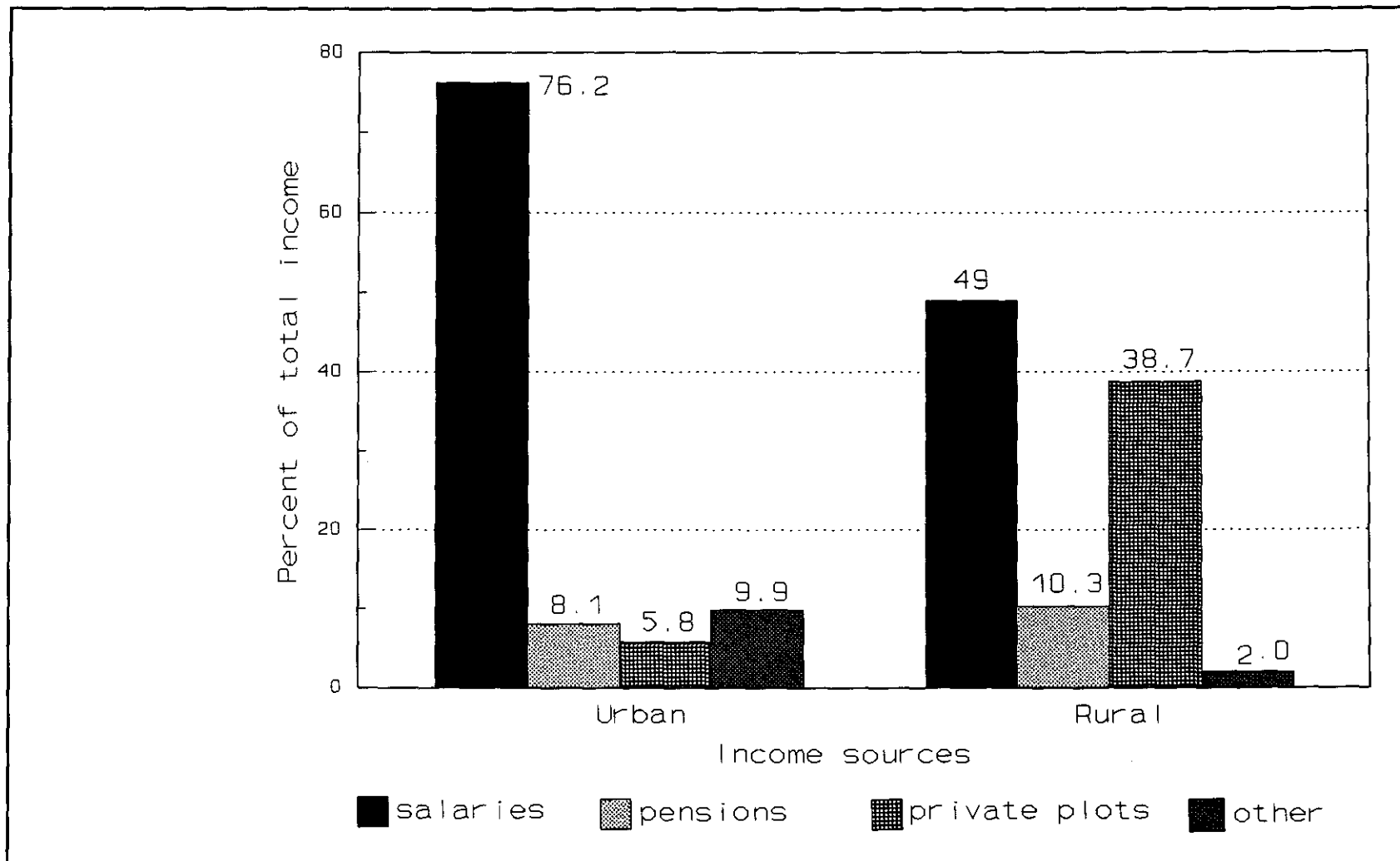


Figure 1. Distribution of income by source, 1989, average per family per year

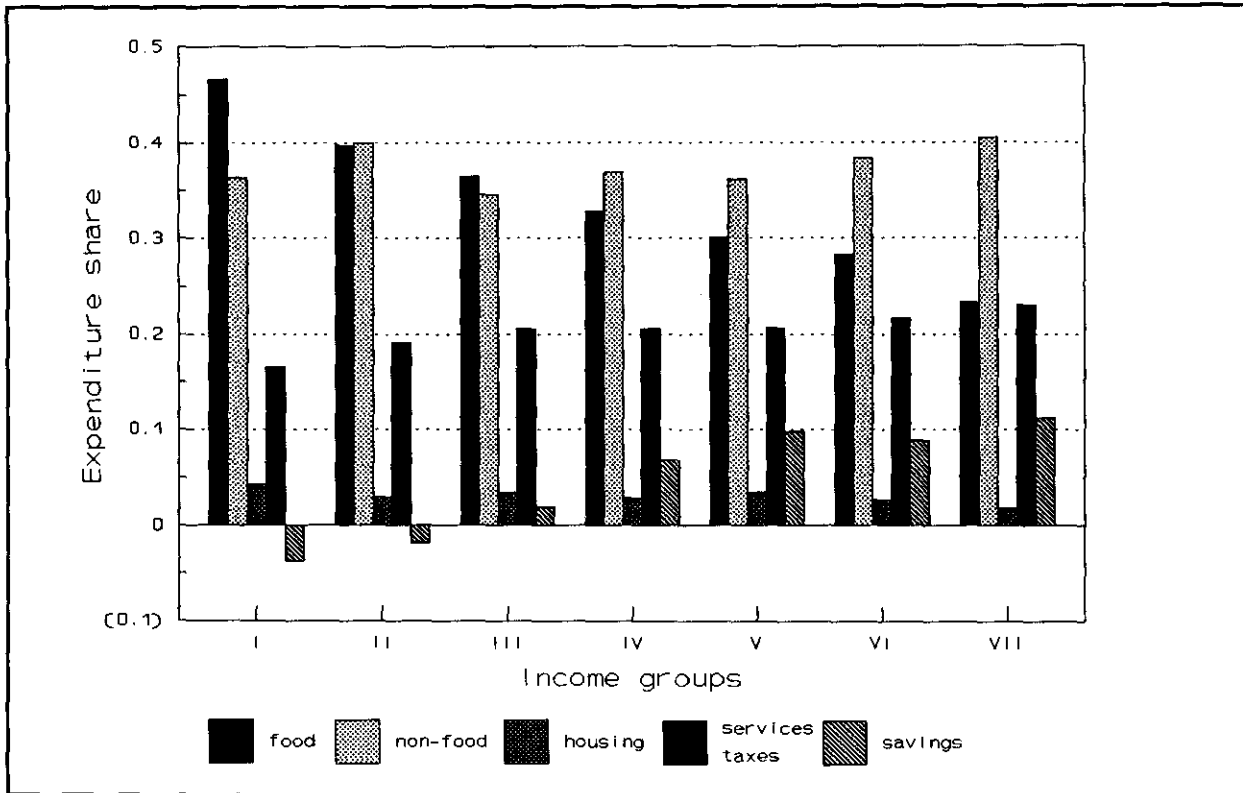


Figure 2. Expenditure shares for urban households, 1989

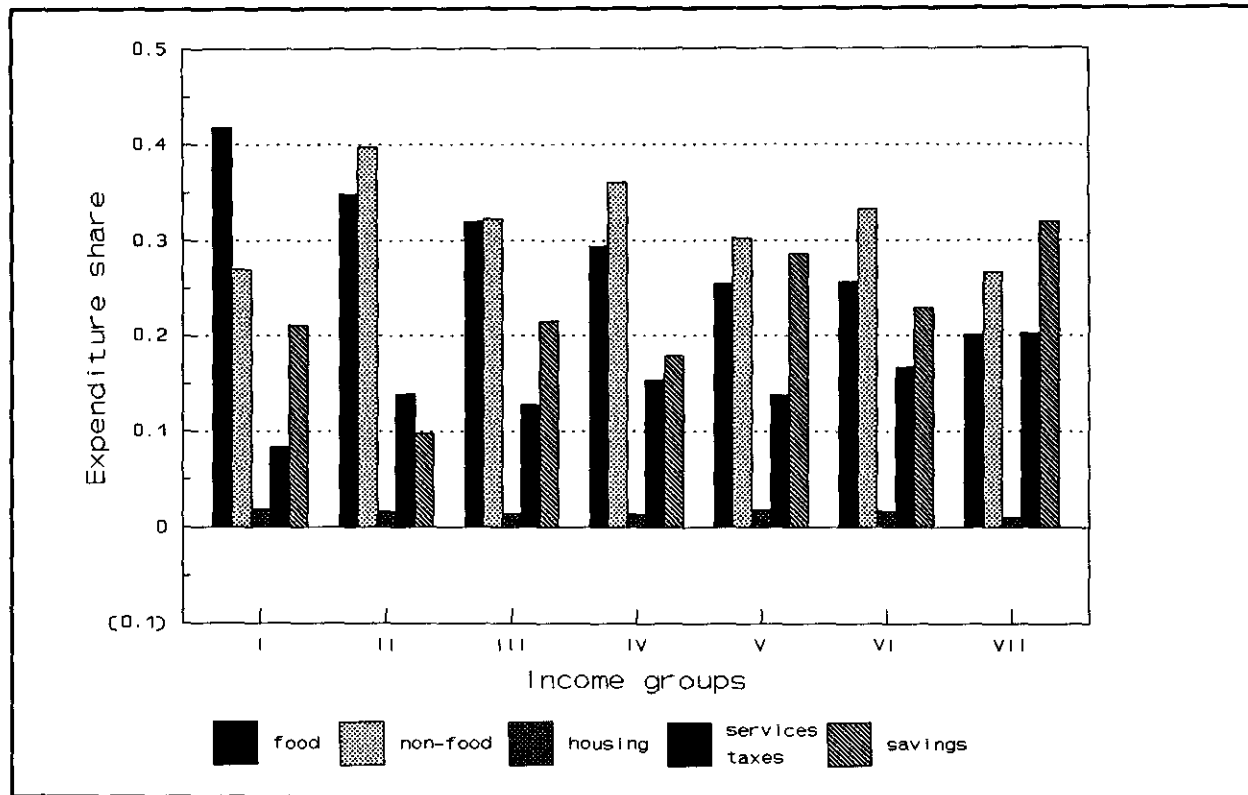


Figure 3. Expenditure shares for rural households, 1989

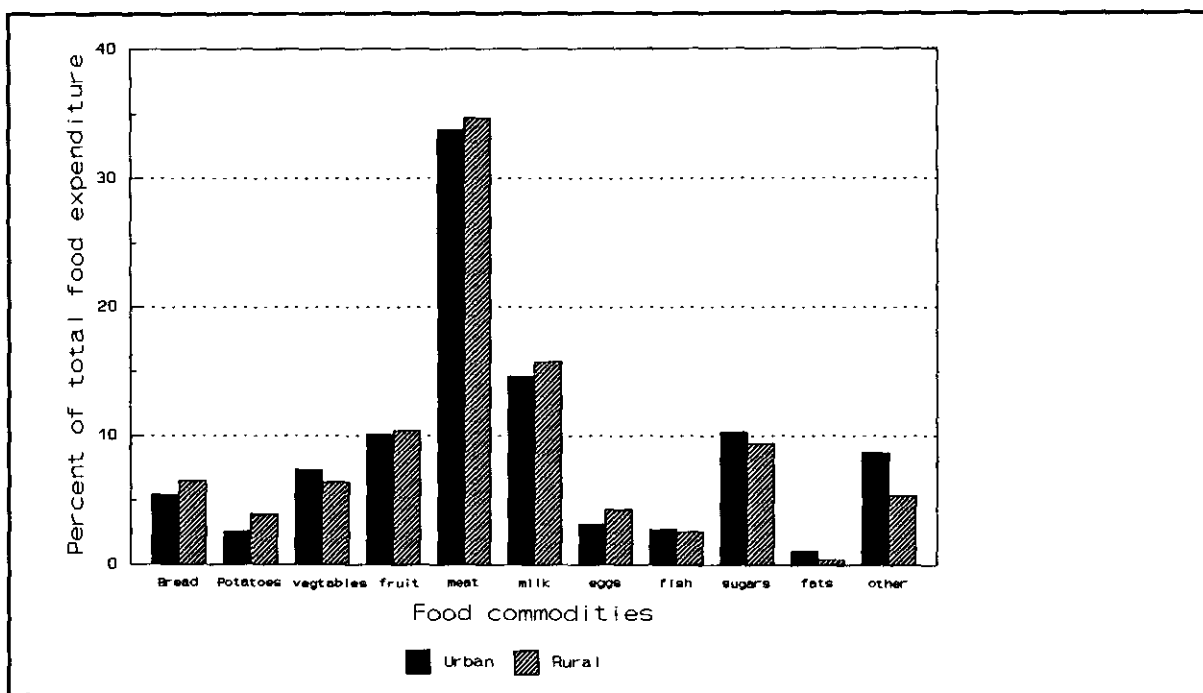


Figure 4. Distribution of household food expenditures, 1989

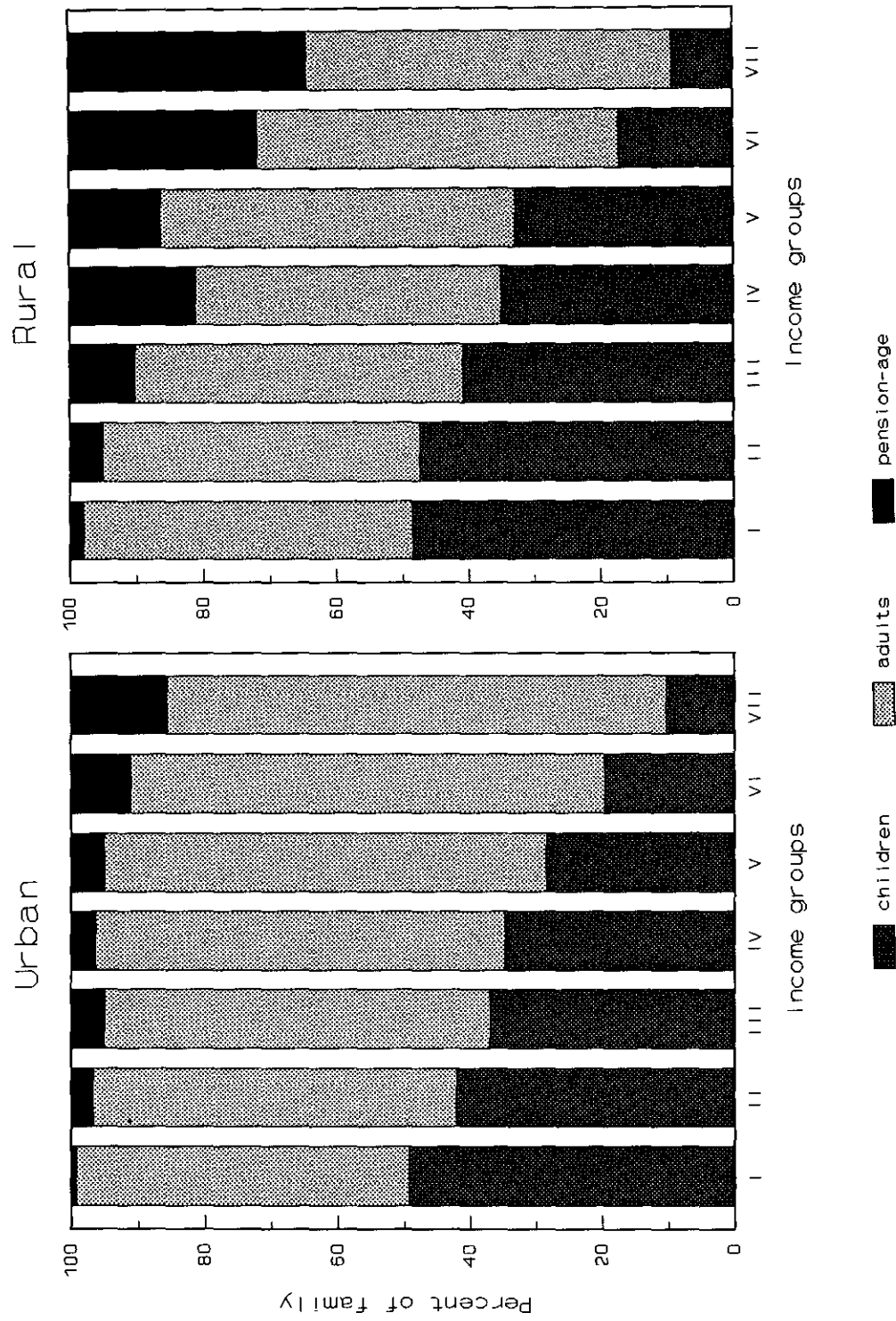


Figure 5. Distribution of household composition with respect to income group, 1989

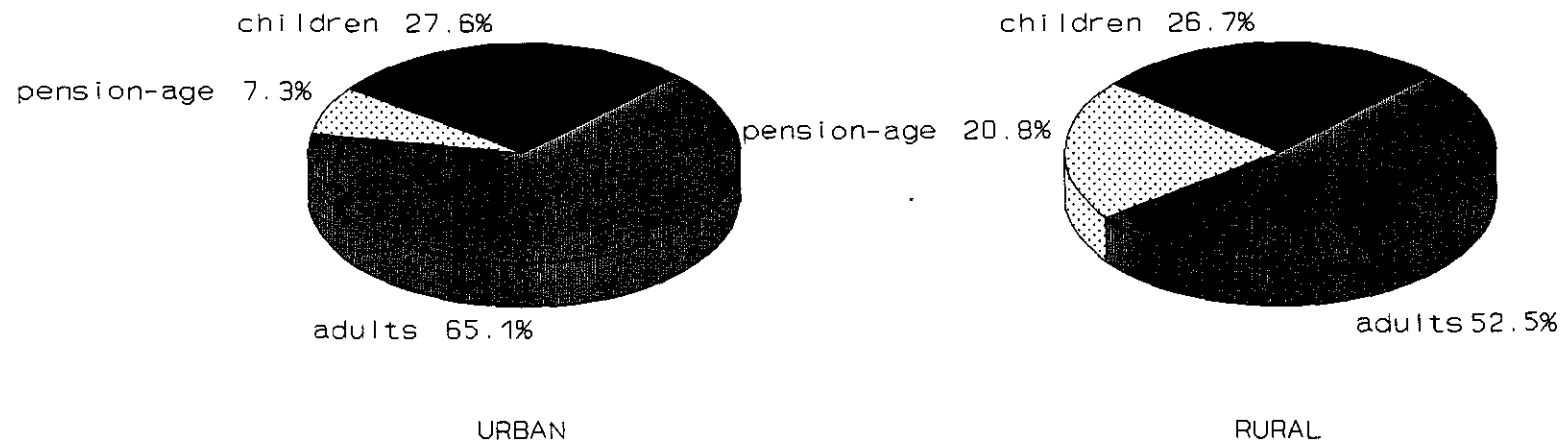


Figure 6. Urban-rural comparisons of household composition, 1989

Analysis of Expenditures

In this section total expenditures and the expenditures on food for Lithuanian households are analyzed using established consumer theory and econometric techniques. The first section is a review of fundamental consumer demand theory, emphasizing the use of Engel functions to analyze the relationship between total income and expenditure on various commodities. The next section addresses more directly issues in Engel function modeling and summarizes different Engel function specifications. These findings justify the use of a semilog and double-log specification of the Engel functions for the income and expenditure analysis. The data and results from the estimation of the Engel functions for Lithuania follow. The estimated parameters are used to calculate the income elasticities for urban and rural households in Lithuania.

Review of Consumer Demand Theory

A large portion of microeconomic literature and empirical studies is dedicated to developing and testing the theory of consumer behavior. *Consumer behavior* here refers to behavior related to the demand for and consumption of final goods and services by a household or individual.

The main questions addressed by consumer demand analysis are: what quantity of a commodity will a consumer or group of consumers demand, and what elements change the consumer's demand? In basic consumer theory it is assumed that the quantity demanded of a commodity depends upon the consumer's preferences, purchasing power, and the relative prices of commodities.

Purchasing power is a product of and directly affected by the consumer's income and prices of commodities. In the simplest treatments of consumer theory, the extent of purchasing power is represented by the following linear budget constraint

$$\sum p_i x_i = Y; \quad (1)$$

where

x_i = quantity of commodity i
 p_i = price of commodity i ; and
 Y = total income.

This constraint simply implies that the consumer's expenditures equal his income.

Utility maximization problem. The preferences of an individual or household in microeconomics are represented by a utility function. Utility is a measure of the level or degree of satisfaction that the consumer achieves by consuming the bundle of goods (\underline{x}). The vector of commodities of x_i is \underline{x} .

The conventional assumption and basic principle of consumer theory is that the consuming unit, be it a household or an individual, is rational and will choose among available alternatives in such a way that utility is maximized. This is represented by the maximization problem,

$$\begin{aligned} &\text{Maximize } U = u(x) \text{ with respect to } x, \\ &\text{subject to } \sum p_i x_i = Y ; \end{aligned} \quad (2)$$

where $u(x)$ is the utility function (see Varian 1984, Chapter 4, and Kreps 1990, Chapter 2). Let the solution to this problem be the vector of commodities $\underline{x}^* = \underline{x}^*(p', y)$, the Marshallian demand for the commodity bundle \underline{x} , which gives the utility maximizing quantity demanded for each commodity in \underline{x} given prices and income.

Because the utility function is a theoretical tool and is not directly observable, and because the bundle \underline{x}^* , prices, and income are observable in the economy, empirical studies of demand commonly estimate \underline{x}^* as a function of prices and income. The remainder of this study concentrates on the relationship between \underline{x}^* and the consumer's income.

Engel Functions and Income Elasticities. A commonly used and effective tool for studying the demand for a commodity and the income of the consumer while holding prices constant is the Engel function, which describes the relationship between quantities consumed and income. The assumption that prices remain constant is not unreasonable for this study because the data used, as discussed earlier and in the estimation discussion below, are cross-section data, and the use of cross-section data implies the absence of price effects.

The significance of the Engel curve lies in its shape and slope. Engel curves for different commodities will most likely have different shapes. An Engel curve for a commodity can be upward sloping, and if so, the commodity is called *normal*. If the Engel curve for a commodity is negatively sloped the commodity is called *inferior*.

Income elasticities of demand are calculated using the slope of the Engel curve. Income elasticities are a measure of the percentage change in the quantity demanded of a commodity with

respect to a percentage change in income, all else constant. Equation 3 illustrates what the elasticity is in mathematical terms:

$$\xi_i = \frac{\partial x_i}{\partial Y} \left(\frac{Y}{x_i} \right) = \frac{\partial \ln(x_i)}{\partial \ln(Y)} \quad (3)$$

Notice that the elasticity is a ratio of percentage changes and, therefore, is free of the units associated with income and quantities; this is what makes elasticity measures so useful for cross-commodity comparisons.

Demand analysis using cross-section data and Engel curve estimation can yield information through the interpretation of the income elasticity. In general, income elasticities can be positive, negative, or zero. Commodities with positive income elasticities are referred to as normal goods, while those with negative income elasticities are referred to as inferior. A further distinction is made within the class of normal goods as follows: goods with income elasticities that exceed 1 are referred to as luxuries, and those with income elasticities between 0 and 1 are called necessities.

Engel Aggregation Condition. Income elasticities across commodities are related. By keeping in mind that x_i^* is the utility-maximizing quantity demanded for commodity x_i and hence is a function of income and prices, if we differentiate the budget constraint

$$\sum_{i=1}^n p_i x_i = Y \quad (4)$$

with respect to Y , assuming no change in prices ($dp_i = 0$), and multiply the left hand side by 1 (x_i/x_i and Y/Y) we obtain

$$\sum_{i=1}^n \left(\frac{x_i}{x_i} \right) \left(\frac{Y}{Y} \right) p_i \frac{\partial x_i}{\partial Y} = 1 \quad (5)$$

or, upon rearranging,

$$\sum_{i=1}^n \frac{p_i x_i}{Y} \left[\frac{\partial \ln(x_i)}{\partial \ln(Y)} \right] = 1. \quad (6)$$

Equation (6) is called the Engel aggregation condition (Henderson and Quandt 1980). The Engel aggregation condition implies that changes in prices and income result in reallocation of quantities that do not violate the budget constraint (Goungetas 1992).

Engel Functions: Literature Review

Model specification of the Engel function is critical because different models may yield very different income elasticities from the same data set (Prais and Houthakker 1955). Model specification is also important because some models consistently give more accurate representations of income-expenditure data than do others. The following is a list of the commonly used and compared specifications for the Engel function. In all of the following models, E is expenditure on a specific commodity or a group of commodities, and Y is total income:

$$\text{Linear} \quad E = \alpha + \beta(Y)$$

$$\text{Quadratic} \quad E = \alpha + \beta_1(Y) + \beta_2(Y)^2$$

$$\text{Semilog} \quad E = \alpha + \beta_1 \ln(Y).$$

$$\text{Double-log} \quad \ln(E) = \alpha + \beta_1 \ln(Y),$$

$$\text{Log-inverse} \quad \ln(E) = \alpha + \beta_1 \left(\frac{1}{Y} \right), \text{ and}$$

$$\text{Inverse} \quad E = \alpha + \beta_1 \left(\frac{1}{Y} \right).$$

Previous research comparing different models indicates that each functional form possesses some desirable characteristics, so no single form has found general acceptance (Salathe 1979).

In studies by Larry Salathe (1979) and S.J. Prais and H.S. Houthakker (1971) these models were compared on the basis of how well they fit the data and how realistic the generated income elasticities were. Prais and Houthakker used British household data from 1938, and Salathe used the 1965 USDA Household Food Consumption Survey data. Salathe found the inverse and log-inverse forms generally gave the lowest elasticities while the double-log form gave the highest elasticities, except where the income elasticities were negative. In this case the double-log form gave the lowest. The double-log model fit the data poorly for flour and cereals, which had negative income elasticities under all specifications (Salathe 1979, 13).

These results led Salathe to conclude that the double-log form may be a poor choice for estimating commodities with negative income elasticities, but for commodities with positive income elasticities it performed well (p. 12). In addition, his study found that when per capita expenditures were expressed as a function of per capita income the double-log and semilog functional forms provided the best results (p. 11), but when per capita expenditures were expressed as a function of household size and income, the quadratic form provided the best fit.

Prais and Houthakker's comparisons of the different models showed that:

1. There was significant variation in the income elasticities generated, with the greatest variation occurring for commodities with the highest elasticities;
2. The double-log and semilog forms yielded higher income elasticities than the other models did;
3. The correlation coefficients, calculated using natural numbers for all models, showed the linear and inverse models to be clearly inferior; and
4. Using a test on the degree of linearity, the semilog specification gave the best representation of the data so long as that commodity's income elasticity did not exceed unity.

As a result of their study Prais and Houthakker chose to use the semilog and double-log Engel curve specifications for further analysis of household consumption behavior. There is, however, the disadvantage of theoretical inconsistency associated with assuming the semilog and double-log functional forms. Neither of them is compatible with utility maximization and hence they do not satisfy the Engel aggregation condition in Equation (6) above (Goungetas 1992).

Estimation of Engel Functions: Using Lithuanian Income and Expenditure Data

Because the semilog and double-log specifications tend to fit cross-section per capita income expenditure data relatively well, and because they generate more realistic income elasticities, this section provides results based on the semilog and double-log specification of the Engel function with

per capita expenditures expressed as a function of per capita income. It must be remembered, however, that theoretical plausibility is compromised in the process.

Estimation of Engel functions using the Lithuanian data described here was accomplished by assuming a two-stage budgeting process. Engel functions were used to generate income elasticities calculated for both stages. In the first budgeting stage it was assumed that the household allocates its total income among these five commodity groups: food, nonfood, housing, services, and savings (Table 19). How the household allocates its budget on the commodities within these five groups is referred to as the *second stage*.

Models. The model specification for a semilogarithmic Engel curve is

$$E_{ij} = \alpha + \beta \ln(Y_j).$$

In this model E_{ij} is the average per capita expenditure for commodity group i by the households in income group j . Y_j is the average total per capita income for the households in income group j . The same definitions for E_{ij} and Y_j apply for the double logarithmic Engel curve with the form:

$$\ln(E_{ij}) = \alpha + \beta \ln(Y_j).$$

The data set provides the ability to partition the sample into urban and rural households. As noted, the interesting parameters in the Engel function are those estimating slope, because they are used to calculate the income elasticity. In order to test for different slopes between urban and rural households a binary variable was introduced into the models (see Judge et al. 1988). The semilogarithmic Engel curve incorporating the binary variable is:

$$E_{ij} = \alpha + \beta \ln(Y_j) + \delta \ln(Y_j)D,$$

where D is a binary variable equal to 1 for urban observations, and equal to 0 for observation of rural households. E_{ij} and Y_j are defined as above. The double-log Engel curve incorporating the binary variable to allow for differing slopes is:

$$\ln(E_{ij}) = \alpha + \beta \ln(Y_j) + \delta \ln(Y)D$$

where all variables are defined as above, and α , β , and δ are parameters to be estimated.

The data used for this process are given in Table 19. The units of observation for total income are the average per capita total expenditure reported within each income group. Given the expenditure groups already defined, total per capita income is equal to total per capita expenditure. The unit of observation for expenditure on commodity i is the average per capita level of expenditure for commodity i reported within each income group. Only the data for 1989 were used to estimate the models, providing a total of only 14 observations ($n = 14$), seven urban observations and seven rural (Table 19).

An Engel function was estimated for each of the five expenditure groups composing stage one using ordinary least squares (OLS) methods. The results of these regressions are in Tables 20 and 21. For the estimations the R-squared values ranged from .824 to .961 for the semilog model, and from .826 to .984 for the double-log model. The parameter estimates were statistically significant ($\alpha = .05$) for both models. It is clear from the results that the introduction of the binary variable (D) to allow for different slopes was justified because the estimated coefficients for δ were statistically significant for all expenditure groups at a 95 percent confidence level. Hence, with some degree of confidence we can say that the slopes of the Engel curve for urban households are different than those of rural households, with the difference being the value of δ (Judge et al. 1988). The final column in Tables 20 and 21 adds the estimated value for β and for δ , and therefore, is the estimated slope of the Engel curves for urban households, while β is the slope of the Engel curves for rural households.

As mentioned above we are considering a two-stage budgeting process. The second-stage analysis of expenditure in this study considers only the household's expenditure on food commodities. In the survey data set, total food expenditures were allocated to 11 food groups (as shown in Table 14). For these 11 food groups Engel functions were estimated using semilog and double-log specifications, as defined above, with the following designation for the variables: Y_j is now average total per capita food expenditure for the households in the j^{th} income group; E_{ij} is the average level of

expenditure per capita on food group i for households in income group j ; and D is a binary variable with the same definition.

The results of this process are shown in Table 22 for the semilog model and in Table 23 for the double-log model. The estimated parameter for δ was not statistically significant for all Engel functions. For both semilog and double-log model specifications we failed to reject the hypothesis that the estimate for δ was equal to 0 (at $\alpha = .05$) for the following food commodities: fruit and berries, meat and meat products, milk and milk products, and fish and fish products. Hence, we cannot conclude that the Engel curves for urban households had different slopes than those for rural households for these food groups. In these cases the final column contains a dash (—) and the estimated slope for both urban and rural households is simply β .

A considerable weakness of this estimation is the lack of observations for the regressions. This makes for a low number of degrees of freedom and high standard errors, so our confidence in the estimated coefficients is not as high as it would be for larger samples. In addition, the observations are means (averages), not individual household observations. This implies two things: (1) the variance will be smaller than what would occur if the individual observations were used; and (2) nonconstant variance is hidden. We expect that the variance of expenditure will be higher in the higher income groups. But because the individual observations are not available, this nonconstant variance cannot be observed or adjustments made to the model to compensate for it.

Calculation of Income and Expenditure Elasticities

The next step is to calculate the income and expenditure elasticities for the commodities and expenditure groups given the estimated parameters of the Engel curves. Income and expenditure elasticities were calculated for both urban and rural households at their mean values of expenditure. The formula used with the semilog Engel function to calculate the income elasticity is

$$\xi_i = \frac{\beta_i}{\bar{e}_i} \quad (7)$$

where ξ_i is the income elasticity, β_i is the estimated slope of the Engel curve, and \bar{e}_i is the average expenditure for commodity i . This notation \bar{e}_i denotes the average for all urban households when calculating urban sector elasticities, and denotes the average for all rural households when calculating

rural sector elasticities. When income elasticities are calculated for rural households, β_i will come from the column of values labeled β in Table 20, and \bar{e}_i will be the average expenditure on commodity i for *all* rural households in Table 7. When income elasticities are calculated for urban households, β_i will be the values in the final column of Table 20 ($\beta_i + \delta_i$), and \bar{e}_i is the average expenditure for *all* urban households on commodity i , also in Table 7.

The income elasticity for the double-log function is simply the estimated coefficient β_i for rural households and $\beta_i + \delta_i$ (Table 21) for urban households. Table 24 gives the income elasticities for the first budgeting stage for both semilog and double-log Engel functions.

As already discussed, a change in real income may cause a household to shift income from some groups of commodities to others in order to maximize satisfaction. These results indicate that food expenditures, with an income elasticity ranging from .44 to .49, will change about one-half as much as income changes.

Given a change in income and an expected change in food expenditure we can study the expected change in food commodity shares by calculating a food expenditure elasticity for food commodities. This gives the percentage increase in food items with a percentage change in *food expenditure*. Food expenditure elasticities under the assumption of a semilog Engel curve are calculated by using Equation (7) again, with β_i being the values in the third and fifth columns of Table 22 for rural and urban households. Under the assumption of the double-log Engel curve the food expenditure elasticity is, as before, the value of β_i for rural households and $\beta_i + \delta_i$ for urban households. It is a simple step to convert the food expenditure elasticities into income elasticities. This is accomplished by multiply the expenditure elasticity for the 11 food commodities by the income elasticity estimated for total food as follows:

$$\xi_{fi} = (\xi_f)(\epsilon_i), \quad (8)$$

where

- ξ_{fi} = income elasticity for food commodity i ,
- ξ_f = income elasticity for total food,
- ϵ_i = food expenditure elasticity for food commodity i .

The estimated food expenditure elasticities calculated using both semilog and double-log Engel functions for 11 food groups are listed in Table 25. The total income elasticities for the 11 food commodities are listed in Table 26.

There is more analytical work that should be done along these same lines. We cannot be totally satisfied with the assumption that per capita expenditures (especially on food) are a function of per capita income alone. The fact cannot be ignored that the expenditure for consumer commodities, especially food, is done on a household basis. Hence, a more comprehensive study would analyze the effect of household size and composition on household expenditure.

In an attempt to capture household size and composition effects, household size elasticities were calculated for this data set following the procedure outlined in the study by Salathe (1979) and another study by Bauer, Capps, and Smith (1989). The process involved estimating an Engel function exactly like the ones used here, but with one additional household size regressor. The household size elasticities were calculated in the same manner as the income elasticities by using the appropriate estimated parameters (Bauer, Capps, and Smith 1989). However, adding one more parameter to the models in this study, given the already small data set, yields generally insignificant parameters and unsatisfactory elasticities both for income and for household size.

Another method by which to incorporate the size and characteristics of the household on the level of expenditure is to incorporate into the Engel function a commodity-specific adult equivalent scale, dependent upon the composition and size of each household. A thorough treatment of this procedure with results of an empirical application is given in Goungetas (1992).

Table 19. Calculated total income and expenditure data, Lithuania 1989

Observations	Total Income	Food	Nonfood	Housing	Services (less housing)	Savings
Urban						
I	1014.0	472.8	368.4	43.4	211.2	-38.4
II	1371.6	544.8	548.4	41.8	303.6	-25.2
III	1630.8	595.2	562.8	56.9	392.4	80.4
IV	1929.6	633.6	711.6	55.6	452.4	132.0
V	2257.2	679.2	816.0	73.9	540.0	222.0
VI	2665.2	756.0	1022.4	71.3	650.4	236.4
VII	3909.6	914.4	1585.2	71.3	972.0	438.0
Rural						
I	1071.6	447.6	289.2	20.1	109.2	225.6
II	1380.0	481.2	548.4	22.4	214.8	135.6
III	1657.2	530.4	535.2	23.5	235.2	356.4
IV	1963.2	588.2	708.0	26.2	327.6	350.4
V	2263.2	576.0	685.2	40.5	354.0	648.0
VI	2695.2	691.2	896.4	42.8	490.8	616.8
VII	4156.8	834.0	1108.8	42.8	883.2	1330.8

Table 20. Estimated parameters for first stage using semilog specification

Commodity Groups	R ²	β (std err)	δ (std err)	$\beta + \delta$
Food	.961	24.95* (1.48)	1.20* (.239)	26.15* (1.49)
Nonfood	.887	59.22* (6.07)	2.40* (.980)	61.62* (6.10)
Housing	.893	1.72* (.32)	.457* (.052)	2.18* (.32)
Services	.917	43.01* (3.73)	1.87* (.603)	44.88* (3.75)
Savings	.824	53.01* (8.02)	-6.09* (1.294)	46.11* (8.06)

* Statistically significant at $\alpha = .05$.

Table 21. Estimated parameters for first stage using double-log specification

Commodity Groups	R ²	β (std err)	δ (std err)	$\beta + \delta$
Food	.984	.467* (.017)	.0228* (.0028)	.4898* (.018)
Nonfood	.933	.968* (.074)	.0324* (.0119)	1.0004* (.074)
Housing	.873	.501* (.100)	.1280* (.0162)	.6290* (.101)
Services (less housing)	.956	1.35* (.086)	.0716* (.0139)	1.4216* (.087)
Savings	.826	2.02* (.304)	-.2320* (.049)	1.7880* (.154)

* Statistically significant at $\alpha = .05$.

Table 22. Estimated parameters for second stage using semilog specification

Food Groups	R ²	β (std err)	δ (std err)	$\beta + \delta$
Breads	.760	21.36* (3.59)	-.708* (.206)	20.65* (3.54)
Potatoes	.929	15.54* (1.88)	-1.180* (.108)	14.36* (1.85)
Vegetables	.963	46.79* (3.17)	.649* (.182)	47.44* (3.13)
Fruit and Berries	.922	77.11* (6.92)	-.232 (.397)	76.88 (6.93)
Meats	.986	223.70* (8.13)	-.940 (.460)	222.67 (8.14)
Dairy	.948	74.10* (5.25)	-.610 (.302)	73.49 (5.26)
Eggs	.825	22.99* (3.31)	-.837* (.190)	22.15* (3.26)
Fish	.752	14.26* (2.62)	.100 (.150)	14.36 (2.62)
Sugars	.937	58.92* (5.17)	.703* (.290)	59.62* (5.19)
Fats and Oils	.931	4.77* (.747)	.347* (.040)	5.12* (.74)
Other	.907	60.55* (8.23)	2.310* (.473)	62.86* (8.10)

* Statistically significant at $\alpha = .05$.

Table 23. Estimated parameters for second stage using double-log specification

Food Groups	R ²	β (std err)	δ (std err)	$\beta + \delta$
Breads	.788	.546* (.086)	-.018* (.0049)	.528* (.085)
Potatoes	.947	.756* (.079)	-.059* (.0045)	.697* (.078)
Vegetables	.981	1.096* (.052)	.016* (.0029)	1.112* (.051)
Fruit and Berries	.936	1.23* (.102)	-.002 (.0058)	1.228 (.102)
Meats	.987	1.060* (.037)	-.0039 (.0021)	1.056 (.037)
Dairy	.948	.776* (.055)	-.0055 (.0032)	.771 (.055)
Eggs	.827	.989* (.139)	-.0337* (.0080)	.956* (.138)
Fish	.722	.840* (.166)	.0058 (.0059)	.846 (.166)
Sugars	.953	.952* (.073)	.0122* (.0042)	.964* (.071)
Fats and Oils	.947	.797* (.110)	.0610* (.0064)	.858* (.110)
Other	.972	1.400* (.105)	.0578* (.0061)	1.458* (.104)

* Statistically significant at $\alpha = .05$.

Table 24. Income elasticities for the first budgeting stage, Lithuanian 1989

Expenditure Groups	Elasticities by Specification			
	Semilog		Double-log	
	Urban	Rural	Urban	Rural
Food	.45	.46	.49	.47
Nonfood	.81	.89	1.00	.97
Housing	.38	.54	.63	.50
Services	.95	1.14	1.42	1.35
Savings	2.74	.88	1.78	2.02

Table 25. Food expenditure elasticities for 11 food groups, Lithuanian 1989

Expenditure Groups	Elasticities by Specification			
	Semilog		Double-log	
	Urban	Rural	Urban	Rural
Breads	.55	.51	.53	.55
Potatoes	.79	.61	.70	.76
Vegetables	.92	1.20	1.11	1.20
Fruit and berries	1.09	1.14	1.23	1.23
Meats	.94	.99	1.06	1.06
Dairy	.73	.73	.78	.78
Eggs	.99	.82	.96	.99
Fish	.73	.85	.84	.84
Sugars	.83	.97	.96	.95
Fats and oils	.66	1.84	.86	.80
Other	1.03	1.73	1.46	1.40

Table 26. Total income elasticities for food commodities, Lithuania 1989

Expenditure Groups	Specification			
	Semilog		Double-log	
	Urban	Rural	Urban	Rural
Breads	0.25	0.24	0.26	0.26
Potatoes	0.35	0.28	0.34	0.35
Vegetables	0.41	0.55	0.54	0.56
Fruit and berries	0.49	0.53	0.60	0.57
Meats	0.42	0.46	0.52	0.50
Dairy	0.33	0.34	0.38	0.36
Eggs	0.44	0.38	0.47	0.46
Fish	0.33	0.39	0.41	0.39
Sugars	0.37	0.45	0.47	0.44
Fats and oils	0.30	0.85	0.42	0.37
Other	0.46	0.80	0.72	0.65

Application to Policy Analysis

In this section income elasticities derived earlier are used to analyze the impact of estimated income changes due to Lithuanian price reforms on per capita expenditures.

Price Reforms and Their Effect on Income

In 1991 Lithuania implemented price reforms for agricultural commodities. One of the goals of the price reform was to reduce the government subsidies to producers and processors by bringing prices more in line with costs. This required an increase in retail prices from 173 percent for potatoes to 382 percent for meat (Kazlauskienė 1991). These price reforms are initially expected to have an adverse effect on the level of real income in Lithuania.

The most recent estimates suggest a decline in real per capita income of 41.1 percent from 1989 to 1991 (Meyers 1991). By using these price changes, along with a system of supply and demand equations, Kazlauskienė, Devadoss, and Meyers (1991) applied an Adaptive Policy Simulation Model (APSM) to study the impact of price reforms on agricultural commodity markets and consumer aggregates. Among their results were estimates for changes in consumption and expenditure from 1989 to 1995. Specifically, they estimated that food expenditure, as a share of total per capita income, would increase from 27 percent in 1989 to 57.5 percent by 1991. Total per capita expenditures on food were estimated to increase from 644.8 rubles per year in 1989 to 2,493.4 rubles per year by 1991, for an increase of more than 280 percent (Kazlauskienė, Devadoss, and Meyers 1991).

Effect of Price Reform on Expenditures

Using the income elasticities calculated earlier, it is possible to estimate a new level of expenditure for a commodity or a group of commodities when there is a percentage change in income. This is accomplished by first multiplying the income elasticity for the commodity group under consideration by the percentage change in income. This will yield an estimated percentage change in expenditure for that commodity group.

The commodity groups were the same five commodity groups for which income elasticities were calculated in the preceding section (Table 24). Table 27 shows the expenditure groups with their income elasticities estimated using the double-logarithmic specification of the Engel curve. These income elasticities are used because they fit the data a little better than the elasticities generated using the semilog Engel curve (see Tables 20 and 21). Included in Table 27 is the expected percentage

change in expenditure for each of the expenditure groups. This percentage change in expenditure was calculated by multiplying each income elasticity by the assumed percentage change in per capita income from 1989 to 1991 ($-.411$). The third column lists the results of applying the estimated percentage change in expenditure to the baseline level of average per capita expenditure in 1989. The last column lists the estimated 1991 average per capita expenditure level for these commodity groups, in 1989 rubles.

The estimated average levels and shares are compared to the 1989 base levels for each income group in Tables 28 and 29. It can be seen that both the level and share of average per capita expenditure estimated for 1991 are most similar to those of the lower income groups in 1989.

The 1991 estimates in the last column of the two tables are based on the assumption of a change in real per capita income of -41.1 percent from 1989 to 1991, and the income elasticities calculated earlier in this paper. Under these assumptions it appears that households will spend a greater percentage of their budgets on the food, housing, and utility payments, and nonfood expenditure categories. In addition, households will be allocating less of their income to services less housing and savings.

The data in Tables 28 and 29 indicate that food expenditures will be reduced by nearly 20 percent (Table 28), but food as a percentage of total expenditure will increase by 35.7 to 37.1 percent (Table 29). The study by Kazlauskiene, Devadoss, and Meyers estimated that food expenditure share per capita would increase approximately 113 percent (from 27 to 57.5) from 1989 to 1991.

A possible explanation for the differences between the estimates for changes in food expenditure lies in the differences in methodology. The APSM is described as a simplified representation of the econometric multicommodity models and it takes into account the specific features of the Lithuanian *agro*-industry (Kazlauskiene, Devadoss, and Meyers 1991). The analysis provided by the APSM is comprehensive because it includes exogenous assumptions defining the policies, technology, state of the economy, and behavior parameters (price and income elasticities for food) pertaining to production and consumption in the agricultural sector. In their study, per capita food consumption was influenced by changes in relative retail *food* prices and real income, over time, through cross- and own-price elasticities and income elasticities estimated for the Soviet Union as a whole. Their study did not take into account per capita expenditures for commodities other than food.

In contrast, the analysis based on household budget data does not directly consider the price change for agricultural commodities, and it is assumed that relative prices remain constant for all commodities. This study views the price changes as causing changes in real income, then analyzes

the shift in budget shares with respect to the estimated change in real income. The estimates for income elasticities and changes in expenditure are based on cross-section data for total per capita expenditure for food as well as *all* other expenditures. The estimates for changing food expenditures are therefore indirectly dependent upon expenditures for other than food commodities. Expenditures for commodities other than food are not examined in the study by Kazlauskiene, Devadoss, and Meyers.

Substitution effects, not analyzed in this study based on household budget data, could be quite substantial and could explain the relatively lower estimates for changes in food expenditures compared with the Kazlauskiene, Devadoss, and Meyers estimates. Food commodities were, as reported in 1989, relatively price inelastic. Hence, given the projected large increases in food retail prices we would expect per capita food expenditures to increase due to price increases. The analysis based on the household budget survey did not take into account the substitution effect of rising food prices. For this reason, changes in food expenditure, as shown in Tables 27 and 29, should be considered a lower bound. Finally, the projected income change of 41.1 percent is a very large one, and the results presented above must also be viewed in the context of the assumption of constant behavioral parameters over such a large change in real income.

Conclusions

One of the stated objectives of this paper was to provide a preliminary analysis of income and expenditure data for Lithuania based on newly published data. In addition, the purpose of the survey used to collect these data was to provide information on the relationship of consumption and expenditure to income and other demographic variables such as urban-rural designation, household size and composition, and the stratum of the national economy in which the household was primarily employed. Given the small number of observations in the data set used here it was impossible to provide a complete analysis of household responses to economic or policy signals according to the purpose of the survey. However, this work can be considered as a profile of the structure of Lithuanian households and their expenditures. It also indicates some of shifts likely in expenditures resulting from estimated changes in real income due to economic reforms.

Table 27. Elasticities, estimated percentage change in expenditure, and estimated 1991 per capita expenditure

Expenditure Groups	Income Elasticity from Table 24	Calculated Percentage Change in Expenditure	Estimated 1991 Expenditure Level (1989 Rubles)
Urban		(1989 rubles)	
Food	.49	-20.1	559.1
Nonfood	1.00	-41.1	538.4
Housing	.63	-25.8	51.0
Services Less Housing	1.42	-58.4	235.0
Savings	1.79	-73.5	53.5
Rural			
Food	.47	-19.2	524.6
Nonfood	.968	-39.8	481.2
Housing	.50	-20.6	30.1
Services Less Housing	1.35	-55.5	200.9
Savings	2.02	-83.0	122.0

Table 28. Expenditure levels, Lithuania 1989 and estimated levels for 1991

Group	Income Groups							1989 Average	1991 Est. Average	Percent Change
	I	II	III	IV	V	VI	VII			
Urban					(1989 rubles)					
Total ^a	1014.0	1371.6	1630.8	1929.6	2257.2	2665.2	3909.6	2382.0	1403.0	-41.1
Food	472.8	544.8	595.2	633.6	679.2	756.0	914.4	700.8	559.1	-20.1
Nonfood	368.4	548.4	562.8	711.6	816.0	1022.4	1585.2	914.4	538.4	-41.1
Housing	43.4	41.8	56.9	55.6	73.9	71.3	71.3	68.7	51.0	-25.8
Services ^b	211.2	303.6	392.4	452.4	540.0	650.4	972.0	565.2	235.0	-58.4
Savings	-38.4	-25.2	80.4	132.0	222.0	236.4	438.0	201.6	53.5	-73.5
Rural										
Total ^a	1071.6	1380.0	1657.2	1963.2	2263.2	2695.2	4156.8	2618.4	1542.2	-41.1
Food	447.6	481.2	530.4	577.2	576.0	691.2	834.0	649.2	524.6	-19.2
Nonfood	289.2	548.4	535.2	708.0	685.2	896.4	1108.8	799.2	481.2	-39.8
Housing	20.1	22.4	23.5	26.2	40.5	42.8	42.8	37.9	30.1	-20.6
Services ^b	109.2	214.8	235.2	327.6	354.0	490.8	883.2	451.2	200.9	-55.5
Savings	225.6	135.6	356.4	350.4	648.0	616.8	1330.8	718.8	122.0	-83.0

Note: Adapted from Table 9.

^a This value is total expenditure and is equal to total income.

^b Services less housing.

Table 29. Distribution of expenditure shares, Lithuania 1989 and 1991 estimates

Group	Share of Total Expenditures of All Income Groups							1989 Average	1991 Est. Average	Percent Change
	I	II	III	IV	V	VI	VII			
Urban										
Food	.466	.397	.365	.328	.301	.284	.234	.294	.399	35.7
Nonfood	.363	.400	.369	.369	.361	.383	.405	.384	.384	0.0
Housing	.428	.030	.029	.029	.033	.028	.018	.029	.037	27.6
Services*	.165	.191	.206	.206	.206	.217	.230	.237	.167	-29.5
Savings	-.038	-.018	.098	.068	.098	.089	.112	.274	.038	-86.1
Rural										
Food	.437	.348	.320	.294	.254	.256	.200	.248	.340	37.1
Nonfood	.269	.397	.322	.360	.302	.332	.266	.305	.312	2.3
Housing	.018	.016	.014	.013	.017	.0158	.010	.014	.019	35.7
Services*	.083	.139	.127	.153	.138	.166	.202	.172	.130	-24.4
Savings	.210	.098	.215	.178	.286	.228	.320	.275	.079	-71.3

* Services less housing.

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