

# Food Demand in Slovenia

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## Lebensmittelnachfrage in Slowenien

### 1. Introduction

Numerous sources infer that a lowering of purchasing power for various sections of the population ensues during the transition from a command to a market economy in Central and Eastern Europe countries (CEEC). The changes in the operation of the economy and political system have a significant impact on food demand, particularly through the opening the domestic market to foreign competition, the establishment of new market structures and the changes in the operation of the price system. These changes would mainly affect higher shares of population belonging either to lower or higher income groups.

Capturing all these important factors and evaluating how these affect the structure of Slovene food demand was, therefore, a primary objective of this empirical analysis. It is

hypothesised that the process of transition generally enhances the market efficiency and the sensitivity of consumer behaviour on the food market. However, this effect may not be so vigorous in the case of Slovenia, where no major macro-economic changes have taken place as was the case with other neighbouring CEECs.

A demand system approach (LA/AIDS model; DEATON and MUELLBAUER, 1980; DEATON, 1987, 1995) was chosen to evaluate food demand in Slovenia during the first stage of the economic and political transition in Slovenia. The empirical estimation involves two periods, 1988 and 1993, before and after 1990 (pre-transitional and transitional period) so that food demand behaviour can be evaluated and mutually compared.

After the description of the method and data, the model is estimated. Empirical results are finally used to derive con-

### Zusammenfassung

Diese Untersuchung versucht, zu einem besserem Verständnis der Veränderungen in der Lebensmittelnachfrage während der Transformationszeit beizutragen. Eine lineare Approximation des „Almost Ideal Demand System“ Models (LA/AIDS) wird mit Daten von Haushaltsbefragungen aus 1988 und 1993 für sieben Produktgruppen vorgenommen. Die Einkommenselastizitäten der Nachfrage reichen von 0,7 bis 1,4. Die höchsten Preiselastizitäten weisen Obst und Fleisch auf, gefolgt von Milchprodukten und Gemüse. Der gefundene Anstieg der Elastizitäten zwischen 1988 und 1993 deutet auf eine Zunahme der Preissensibilität der Konsumenten hin. Weiters gibt es Hinweise auf Wohlfahrtseinbußen der niedrigeren Einkommensschichten.

**Schlagworte:** LA/AIDS Nachfragesystem, Einkommens- und Preiselastizitäten, Transformationsländer.

### Summary

This paper attempts to contribute to a better understanding of changes occurring in food demand during the transitional period that the whole Slovene society has been experiencing. The Linear Approximation of Almost Ideal Demand System (LA/AIDS) model was estimated for seven different food groups using Household Budget Survey data for 1988 and 1993, respectively. The computed food expenditure elasticities range between 0.7 and 1.4. The most price elastic food groups were found to be fruits and meats, followed by milk and vegetables. An increase in food elasticities may be interpreted as the result of an increase in price responsiveness of the average food consumer and there are indications of a decline in the welfare of low-income households during transition. These estimates may be used for policy purposes, especially to simulate the implications of adopting the Common Agricultural Policy on Slovene consumers.

**Key words:** LA/AIDS demand system, expenditure and price elasticities, economy in transition.

clusions. The methodology applied for this study has not been very diffused in CEECs given the poor quality of the data in most CEECs. However, as we shall demonstrate, when a good data set exists, as is the case in Slovenia, one can use individual household responses to analyse spatial price variation.

## 2. Methods and Data Description

### 2.1 Review of Literature

Different food demand structures evolve from different socio-economic, demographic and institutional factors. These differences within a food distribution network can be detected from the values of various food price and expenditure elasticities. Two basic approaches are generally used in demand analysis. The first is the traditional one, which is based on the estimation of Engel curves where food expenditure and income elasticities are subsequently derived. Another way to perform econometric estimation is to construct a demand system and from it to compute compensated (Hicksian) and/or uncompensated (Marshallian) price and expenditure elasticities.

A demand system methodology has been widely applied in empirical work through the use of the Almost Ideal Demand System (AIDS) model, which was developed by DEATON and MUELLBAUER (1980); ALSTON and CHALFANT (1993); BUSE (1994); MERGOS and DONATOS (1989). The model has many advantages.

BUSE (1994) mentions that the model is "grounded in a well-structured analytical framework, accommodates certain types of aggregation, is easy to estimate, and permits testing of the standard restrictions of classical demand theory". The most popular version of the AIDS in applied demand analysis is its "Linear Approximation" version (LA/AIDS). It is based on the share-weighted Stone price index which simplifies, to a great extent, the estimation process. The application of the Rotterdam model, as the second system demand choice, was also considered by some authors in the empirical work (ALSTON and CHALFANT, 1993). Despite AIDS and Rotterdam models being very similar (i.e., the only two differences appear in the alternative interpretation of endogenous variable and in a different specification of the income term), the advantage of using the former over the latter is its applicability for either time-series or cross-section data analyses.

### 2.2 The LA/AIDS Model Formulation

The AIDS is one of the most diffused specifications in applied demand analysis. The linear approximation of AIDS model (LA/AIDS) uses a Stone price index although MOSCHINI (1995) argues that it is not invariant to changes in units of measurement, which may affect the approximation properties of the system demand model. LA/AIDS is a complete demand system which in reality represents the indirect cost or expenditure function. The systems approach, however, cannot be used without sufficient price variation and the main difficulty in using Household Budget Survey (HBS) data is the lack of price information.

DEATON (1987 and 1995) has developed a way of modelling price reactions jointly with choice of unit values in HBS data under assumptions about fixity of underlying relative prices within spatially defined areas.

Share equations for individual food groups are set, with the overall price index:

$$w_i = a_i + \sum g_{ij} \ln p_j + b_i \ln(E/P) \quad (1)$$

where  $w_i$  is the expenditure share of the  $i^{\text{th}}$  good,  $p_j$  is the price of good  $j$ ,  $E$  is expenditures, and  $P$  is an overall price index approximated by Stone's geometric price index to uphold the linear specification:

$$\ln P = \sum w_i \ln p_i \quad (2)$$

The linear approximation of the AIDS model was selected to estimate price and expenditure elasticities since budget (expenditure) data are available. Thanks to the linear approximation of the original AIDS model, empirical applications are not difficult to conduct and the results are comprehensible enough to be interpreted with ease.

In order to ensure that the AIDS model is compatible with demand theory, the parameters of the demand equations must satisfy the following set of restrictions:

$$\text{adding up; } \sum a_i = 1, \sum g_{ij} = 0, \sum b_i = 0 \quad (3)$$

$$\text{homogeneity; } \sum g_{ij} = 0 \quad (4)$$

$$\text{symmetry; } g_{ij} = g_{ji} \text{ for all } i, j \quad (5)$$

The adding-up condition is satisfied by the specification, while the homogeneity and symmetry restriction must be imposed on the estimated parameters. Since the expenditure share sums to unity, the covariance matrix of the demand system becomes singular and one share equation must be omitted in the estimation, with its parameters retrieved using the adding up condition. The Marshallian (uncompensated) price elasticities can be computed from the estimated parameters of the LA/AIDS model as:

$$e_{ij} = d_{ij} + g_{ij} / w_i - b_i w_j / w_i \quad (6)$$

where  $d_{ij} = -1$  when  $i = j$ , and is otherwise equal to zero.

On the other hand, the expenditure elasticities in the AIDS model are defined as:

$$h_i = 1 + b_i / w_i. \quad (7)$$

product. The ratio of these two observations is called a *unit value*. Unit values are affected by the choice of quality, which varies across households. The size of quality effects is assessed by regressing the logarithm of the unit value on the logarithm of total expenditure and the list of household demographics.

## 2.3 Household Budget Survey

The cross-sectional data were collected through two annual Household Budget Surveys conducted in 1988 and 1993 (SURS, 1989; SURS, 1994). The household members reported data on available and allocated assets within individual households to the interviewers. While the available assets account for the total revenue earned (including loans), the allocated assets include all expenditures incurred to household members during the particular calendar year. The 1988 survey covered 3027 households and the 1993 survey included 3112 households, which in both cases corresponds to around 0.5 % of the total Slovene population. In order to obtain comparable "two-year" estimates, monetary values from 1993 were deflated by the average annual retail price index adjusted to correspond to monthly variations in 1988 (Conversion rate: 1 SIT = 15 DIN).

Table 1 reports the results for two sample years, given the aggregated data for total and food expenditures by individual household type. In 1993, food expenditures, as the portion of total household expenditures, decreased by 13 % compared to 1988. The major reasons for this drop were a slight reduction in total expenses (lower food intakes) and lower food price levels. Lower and, to some extent, middle-income bracket households cut down their food expenditures, while households belonging to higher income groups did not considerably reduce the amount of financial resources spent on food.

In the Surveys, households are asked to report, amongst other things, expenditures and physical amounts of each

## 2.4 Food Expenditure Structure

Quantities and unit prices of seven food products were selected. The largest difference within the products appears for breads, where poorer families in 1993 spent nearly one and a half as much for bread and cereals as was the case with more affluent families. The least important food items in total food expenditures tend to be oils and fats (around 3 %) and fruits (around 7 %). There is a clear reduction in fruit and vegetable expenditures for all households sampled in 1993 as compared to 1988. During the same period, a relatively high increase in meat expenditures is also recorded. As one expects, the lowest variations in food expenditure patterns for Slovene households are present in the basic commodity basket (i.e., breads, milk and oil). This shows that regardless of the order of magnitude of economic reform, the consumption of the basic food products in the Slovenian diet is not affected to any significant degree. However, the higher income households spend more on milk products and other food and vegetables and less on bread and cereals.

## 3. Estimation and Calculation of Demand Elasticities

### 3.1 Model Results

Several modelling approaches were used to estimate food demand elasticities. (All estimations and tests in this paper

Table 1: Total and Food Expenditures and the Distribution of the Slovene Household Samples  
Tabelle 1: Gesamt- und Ernährungsausgaben sowie die Verteilung der ausgewählten Haushalte

Household Type	Total	Food	Number of Households			
	Expenditures in 1993	Expenditures in 1993	1988		1993	
	1988=100	1988=100	No.	(%)	No.	(%)
Low Inc. Groups	91	78	1245	41,13	1079	34,67
Medium Inc. Groups	97	91	1450	47,90	1494	48,01
High Inc. Groups	100	99	332	10,97	539	17,32
Total	95	87	3027	100,00	3112	100,00

Table 2: Average Annual Food Expenditures Per Capita in Slovenia By Income Household Type  
 Tabelle 2: Die jährlichen Durchschnittsausgaben für Nahrungsmittel (pro Person) in Slowenien nach Haushaltstypen

	Total Sample (%)		Low Inc.Groups (%)		Med. Inc.Groups (%)		High Inc.Groups (%)	
	1988	1993	1988	1993	1988	1993	1988	1993
Bread & Cereals	12.4	11.7	14.9	13.9	11.4	11.5	9.6	9.7
Meat	32.7	36.7	32.6	37.1	33.0	36.9	31.7	36.1
Fruits	9.4	7.1	8.3	6.1	9.8	7.1	10.7	8.1
Vegetables	15.3	11.2	16.1	11.2	15.0	11.2	14.3	11.3
Milk	14.4	14.8	13.9	13.8	14.5	14.8	15.3	15.8
Oils and Fats	2.9	3.3	3.1	4.1	2.8	3.3	2.4	2.7
Other foods	13.0	15.2	11.0	13.8	13.6	15.3	16.1	16.4
Total Food Expenditures	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

were done with the econometric software package SHAZ-AM.) Having tested different functional specifications of Engel curves first, the AIDS model was then applied incorporating various socio-economic and demographic variables (such as household types and age of the household). Due to the lack of information on education in the 1988 survey, the system estimation procedure did not include regression on various education levels. The empirical estimation of the model used the SURE (Seemingly Unrelated Regression) procedure. Share equations were initially estimated using the OLS method and, then, theoretical restrictions were imposed and tested (homogeneity and symmetry).

### 3.2 Elasticities

Table 4 presents the uncompensated (Marshallian) own-price elasticities and food expenditures elasticities for the various food categories by income household type for the two selected years.

As expected, the own-price elasticities were generally negative and inelastic. The only exception emerges in the case

of other food which is elastic. This is quite understandable given the nature of this particular food commodity – comprised of sugar, coffee, various pastries, different spices, etc. Price elasticities of demand for bread and oil were found to be the most inelastic. This is again quite an expected outcome, considering the importance that bread has in the total Slovene food demand structure. The most price-elastic commodities alongside other foods, were established to be fruits and meats, followed by milk and vegetables.

During the observed period (1988-1993), some significant changes in the elasticity coefficients across different food products have appeared. A rise in food price elasticities for most commodities is basically the result of changes in purchasing power. This is also, to a lesser extent, the consequence of some alterations in food consumption habits. A different attitude towards meat consumption has slowly been restored. Traditionally, meat was the basic commodity in Slovene food demand structure. However, it is gradually losing its position in the diet. A growing economic crisis between 1988 and 1993 has resulted in the situation where meat consumers have become more responsive to price changes. It is not surprising, therefore, that the first transitional effects have yielded a market situation where

Table 3: Model Testing Results  
 Tabelle 3: Ergebnisse der Modellauswertung

Model	Log of Likelihood Functions	System R <sup>2</sup>	Likelihood Ratio Test of Diagonal Cov. Matrix
Total (1988)	32007.4	0.6722	3772.0
Low Income Groups (1988)	13098.2	0.6936	1540.5
Medium Income Groups (1988)	15348.4	0.6874	1784.0
High Income Groups (1988)	3456.2	0.8020	483.3
Total (1993)	34354.6	0.6449	3330.8
Low Income Groups (1993)	11821.3	0.6701	1249.2
Medium Income Groups (1993)	16404.1	0.6538	1628.1
High Income Groups (1993)	5848.6	0.6191	657.5

meat and most other food products have become more and more price elastic. These alterations were particularly strong in the case of oil consumption (i.e., a shift from a completely price inelastic good to a "normal" market good). A particularly interesting empirical result arises from the fact that no real difference in the consumption pattern between various income classes is (re)affirmed, which points at somewhat stable food consumption preferences and habits of the Slovene population regardless of their socio-economic status acquired.

The violation of the negativity property by the estimated system for 1988, but not for 1993 needs to be explained. The violation reflects somehow the given market distortions, due to high inflation and extensive administrative controls. In 1993, with radical economic and political changes (most administrative controls on the operation of the price system were eliminated) the restriction of demand theory are (more) satisfied by the estimated parameters. This economic explanation is further supported by the changes in the magnitude of the elasticities, as explained below.

Table 4 shows also food expenditure elasticities for different income household types for two selected years. The expenditure elasticities range between 0.7 and 1.4. Bread and cereals, vegetables, and other food have close to unitary expenditure elasticities. The most expenditure elastic is demand for fruits and milk, and the least elastic are meats. It is expected that with continuous economic growth more

income, in relative terms, will be allocated to fruits, milk and milk products, vegetables and other food. Relatively high values of food expenditure elasticities may well suggest that Slovene consumers are very sensitive to changes in their economic environment, with food expenses being quite high on their agenda. Engel's law in this case is confirmed for practically no individual food commodities demanded by even the most affluent households (High Income Groups). Surprisingly enough, this situation has not altered much over the period observed.

There are also only small differences in the estimated expenditures between both years. In most cases the differences between estimated expenditures may not be statistically significant. However, the differences between the two selected years arise when analysing consumption patterns by income classes. Households ranked into low and middle income groups experienced a decrease in meat demand which was followed by an increase in demand for milk products and cereals. The explanation for this can partly be attributed to lower purchasing power of many Slovene consumers.

#### 4. Conclusions

It is the objective of the paper to contribute to a better understanding of changes taking place in food consumption patterns in the transitional period that the Slovene

Table 4: Expenditure and Own-Price Elasticities of Various Food Commodity Groups in Slovenia  
Tabelle 4: Einkommen(Ausgaben)- und Preiselastizitäten für ausgewählte Nahrungsmittel in Slowenien

	Total		Low Inc. Groups		Med. Inc. Groups		High Inc. Groups	
	1988	1993	1988	1993	1988	1993	1988	1993
Own-Price Elasticities								
Bread & Cereals	-0.331	-0.409	-0.310	-0.458	-0.309	-0.459	-0.269	-0.483
Meat	-0.412	-0.750	-0.379	-0.813	-0.386	-0.790	-0.343	-0.910
Fruits	-0.877	-0.708	-0.867	-0.762	-0.825	-0.749	-1.182	-0.828
Vegetables	-0.629	-0.461	-0.640	-0.479	-0.612	-0.489	-0.780	-0.556
Milk	-0.630	-0.677	-0.668	-0.735	-0.682	-0.773	-0.584	-0.841
Oils and Fats	0.072	-0.404	0.173	-0.237	0.165	-0.385	0.155	-0.296
Other foods	-1.273	-1.244	-1.227	-1.020	-1.264	-1.076	-0.836	-1.055
Expenditure Elasticities								
Bread & Cereals	0.861	0.949	0.907	1.204	0.878	1.131	0.990	1.213
Meat	0.892	0.873	0.824	0.668	0.871	0.722	0.712	0.725
Fruits	1.218	1.252	1.267	1.295	1.228	1.300	1.192	1.242
Vegetables	0.991	1.053	1.081	1.187	1.015	1.157	1.144	1.151
Milk	1.163	1.173	1.211	1.404	1.194	1.326	1.311	1.358
Oils and Fats	0.912	0.949	0.941	0.994	0.901	1.000	1.087	0.965
Other foods	1.083	1.032	1.008	0.971	1.049	0.997	1.100	0.972

economy has been undergoing. The Household Budget Survey data for 1988 and 1993 were used in the estimation process. The "Linear Approximation of Almost Ideal Demand System" (LA/AIDS) model was estimated for seven different food groups. The empirical results derived are reasonable and the changes observed could have important implications for all producers, consumers and policy makers in Slovenia alike. The use of unit values in estimating demand system with HBS data is feasible in transition economies where no alternative ways (time-series or panel data) of estimating price elasticities are available.

These results, the first of their sort to be estimated for Slovenia, could be used for policy purposes, especially to assess the long-run implications of the Common Agricultural Policy on different segments of Slovene society. This is especially important in view of the fact that Slovenia is gradually becoming more integrated in the EU and detailed negotiations on the agricultural chapter are expected in a couple of months' time.

Fruits and milk products were found to be luxury goods and with continuous consumer income increases, both are expected to register increased demand levels. This is important for the fruits category considering its comparative advantage and, to a certain extent, also for milk products given the growing milk surpluses problem. The relative magnitude of these elasticities are important, within the context of designing a future agricultural policy framework, given prospects of high GDP growth rates in the medium term. Own-price elasticities of most food categories are inelastic. The elasticities computed for different individual income groups indicate no great variation in the behaviour of domestic consumers; thereby pointing at certain convergence attained in food consumption patterns in Slovenia.

During the transitional period spanning from 1988-1993, some changes have been observed in the responsiveness of Slovene consumers to price changes for several food products. The pattern of change is consistent, hence, one is tempted to look for reasons that might be responsible for that change. An observed increase in the expenditure elasticities, giving a declining slope of an income-consumption path (as expected for an Engel curve) would imply an underlying decline in available income. If this is true, and in fact expenditures elasticities have increased, then from the adding-up property one would expect an increase in the own-price (in absolute terms) elasticities. This is in fact observed in the estimated results. The consumers do respond strongly to changes in meat and cereals product

prices. We can conclude that this was caused by the reduction in purchasing power. However, the observed increase in own-price and expenditure elasticities reflects also an general increase in price responsiveness and a change in consumer behaviour towards full economic rationality.

The whole impact of the transitional period on the food consumption patterns can only be assessed by monitoring food consumption patterns in the period just before or at the very beginning of the next millenium (e.g., Slovenia as a full EU member), with all possible refinements to methodology used here. In order to grasp the whole picture of all major events occurring in the Slovene food demand, an additional study, which would incorporate dis-aggregated meats, milk and dairy by-products, fruits and vegetables, is clearly needed.

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