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**Working Paper**

# Assessing the Demand for Food in Europe by the Year 2010

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*Leon Podkaminer*

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# Assessing the Demand for Food in Europe by the Year 2010

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# Abstract


### Abstract

Data on household consumption provided by the European Comparison Project for 1999 are used to estimate the parameters of the cross-country Almost Ideal Demand System (AIDS) for two aggregates: food and non-food. The estimates are highly significant. AIDS specified with parameter estimates is used for assessing food demand in 2010. Four alternative price trends are considered, each assuming 2% real per capita income growth p.a. in Western Europe and 4% in 12 EU accession countries (ACs). Food consumption will be rising 2.6% p.a. in ACs, and the ACs' share in all-Europe food consumption will increase from 13.6% (1999) to 16-17% (2010).



**Keywords:** cross-country demand functions, Almost Ideal Demand System, food consumption, European Comparison Project

**JEL classification:** R22, C53, D12, Q11

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# Assessing the demand for food in Europe by the year 2010

## 1 Introduction

Rising levels of per capita real incomes in individual European countries will be associated with changes in the consumer (household) demand for foodstuffs. Assessing the direction and magnitudes of these changes is certainly not an easy task. In principle, the assessments could be based on econometrically estimated food demand functions for the countries in question, and on specific assumptions concerning the evolution of prices and household incomes. The estimation of food demand functions for individual countries with country-specific time-series data on consumption, prices and incomes would involve a tremendous amount of work – especially because not all countries report the volumes of household consumption of food systematically. Besides, the reliable time series on household consumption are rather short for most Central and East European countries. (The statistics on consumption for the pre-transition years are generally useless for the estimation of demand functions because they often reflected endemic shortages and rationing practices prevailing under central planning rather than unrestricted consumer responses to prices and incomes.) Finally, the estimation of food demand functions with the country-specific time-series is usually troublesome even if the available statistical data are of acceptable quality. This is so because as a rule the relative prices (prices of food vs. prices of non-food items) change relatively slowly over time. This implies that there is little variation in relative prices in time-series for individual countries – and consequently the estimation is crippled by collinearity among the explanatory variables.

An alternative approach to the econometric estimation of demand functions, adopted in this study, was pioneered by Professor Henri Theil.[1] The approach works with data provided by international comparison projects for specific years, thus treating the data for individual countries covered by comparison projects as a single cross-section sample. The maintained assumption behind the approach is that the pattern of consumer demand formation is the same across countries. This assumption, which has a rather long tradition in applied consumer demand studies[2], requires that the demand functions to be estimated are sufficiently 'flexible' so as to allow for consumer behaviour at different levels of income. One of the basic features of the desirable flexibility is that the estimated demand functions do not rule out the Engel Law (i.e. the empirically proven fact that the share of food expenditure in total consumer expenditure falls as income rises). The Theil

[1] See Theil and Suhm (1981) and Theil and Clements (1987).

[2] E.g. Houthakker (1957) or Lluch et al. (1977).

approach has many other advantages; for instance, it allows direct inter-country comparisons of consumption volumes, relative prices and also of the price levels. Besides, because the relative prices differ quite significantly across countries, the risk of collinearity among the explanatory variables is here greatly reduced.

## 2 The 1999 European Comparison Project

The ongoing European Comparison Project (ECP) run by the Eurostat currently provides detailed results for the year 1999. (It takes about two years for the elaboration of the detailed ECP results. The results for the next year covered by the ECP, 2002, will probably be available in 2004.) Thus, out of necessity, the present study works with the 1999 ECP data. Actually, there are two variants of these data: (1) based on the SNA concept of the national accounts; (2) based on the original ECP concept of the national accounts. The two variants differ in the way they treat publicly financed individual consumption. In the SNA concept, private household consumption is restricted to items actually purchased, at market prices, by private households. In the original ECP concept, private consumption includes also items such as publicly financed education or health services which are transferred to private households (and not purchased by them). In the further analysis the data based on the SNA concept are used.

Specifically, we work with the following items for the 31 countries included in the ECP for 1999:

QF real per capita household consumption of food (excluding non-alcoholic beverages), measured in euro at Purchasing Power Standards (PPS) of 1999;

QN real per capita household consumption of non-food commodities and services (including alcoholic and non-alcoholic beverages), measured at PPS of 1999;

PF Purchasing Power Standard for private household food consumption (as above defined), measured in national currency units per 1 euro (vs. the EU-15);

PN Purchasing Power Standard for private household non-food consumption (as above defined), measured in national currency units per 1 euro (vs. the EU-15);

SF share of food expenditure in total private household consumption expenditure, at national currency units.

Purchasing Power Standards PF and PN represent domestic prices of the aggregate food and non-food items respectively (corresponding to the quantities QF and QN). The ratio PF/PN represents the relative price of food in terms of non-food.

The share of food SF satisfies the identity:

$$SF = QF*PF/ (QF*PF+QN*PN)$$

The items SF, QF and PF are directly available from the detailed ECP 1999 results. Items for the non-food consumption (QN and PN) require additional calculations (aggregation) of more detailed non-food items reported.

Table 1 reports QF, QN, PF, PN, PF/PN and SF together with some other items (population, exchange rates). As can be seen, real per capita consumption of both food and non-food is generally much higher in Western Europe (EU-15 and the three EFTA countries: Norway, Switzerland and Iceland) than in the remaining (accession) countries, or in Turkey. However, the disparity between the levels of real consumption is much higher for non-food items. Secondly, food tends to be *relatively* much cheaper in the West than in the AC-12 or in Turkey. Thirdly, the share of food expenditure SF is generally much lower in the West (which is the manifestation of the Engel Law).

On closer examination one becomes suspicious about the quality of the data for two countries: Bulgaria (BG) and Cyprus (CY). Reported consumption of food (QF) in Bulgaria seems incredibly low (306.4 PPS EUR per capita) – less than 1 PPS EUR per person per day.[3] The second-lowest food consumption level recorded in Latvia (LV) is more than twice the Bulgarian level. Most probably, the quality of national accounting in Bulgaria still leaves much to be desired. In the case of Cyprus, the reported per capita consumption of food seems incredibly large (close to 2500 EUR, or about 50% more than in the richest Western countries such as Luxembourg and Switzerland). Most probably, a large part of the reported food consumption represents consumption by foreign tourists, and not by the domestic households. In any case, it makes sense to exclude the data for both countries from estimation outright. For the same reason it also seems desirable to exclude from estimation the data for some other countries with high levels of 'net consumption by foreigners' (which is also reported by the ECP).

[3] This roughly corresponds to less than 1 'actual' euro spent on food in, let us say, Austria. Clearly, such a consumption level would imply massive starvation, which is not observed in Bulgaria.

Table 1

## Selected data for 1999

| Country | Population | Real Consumption | | | PPS | PPS | Relative | Food share in | Exchange rate |
|---|---|---|---|---|---|---|---|---|---|
| | | Food (QF) | Non-food (QN) | Food+Non-food (QF+QN) | Food (PF) | Non-food (PN) | price (PF/PN) | expenditure at NCU (SF) | |
| | million | EUR/p.c. | EUR/p.c. | EUR/p.c. | NCU/EUR | NCU/EUR | | | NCU/EUR |
| Belgium (B) | 10.2 | 1329.1 | 10357.4 | 11686.5 | 41.4 | 41.3 | 1.004 | 0.1142 | 40.3 |
| Denmark (DK) | 5.3 | 1313.0 | 11140.2 | 12453.2 | 9.42 | 9.01 | 1.046 | 0.1098 | 7.44 |
| Germany (D) | 82.1 | 1382.4 | 11617.2 | 12999.5 | 1.970 | 2.039 | 0.966 | 0.1031 | 1.96 |
| Greece (EL) | 10.5 | 1450.7 | 8155.5 | 9606.1 | 300.3 | 261.2 | 1.150 | 0.1698 | 325.8 |
| Spain (E) | 39.4 | 1512.5 | 8501.3 | 10013.9 | 143.6 | 138.4 | 1.037 | 0.1558 | 166.4 |
| France (F) | 60.2 | 1511.4 | 10040.6 | 11552.0 | 7.16 | 6.86 | 1.045 | 0.1359 | 6.56 |
| Ireland (IRL) | 3.7 | 1161.9 | 9495.0 | 10656.9 | 0.805 | 0.813 | 0.990 | 0.1080 | 0.79 |
| Italy (I) | 57.6 | 1682.2 | 11555.2 | 13237.4 | 1876.4 | 1645.9 | 1.140 | 0.1423 | 1936.3 |
| Luxembourg (L) | 0.4 | 1750.5 | 15910.8 | 17661.3 | 42.98 | 39.00 | 1.102 | 0.1082 | 40.3 |
| Netherlands (NL) | 15.8 | 1277.5 | 10802.5 | 12080.0 | 2.067 | 2.137 | 0.967 | 0.1026 | 2.20 |
| Austria (A) | 8.1 | 1502.1 | 11638.4 | 13140.4 | 14.40 | 13.92 | 1.035 | 0.1178 | 13.76 |
| Portugal (P) | 10.0 | 1480.3 | 7591.7 | 9072.0 | 170.3 | 143.0 | 1.191 | 0.1885 | 200.5 |
| Finland (FIN) | 5.2 | 1177.1 | 8324.3 | 9501.4 | 6.69 | 7.17 | 0.933 | 0.1165 | 5.95 |
| Sweden (S) | 8.9 | 1194.4 | 8710.1 | 9904.5 | 10.41 | 11.18 | 0.932 | 0.1133 | 8.81 |
| United Kingom (UK) | 59.4 | 1261.8 | 11601.4 | 12863.2 | 0.668 | 0.744 | 0.898 | 0.0889 | 0.66 |
| Iceland (IS) | 0.3 | 1619.2 | 11642.9 | 13262.1 | 118.5 | 93.3 | 1.270 | 0.1501 | 77.2 |
| Norway (NO) | 4.5 | 1269.8 | 10377.0 | 11646.7 | 12.66 | 10.33 | 1.225 | 0.1304 | 8.31 |
| Switzerland (CH) | 7.1 | 1635.8 | 13396.4 | 15032.2 | 2.281 | 2.106 | 1.083 | 0.1168 | 1.60 |
| Bulgaria (BG) | 8.2 | 306.4 | 3384.6 | 3690.9 | 0.815 | 0.539 | 1.511 | 0.1203 | 1.96 |
| Cyprus (CY) | 0.7 | 2435.7 | 8399.4 | 10835.1 | 0.468 | 0.446 | 1.051 | 0.2336 | 0.58 |
| Czech Republic (CZ) | 10.3 | 993.8 | 5033.2 | 6027.1 | 17.55 | 15.97 | 1.099 | 0.1783 | 36.9 |
| Estonia (EE) | 1.4 | 923.1 | 3094.3 | 4017.4 | 9.405 | 7.031 | 1.338 | 0.2852 | 15.6 |
| Hungary (HU) | 10.1 | 809.0 | 3981.9 | 4790.8 | 131.9 | 118.6 | 1.112 | 0.1843 | 252.8 |
| Latvia (LV) | 2.4 | 671.4 | 2616.7 | 3288.1 | 0.413 | 0.284 | 1.453 | 0.2715 | 0.62 |
| Lithuania (LT) | 3.7 | 932.9 | 3026.0 | 3958.9 | 2.461 | 1.730 | 1.423 | 0.3049 | 4.26 |
| Malta (MT) | 0.4 | 1294.2 | 4639.3 | 5933.5 | 0.371 | 0.406 | 0.914 | 0.2033 | 0.43 |
| Poland (PL) | 38.7 | 911.9 | 3897.6 | 4809.5 | 2.221 | 2.082 | 1.067 | 0.1997 | 4.23 |
| Romania (RO) | 22.5 | 709.1 | 2297.9 | 3007.0 | 6785 | 5427 | 1.250 | 0.2784 | 16345 |
| Slovakia (SK) | 5.4 | 985.9 | 4113.7 | 5099.6 | 21.64 | 14.47 | 1.496 | 0.2639 | 44.1 |
| Slovenia (SI) | 2.0 | 988.2 | 6368.8 | 7356.9 | 183.2 | 129.8 | 1.411 | 0.1796 | 194.5 |
| Turkey (TU) | 64.3 | 854.5 | 2614.8 | 3469.4 | 294217 | 214168 | 1.374 | 0.3098 | 447230 |

*Source:* ECP-1999, own calculations. NCU – National Currency Units.

## 3 Econometric estimates of the parameters of the all-Europe food demand function

The final sample of countries included in the econometric estimation comprises 21 countries. (Bulgaria, Cyprus, Malta, Portugal, Austria, France, Spain, Greece, Italy and Luxembourg are excluded.)

Functionally, the demand system chosen for estimation is of the so-called AIDS (Almost Ideal Demand System[4]) type, given, in our case, by the following basic formula:

$$SF=A+B*[\log(M/M°)-A*\log(PF)-(1-A)*\log(PN)-(C/2)*(\log(PF/PN))^2] + C*\log(PF/PN) \quad (1)$$

where A, B, C are parameters to be estimated;

log stands for logarithm;

M is the total per capita nominal expenditure, at NCU (viz. M=PF*QF+PN*QN);

M° is the average total per capita nominal expenditure in the EU-15 area, at EUR. (M equals 12064.36.)

Many consumer demand studies suggest that the crucial elasticity parameter B is negative and equals about –0.15.[5]

Equation (1) is non-linear in the parameters. Its estimation was conducted with the E-Views 3 econometric package, with individual country observations properly weighted with the population sizes.

The following estimate values were obtained:

$$A = 0.12137 \quad B = -0.157472 \quad C = 0.737269$$

The statistical quality of the estimates is very high, with the standard errors of the estimates equalling 0.002, 0.0165 and 0.06 respectively and their t-Statistics equalling 57.4, –9.56 and 12.48 respectively. The adjusted R-square assumes a value of 0.9982 and the F statistics equals 5440. All parameter estimates are highly significant (with the testing probabilities less than 0.00005).

[4] See Deaton and Muellbauer (1980).

[5] See, for example, Clements and Selvanathan (1994), who review several such studies. Podkaminer (1999) estimated B= –0.145 for the ECP data for 1990.

Table 2

**Actual and theoretical shares of food expenditure in 1999**

| Country | SF 1999 | SF theoretical | Residual |
|---|---|---|---|
| B | 0.1142 | 0.1249 | -0.011 |
| DK | 0.1098 | 0.1337 | -0.024 |
| D | 0.1031 | 0.1052 | -0.002 |
| EL | 0.1698 | 0.1815 | -0.012 |
| E | 0.1558 | 0.1457 | 0.010 |
| F | 0.1359 | 0.1383 | -0.002 |
| IRL | 0.1080 | 0.1266 | -0.019 |
| I | 0.1423 | 0.1571 | -0.015 |
| L | 0.1082 | 0.1267 | -0.019 |
| NL | 0.1026 | 0.1106 | -0.008 |
| A | 0.1178 | 0.1264 | -0.009 |
| P | 0.1885 | 0.1966 | -0.008 |
| FIN | 0.1165 | 0.1154 | 0.001 |
| S | 0.1133 | 0.1123 | 0.001 |
| UK | 0.0889 | 0.0823 | 0.007 |
| IS | 0.1501 | 0.1918 | -0.042 |
| NO | 0.1304 | 0.1893 | -0.059 |
| CH | 0.1168 | 0.1321 | -0.015 |
| BG | 0.1203 | 0.3370 | -0.217 |
| CY | 0.2336 | 0.1443 | 0.089 |
| CZ | 0.1783 | 0.1989 | -0.021 |
| EE | 0.2852 | 0.2880 | -0.003 |
| HU | 0.1843 | 0.2183 | -0.034 |
| LV | 0.2715 | 0.3284 | -0.057 |
| LT | 0.3049 | 0.3083 | -0.003 |
| MT | 0.2033 | 0.1419 | 0.061 |
| PL | 0.1997 | 0.2047 | -0.005 |
| RO | 0.2784 | 0.2863 | -0.008 |
| SK | 0.2639 | 0.3080 | -0.044 |
| SI | 0.1796 | 0.2660 | -0.086 |
| TU | 0.3098 | 0.3060 | 0.004 |

*Source:* Own calculations.

By applying formula (1) specified with estimated values of the parameters to the actual values of M, PF and PN for individual countries, one arrives at the theoretical values of the share of food SF (see Table 2).

The differences between actual and theoretical SF (the residuals) are in most cases reasonably small – even for the most 'tourist-oriented' countries, which are excluded from the estimation. As could be expected though, the residuals are very large in the case of Bulgaria and Cyprus, and also quite significant in some small countries such as Malta, Slovenia, Latvia, Iceland and Norway.

## 4 Assessing the impacts of changing real income and relative prices

The parametrically specified formula (1) allows the calculation of the share of food expenditure for any hypothetical change in nominal total per capita expenditure M and in prices PF and PN. Consequently, it also allows the calculation of the demand for food following the hypothetical changes in nominal per capita total expenditure and in prices. At the same time, formula (1) can be modified and used to compute the demand for food (and also for the non-food aggregate) following a hypothetical change in the *relative* price (PF/PN) and a hypothetical change in total *real* per capita consumption. The algorithm for the computation of demand under such assumptions is quite complex and is not discussed here.[6] But this algorithm will now be used to elicit the changes in the demand for food in individual countries under the following assumptions:

*Assumption 1*

Total (food + non-food) *real* consumption per capita in individual West European (EU-15 and EFTA-3) countries will be rising by 2% per year (or cumulatively 24.3% over the whole period 1999-2010); and by 4% per year (or 53.9% cumulatively) in the remaining countries. These assumptions seem reasonable because it is generally assumed that the overall GDP growth in the West will, in the coming years, be on average about 2% p.a. – against about 4% p.a. in the accession countries.

Additionally, we assume constant population everywhere. This assumption may of course turn out to be debatable – especially with respect to Turkey.

*Assumption 2*

Rising total real per capita consumption will be associated with changes in the relative price (PF/PN). As evidenced by the 1999 data (see Table 1), the relative price of food

[6] This algorithm is described in Podkaminer, op. cit.

generally declines with rising real income. This tendency may reflect many developments such as evolving cost and productivity differentials (in production of food vs. non-food), or differences in the market structure (high degree of oligopolization in the production and distribution of services and of many durable consumer goods, which are a significant part of the non-food aggregate), etc. Clearly, forecasting the future evolution of the relative food price in each of the 31 European countries would be a major research task, not undertaken here. Instead, we propose to study the consequences of a few likely alternative scenarios:

*Scenario B:* during the entire period 1999-2010, the price of non-food will rise faster than the price of food by 2% in West European countries and by 5% in the accession countries and Turkey. (In effect, by 2010 in each West European country the relative price PF/PN will decline by about 1.96% from its 1999 level, and by 4.76% in each of the remaining countries.)

*Scenario C:* the price of non-food will rise 3% faster in the West and 6% faster in the accession countries. (In effect, by 2010 in each West European country the relative price PF/PN will decline by about 2.91% from its 1999 level, and by 5.66% in each of the remaining countries.)

*Scenario D:* the price of non-food will rise 7% faster in all countries. (In effect, by 2010 in each European country the relative price PF/PN will decline by about 6.54% from its 1999 level.)

Additionally, we study the effects of rising real consumption under *unchanged* relative prices (this is our reference *Scenario A*).

## 5 Estimates of household demand for food by the year 2010

Table 3 reports the estimates of demand for food in per capita terms. The items from the first 5 columns of Table 3 represent the volumes of food consumption (at constant PPS EUR of 1999). The last 4 columns of Table 3 contain the growth rates (vs. the actual food consumption of 1999).

As can be seen, the calculated responses of food demand to assumed changes in total real consumption and in relative prices differ across countries.

Table 3

## Per capita food consumption at 1999 PPS euro and its real growth rates vs.1999

| Country | per capita food consumption at 1999 PPS | | | | | Growth rates vs. 1999 | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 1999 actual | 2010 A | 2010 B | 2010 C | 2010 D | 2010 A | 2010 B | 2010 C | 2010 D |
| B | 1329.1 | 1436.9 | 1417.2 | 1407.7 | 1371.3 | 0.08 | 0.07 | 0.06 | 0.03 |
| DK | 1313.0 | 1411.0 | 1361.8 | 1337.0 | 1237.4 | 0.07 | 0.04 | 0.02 | -0.06 |
| D | 1382.4 | 1470.5 | 1383.5 | 1339.6 | 1159.9 | 0.06 | 0.00 | -0.03 | -0.16 |
| EL | 1450.7 | 1645.5 | 1664.0 | 1673.8 | 1716.0 | 0.13 | 0.15 | 0.15 | 0.18 |
| E | 1512.5 | 1700.8 | 1710.5 | 1715.7 | 1739.9 | 0.12 | 0.13 | 0.13 | 0.15 |
| F | 1511.4 | 1673.2 | 1629.0 | 1606.8 | 1517.2 | 0.11 | 0.08 | 0.06 | 0.00 |
| IRL | 1161.9 | 1245.5 | 1161.8 | 1119.3 | 945.2 | 0.07 | 0.00 | -0.04 | -0.19 |
| I | 1682.2 | 1872.7 | 1925.1 | 1952.4 | 2068.6 | 0.11 | 0.14 | 0.16 | 0.23 |
| L | 1750.5 | 1876.8 | 1845.2 | 1829.7 | 1770.1 | 0.07 | 0.05 | 0.05 | 0.01 |
| NL | 1277.5 | 1357.9 | 1277.9 | 1237.5 | 1072.4 | 0.06 | 0.00 | -0.03 | -0.16 |
| A | 1502.1 | 1631.4 | 1589.6 | 1568.8 | 1485.4 | 0.09 | 0.06 | 0.04 | -0.01 |
| P | 1480.3 | 1695.0 | 1707.5 | 1714.0 | 1742.7 | 0.15 | 0.15 | 0.16 | 0.18 |
| FIN | 1177.1 | 1276.4 | 1233.5 | 1211.9 | 1124.7 | 0.08 | 0.05 | 0.03 | -0.04 |
| S | 1194.4 | 1289.8 | 1251.4 | 1232.1 | 1154.8 | 0.08 | 0.05 | 0.03 | -0.03 |
| UK | 1261.8 | 1306.0 | 1188.3 | 1128.5 | 883.0 | 0.04 | -0.06 | -0.11 | -0.30 |
| IS | 1619.2 | 1813.4 | 1815.3 | 1816.7 | 1824.9 | 0.12 | 0.12 | 0.12 | 0.13 |
| NO | 1269.8 | 1398.4 | 1363.8 | 1346.5 | 1277.0 | 0.10 | 0.07 | 0.06 | 0.01 |
| CH | 1635.8 | 1774.5 | 1687.8 | 1644.0 | 1465.0 | 0.08 | 0.03 | 0.01 | -0.10 |
| BG | 306.4 | 356.0 | 330.0 | 315.6 | 257.5 | 0.16 | 0.08 | 0.03 | -0.16 |
| CY | 2435.7 | 3276.0 | 3239.7 | 3195.3 | 2972.8 | 0.35 | 0.33 | 0.31 | 0.22 |
| CZ | 993.8 | 1276.8 | 1278.4 | 1270.5 | 1225.3 | 0.28 | 0.29 | 0.28 | 0.23 |
| EE | 923.1 | 1274.1 | 1287.2 | 1283.5 | 1250.0 | 0.38 | 0.39 | 0.39 | 0.35 |
| HU | 809.0 | 1046.0 | 1065.7 | 1068.4 | 1067.6 | 0.29 | 0.32 | 0.32 | 0.32 |
| LV | 671.4 | 921.3 | 914.5 | 903.6 | 846.7 | 0.37 | 0.36 | 0.35 | 0.26 |
| LT | 932.9 | 1297.2 | 1303.8 | 1296.6 | 1248.8 | 0.39 | 0.40 | 0.39 | 0.34 |
| MT | 1294.2 | 1703.2 | 1670.1 | 1640.5 | 1500.8 | 0.32 | 0.29 | 0.27 | 0.16 |
| PL | 911.9 | 1196.4 | 1185.6 | 1171.3 | 1099.2 | 0.31 | 0.30 | 0.28 | 0.21 |
| RO | 709.1 | 975.9 | 1017.8 | 1031.1 | 1070.2 | 0.38 | 0.44 | 0.45 | 0.51 |
| SK | 985.9 | 1348.0 | 1364.5 | 1361.9 | 1332.3 | 0.37 | 0.38 | 0.38 | 0.35 |
| SI | 988.2 | 1271.4 | 1294.6 | 1297.8 | 1296.6 | 0.29 | 0.31 | 0.31 | 0.31 |
| TU | 854.5 | 1190.3 | 1258.1 | 1282.8 | 1364.1 | 0.39 | 0.47 | 0.50 | 0.60 |

*Source:* Own calculations.

In *Scenario A* (unchanged relative prices), demand for food increases moderately in Western Europe. (The maximum rise is by 15% in Portugal, the minimum by 4% in Great Britain. In Austria, the rise is about 9%.) By contrast, demand for food increases quite strongly in the accession countries. The rise is highest in Turkey, Romania and Estonia, by 38-39%, and lowest in the Czech Republic, by 28%. (A lower growth rate obtains in Bulgaria, however, as the original Bulgarian data cannot be trusted, one should take the estimates for that country sceptically.)

In *Scenario B* the demand for food virtually stagnates in the *richest* West European countries while increasing more substantially in Spain, Portugal, Italy and Greece. In most accession countries the demand for food increases even more strongly than in Scenario A. The rise in demand for food is particularly strong in Turkey.

In *Scenario C* demand for food actually declines in some of the rich West European countries and rises strongly in the least affluent ones (Spain, Greece, Portugal). Food demand rises further in the poorest countries (Romania, Turkey) and remains as high as in Scenarios A and B in the remaining accession countries.

Tables 4 and 5 provide estimates of total demand for food in Europe by the year 2010, allowing for the population of the individual countries. Table 4 provides the estimates of the food demand volumes (at constant PPS EUR of 1999) and Table 5 recalculates the estimates of Table 4 into actual EUR of 1999 (at the exchange rates of 1999).

According to Table 4, the total demand for food in Europe (including Turkey) will rise by about 11-14% (Scenarios A to C). If there is simultaneously a strong decline in the relative price of food, the rise in total food demand will be about 7% only (Scenario D).

Total demand for food in the accession countries combined (AC-12) appears to be quite insensitive to the changes in relative prices. In Scenarios A to C the rate of growth of AC-12 demand for food is about 32-33%, and in Scenario D 28%. By contrast, the demand for food in the EU-15 (and EFTA-3) and in Turkey appears to be highly sensitive to changes in relative prices. However, the responses go into opposite directions. In Western Europe, the demand for food rises by 9% at unchanged relative prices, by 5-6% in Scenario B, by 3-4% in Scenario C, and declines (by 2% in EU-15, 6% in EFTA-3) in Scenario D. In Turkey, the falling relative food price results in a progressive rise in the demand for food.

Table 4

## Total food consumption at billion 1999 PPS EUR

| Country | 1999 actual | 2010 A | 2010 B | 2010 C | 2010 D |
|---|---|---|---|---|---|
| B | 13.6 | 14.7 | 14.5 | 14.4 | 14.0 |
| DK | 7.0 | 7.5 | 7.2 | 7.1 | 6.6 |
| D | 113.5 | 120.7 | 113.6 | 110.0 | 95.2 |
| EL | 15.3 | 17.3 | 17.5 | 17.6 | 18.1 |
| E | 59.6 | 67.0 | 67.4 | 67.6 | 68.6 |
| F | 90.9 | 100.7 | 98.0 | 96.7 | 91.3 |
| IRL | 4.4 | 4.7 | 4.4 | 4.2 | 3.5 |
| I | 97.0 | 108.0 | 111.0 | 112.5 | 119.2 |
| L | 0.8 | 0.8 | 0.8 | 0.8 | 0.8 |
| NL | 20.2 | 21.5 | 20.2 | 19.6 | 17.0 |
| A | 12.2 | 13.2 | 12.9 | 12.7 | 12.0 |
| P | 14.8 | 16.9 | 17.1 | 17.1 | 17.4 |
| FIN | 6.1 | 6.6 | 6.4 | 6.3 | 5.8 |
| S | 10.6 | 11.4 | 11.1 | 10.9 | 10.2 |
| UK | 75.0 | 77.6 | 70.6 | 67.1 | 52.5 |
| IS | 0.4 | 0.5 | 0.5 | 0.5 | 0.5 |
| NO | 5.7 | 6.2 | 6.1 | 6.0 | 5.7 |
| CH | 11.7 | 12.7 | 12.0 | 11.7 | 10.4 |
| BG | 2.5 | 2.9 | 2.7 | 2.6 | 2.1 |
| CY | 1.6 | 2.2 | 2.2 | 2.1 | 2.0 |
| CZ | 10.2 | 13.1 | 13.1 | 13.1 | 12.6 |
| EE | 1.3 | 1.8 | 1.9 | 1.9 | 1.8 |
| HU | 8.1 | 10.5 | 10.7 | 10.8 | 10.7 |
| LV | 1.6 | 2.2 | 2.2 | 2.2 | 2.0 |
| LT | 3.5 | 4.8 | 4.8 | 4.8 | 4.6 |
| MT | 0.5 | 0.7 | 0.6 | 0.6 | 0.6 |
| PL | 35.2 | 46.2 | 45.8 | 45.3 | 42.5 |
| RO | 15.9 | 21.9 | 22.9 | 23.2 | 24.0 |
| SK | 5.3 | 7.3 | 7.4 | 7.3 | 7.2 |
| SI | 2.0 | 2.5 | 2.6 | 2.6 | 2.6 |
| TU | 55.0 | 76.6 | 81.0 | 82.5 | 87.8 |
| **TOTAL** | **701.3** | **800.8** | **789.0** | **781.7** | **749.4** |
| EU-15 | 540.7 | 588.6 | 572.6 | 564.5 | 532.2 |
| EFTA-3 | 17.8 | 19.4 | 18.6 | 18.2 | 16.7 |
| AC-12 | 87.8 | 116.2 | 116.9 | 116.3 | 112.8 |
| **Growth rates vs. 1999** | | | | | |
| Total | | 0.14 | 0.13 | 0.11 | 0.07 |
| EU-15 | | 0.09 | 0.06 | 0.04 | -0.02 |
| EFTA-3 | | 0.09 | 0.05 | 0.03 | -0.06 |
| AC-12 | | 0.32 | 0.33 | 0.32 | 0.28 |
| Turkey | | 0.39 | 0.47 | 0.50 | 0.60 |

*Source:* Own calculations.

Table 5

**Total food consumption at exchange rates (billion constant 1999 EUR)**

| Country | 1999 actual | 2010 A | 2010 B | 2010 C | 2010 D |
|---|---|---|---|---|---|
| B | 14.0 | 15.1 | 14.9 | 14.8 | 14.4 |
| DK | 8.9 | 9.5 | 9.2 | 9.0 | 8.3 |
| D | 114.3 | 121.6 | 114.4 | 110.8 | 95.9 |
| EL | 14.1 | 16.0 | 16.1 | 16.2 | 16.7 |
| E | 51.4 | 57.8 | 58.2 | 58.4 | 59.2 |
| F | 99.3 | 109.9 | 107.0 | 105.6 | 99.7 |
| IRL | 4.4 | 4.8 | 4.4 | 4.3 | 3.6 |
| I | 94.0 | 104.6 | 107.5 | 109.1 | 115.6 |
| L | 0.8 | 0.9 | 0.9 | 0.9 | 0.8 |
| NL | 18.9 | 20.1 | 18.9 | 18.3 | 15.9 |
| A | 12.7 | 13.8 | 13.5 | 13.3 | 12.6 |
| P | 12.6 | 14.4 | 14.5 | 14.5 | 14.8 |
| FIN | 6.8 | 7.4 | 7.2 | 7.0 | 6.5 |
| S | 12.5 | 13.5 | 13.1 | 12.9 | 12.1 |
| UK | 76.0 | 78.7 | 71.6 | 68.0 | 53.2 |
| IS | 0.7 | 0.8 | 0.8 | 0.8 | 0.8 |
| NO | 8.6 | 9.5 | 9.3 | 9.2 | 8.7 |
| CH | 16.6 | 18.0 | 17.2 | 16.7 | 14.9 |
| BG | 1.0 | 1.2 | 1.1 | 1.1 | 0.9 |
| CY | 1.3 | 1.8 | 1.7 | 1.7 | 1.6 |
| CZ | 4.9 | 6.2 | 6.3 | 6.2 | 6.0 |
| EE | 0.8 | 1.1 | 1.1 | 1.1 | 1.1 |
| HU | 4.2 | 5.5 | 5.6 | 5.6 | 5.6 |
| LV | 1.1 | 1.5 | 1.4 | 1.4 | 1.3 |
| LT | 2.0 | 2.8 | 2.8 | 2.8 | 2.7 |
| MT | 0.4 | 0.6 | 0.6 | 0.6 | 0.5 |
| PL | 18.5 | 24.3 | 24.1 | 23.8 | 22.3 |
| RO | 6.6 | 9.1 | 9.5 | 9.6 | 10.0 |
| SK | 2.6 | 3.6 | 3.6 | 3.6 | 3.5 |
| SI | 1.8 | 2.4 | 2.4 | 2.4 | 2.4 |
| TU | 36.2 | 50.4 | 53.3 | 54.3 | 57.7 |
| **TOTAL** | 648.2 | 726.8 | 712.1 | 703.9 | 669.3 |
| EU-15 | 540.7 | 588.1 | 571.4 | 563.0 | 529.2 |
| EFTA-3 | 25.9 | 28.3 | 27.2 | 26.6 | 24.3 |
| AC-12 | 45.3 | 60.0 | 60.2 | 59.9 | 57.9 |
| **Growth rates vs. 1999** | | | | | |
| Total | | 0.12 | 0.10 | 0.09 | 0.03 |
| EU-15 | | 0.09 | 0.06 | 0.04 | -0.02 |
| EFTA-3 | | 0.09 | 0.05 | 0.03 | -0.06 |
| AC-12 | | 0.32 | 0.33 | 0.32 | 0.28 |
| Turkey | | 0.39 | 0.47 | 0.50 | 0.60 |

*Source:* Own calculations.

It may be observed that one implication of the calculations of Table 4 is the rise in the significance of the AC-12 as food consumers. In 1999, those countries consumed 13.6% of all food consumed in the 30 European countries considered (excluding Turkey). By 2010, their share will rise to 16-17% (depending on the price scenario).

Finally, according to Table 5, the total value (at constant EUR, at exchange rates of 1999) of food demand is markedly lower than at the PPS EUR in the AC-12 and in Turkey. This is the consequence of the huge differences between the exchange rates and the PPS for food in 1999. At constant exchange rates, the value of food consumption realized in the AC-12 constituted 7.4% of the combined value of food consumption in 30 European countries (excluding Turkey). By 2010 that share will rise to 8.9-9.5% (depending on the price scenario). Of course, at *current* exchange rates of 2010, those shares will be somewhat higher because one should expect some narrowing of the gaps between the future PPS and the future exchange rates. The process will be slow yet. Eventually, at current exchange rates the value of food consumed by the AC-12 will certainly constitute much less than 16-17% of the value of food consumed by the 30 European countries combined.

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