FUNDAMENTAL SIMILARITIES IN CONSUMER BEHAVIOR*

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Kenneth W Clements

and

Dongling Chen

Economic Research Centre
Department of Economics
The University of Western Australia

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Kenneth W Clements
Economic Research Centre
Department of Economics
The University of Western Australia

and

Dongling Chen
Department of Economics
The University of Chicago
and
Economic Research Centre
Department of Economics
The University of Western Australia

Abstract

This paper sheds light on the diversities and similarities in international consumption patterns. We employ a large body of data to identify cross-country consumption differences and then attempt to understand them in terms of the familiar utility-maximising framework in which observed differences in prices and incomes play the key role. In effect, our approach is to eschew the ad hocery of "special case" explanations and ask, to what extent can a simple model be used to tell a common story to account for the observed differences in consumption across countries? Taken as a whole, the results reveal a surprising degree of similarity in international consumption patterns and support the idea that tastes are constant, at least with respect to the broad commodity groups.

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1. Introduction

Why is it that Asians eat rice and Europeans bread? Is it because climatic conditions cause rice to be cheaper in Asia, or are there other (physiological and/or psychological?) differences? Do we have to resort to the old-favorite that tastes are simply different? Similarly, do Australians drink beer, the French wine and Americans spirits for no better reason than tradition? Why does food absorb about one half of the consumption budget in the poorest countries, and only 20 percent for the most affluent?

These are but a couple of examples of the diversity that seems to pervade cross-country consumption comparisons. Yet at the same time there also seem to be forces at work which blur these differences: Transport and communication costs and other barriers to international trade have fallen dramatically over the last 30 years, leading to an explosion of world trade, international travel and migration. For these reasons there has been a tendency towards homogenising or convergence of consumption patterns in different countries. Examples include the growth of ethnic restaurants in all major western cities; McDonalds and other fast-food outlets prospering in many places other than America, the country of origin; western fashions in clothes becoming common in many eastern and southern countries; and American movies now dominating entertainment markets in almost all countries.

This paper sheds light on the diversities and similarities in international consumption patterns. We employ a large body of data to identify cross-country differences and then attempt to understand them in terms of the familiar utility-maximising framework in which

observed differences in prices and incomes play the key role. In effect, our approach is to eschew the ad hocery of "special case" explanations and ask, to what extent can a simple model be used to tell a common story to account for the observed differences in consumption across countries?

Section 2 of the paper presents consumption data in rich and poor countries, together with some summary measures. In Section 3 we analyse the extent to which tastes are constant by comparing demand elasticities in the two groups of countries. Section 4 considers the issue of what constitutes a rich country. The next four sections of the paper deal with food consumption in a large number of countries and identify a number of intriguing empirical regularities, including the particular form of the dependence of the food budget share on income. Taken as a whole, the results reveal a surprising degree of similarity in international consumption patterns and support the idea that tastes are constant, at least with respect to the broad commodity groups.¹

2. Consumption Patterns in Rich and Poor Countries

In this section we provide a descriptive comparison of consumption patterns in a group of OECD countries with those in developing countries. Table 1 gives details of the individual countries in each group.

Let p_{it}^c and q_{it}^c be the price and quantity consumed of good i in year t and country c . If there are n goods, $\sum_{i=1}^n p_{it}^c q_{it}^c = M_t^c$ is then total expenditure ("income" for short) and $w_{it}^c = p_{it}^c q_{it}^c / M_t^c$ is the budget share of good i . Further, let $Dp_{it}^c = \log p_{it}^c - \log p_{i,t-1}^c$ be

Table 1
Characteristics of the First Database

Country	Sample period	Mean per capita GDP in	
		International dollars in 1985 prices	(3) with USA = 100
(1)	(2)	(3)	(4)
<u>OECD</u>			
1. USA	1960-1981	13,012	100.0
2. Switzerland	1960-1981	12,224	93.9
3. Canada	1960-1981	10,879	83.6
4. Australia	1960-1981	9,659	74.2
5. Sweden	1964-1981	9,538	73.3
6. Denmark	1966-1981	9,109	70.0
7. France	1964-1981	9,086	69.8
8. Norway	1964-1981	8,898	68.4
9. Germany	1960-1981	8,548	65.7
10. UK	1964-1981	8,466	65.1
11. Japan	1970-1981	8,237	63.3
12. Belgium	1960-1981	7,925	60.9
13. Austria	1964-1981	7,520	57.8
14. Italy	1964-1981	7,512	57.7
15. Netherlands	1952-1977	6,881	52.9
16. Finland	1960-1977	6,702	51.5
17. Iceland	1960-1973	6,673	51.3
18. Spain	1964-1977	5,381	41.4
<u>LDCs</u>			
19. Israel	1970-1984	8,077	62.1
20. Hong Kong	1970-1984	7,035	54.1
21. Singapore	1967-1984	6,420	49.3
22. Puerto Rico	1963-1984	5,831	44.8
23. Mexico	1970-1983	4,939	38.0
24. Malta	1973-1984	4,398	33.8
25. Colombia	1972-1983	3,053	23.5
26. Ecuador	1973-1984	2,809	21.6
27. Taiwan	1962-1986	2,677	20.6
28. Korea	1963-1984	2,271	17.5
29. Thailand	1967-1984	1,795	13.8
30. Sri Lanka	1963-1984	1,469	11.3
31. Zimbabwe	1970-1982	1,290	9.9

Source: See Appendix.

the log-change in the i^{th} price; $Dq_{it}^c = \log q_{it}^c - \log q_{i,t-1}^c$ be the corresponding quantity log-change; and let $\bar{w}_{it}^c = \frac{1}{2}(w_{it}^c + w_{i,t-1}^c)$ be the arithmetic average of the budget share of i over the years t and $t-1$. If T^c is the sample size for country c , we can then eliminate the time dimension by averaging to define $Dp_i^c = (1/T^c) \sum_{t=1}^{T^c} Dp_{it}^c$, $Dq_i^c = (1/T^c) \sum_{t=1}^{T^c} Dq_{it}^c$ and $\bar{w}_i^c = (1/T^c) \sum_{t=1}^{T^c} \bar{w}_{it}^c$.

Column 2 of Table 2 gives the budget shares $\bar{w}_i^c$ for $i=1, \dots, 8$ goods, averaged over the 18 OECD countries; column 3 contains the same budget shares averaged over the 13 LDCs. The entries in the remaining columns, for the prices and quantities, are similarly averaged over countries. The Divisia price and volume indexes are defined as

$$(2.1) \quad DP_t^c = \sum_{i=1}^8 \bar{w}_{it}^c Dp_{it}^c, \quad DQ_t^c = \sum_{i=1}^8 \bar{w}_{it}^c Dq_{it}^c,$$

which measure the overall growth in prices and quantities. Row 9 of the table contains (2.1) averaged over time and countries.

Columns 2 and 3 of Table 2 reveal the following differences in the budget shares for the two groups of countries [(OECD - LDC) * 100]:

1. Food	-10.85	5. Medicine	1.29
2. Clothing	-.12	6. Transport	2.65
3. Housing	4.94	7. Recreation	1.56
4. Durables	.61	8. Other	-.08

Figure 1 plots these differences. As can be seen, the major difference in the structure of consumption is that food is relatively less important in the OECD, which is a reflection of Engel's law. The "saving" on food is redistributed to housing and transport in

Table 2
Comparison of Consumption Patterns
in the OECD and LDCs

Commodity (1)	Budget shares		Prices		Per capita quantities	
	OECD (2)	LDCs (3)	OECD (4)	LDCs (5)	OECD (6)	LDCs (7)
Undeclared log-changes						
1. Food	29.59	40.44	6.77	14.28	1.67	1.69
2. Clothing	9.17	9.29	6.03	12.61	2.38	3.45
3. Housing	16.35	11.41	7.69	13.37	3.30	3.74
4. Durables	9.04	8.43	6.28	13.34	3.26	4.01
5. Medicine	5.06	3.77	7.87	13.85	4.09	4.54
6. Transport	12.37	9.72	7.07	14.55	4.89	5.29
7. Recreation	7.49	5.93	6.84	13.53	4.34	4.87
8. Other	10.94	11.02	7.98	14.54	3.17	4.25
9. Divisia index			7.05	13.97	3.05	3.23
Deflated log-changes						
10. Food			-.28	.31	-1.38	-1.54
11. Clothing			-1.02	-1.36	-.66	.21
12. Housing			.64	-.60	.26	.50
13. Durables			-.77	-.63	.21	.77
14. Medicine			.83	-.12	1.04	1.30
15. Transport			.03	.58	1.84	2.05
16. Recreation			-.21	-.43	1.29	1.63
17. Other			.93	.58	.12	1.01

The log-changes in the upper part of the table are deflated by the corresponding Divisia index given in row 9 to yield the deflated log-changes in the lower part. All entries are to be divided by 100. See Appendix for further details.

particular. Other than this, there is a good deal of similarity in the budget shares across countries. This is also apparent from the graph in the top left-hand corner of Figure 2, where the correlation between the two sets of budget shares is .96.

Figure 1

Percentage Budget Shares: OECD less LDCs

Figure 2

Budget Shares, Prices and Quantities for 8 Commodities:

OECD versus LDCs

The graph in the top right-hand corner of Figure 2 shows that all of the quantity log-changes for the LDCs are slightly larger than those for the OECD. In part, this reflects the faster growth in the overall volume of per capita consumption in the LDCs, as measured by the Divisia volume index -- 3.23 percent p.a. for the LDCs versus 3.05 percent for the OECD (see row 9, columns 6 and 7 of Table 2). Even after the quantities are adjusted for this differing overall growth, the same broad pattern emerges, as indicated in the bottom right-hand corner of Figure 2. Note also that the correlation between the two sets of quantity log-changes is again quite high at .95. On the other hand, however, prices in the two groups of countries are more dissimilar, with a correlation coefficient of .57 (see the bottom left-hand corner of Figure 2).

To compare the co-movement of prices and quantities, we use the data given in the lower part of Table 2 to subtract the deflated quantity and price log-changes in the LDCs from the corresponding values for the OECD to yield:

	$Dq_i - DQ$ $\times 100$	$Dp_i - DP$ $\times 100$
1. Food	.16	-.59
2. Clothing	-.87	.34
3. Housing	-.24	1.24
4. Durables	-.56	-.14
5. Medicine	-.26	.95
6. Transport	-.21	-.55
7. Recreation	-.34	.22
8. Other	-.89	.35

As can be seen, in six of the eight cases the quantity and price changes have opposite signs, indicating that consumption of a commodity grows faster when its relative price falls and vice versa.

Although this is encouraging support for the law of demand, we shall resist the temptation to pursue this further and postpone until the next section a more formal analysis of consumer behavior.

Next, we compute Divisia summary measures of the data and start with the price and volume indexes, reproduced in the first two rows of Table 3. As can be seen, the LDCs grow slightly faster than the OECD, but at the expense of much higher inflation (14.0 percent p.a. versus 7.1).

Table 3

Divisia Measures for the OECD and LDCs

Variable	OECD	LDCs
1. Price index ($\times 10^{-2}$)	7.05	13.97
2. Per capita volume index ($\times 10^{-2}$)	3.05	3.23
3. Price variance ($\times 10^{-4}$)	6.54	21.88
4. Quantity variance ($\times 10^{-4}$)	12.96	30.43
5. Price-quantity correlation	-.26	-.27

Source: See Appendix.

The Divisia price and quantity variances are defined as (Theil, 1967, Chap. 5)

$$(2.2) \quad \Pi_t^C = \sum_{i=1}^8 \bar{w}_{it}^C (Dp_{it}^C - DP_t^C)^2, \quad K_t^C = \sum_{i=1}^8 \bar{w}_{it}^C (Dq_{it}^C - DQ_t^C)^2.$$

These measure the degree to which the prices and quantities of the individual goods move disproportionately. The corresponding price-quantity covariance is $\Gamma_t^C = \sum_{i=1}^8 \bar{w}_{it}^C (Dp_{it}^C - DP_t^C)(Dq_{it}^C - DQ_t^C)$, with correlation

$$(2.3) \quad \rho_t^C = \frac{\Gamma_t^C}{\sqrt{\Pi_t^C \times K_t^C}} .$$

Given the tendency of the consumer to move away from those commodities with above-average price rises, we expect ρ to be negative. Rows 3-5 of Table 3 contain the measures defined by equations (2.2) and (2.3) averaged over time and countries. The results reveal that both prices and quantities are much less variable in the OECD: The standard deviation of prices in the OECD is $\sqrt{6.54 \times 10^{-2}} = 2.6$ percent p.a., a little over half that for the LDCs ($\sqrt{21.88 \times 10^{-2}} = 4.7$ percent); the standard deviation of quantities in the OECD is $\sqrt{12.96 \times 10^{-2}} = 3.6$ percent, about two percentage points less than that for LDCs ($\sqrt{30.43 \times 10^{-2}} = 5.5$ percent). Interestingly however, the coefficients of variation are more similar in the two groups of countries:

	<u>OECD</u>	<u>LDCs</u>
Prices	$\frac{2.6}{7.1} = .37$	$\frac{4.7}{14.0} = .34$
Quantities	$\frac{3.6}{3.1} = 1.16$	$\frac{5.5}{3.2} = 1.72$

Finally, row 5 of Table 3 shows that the price-quantity correlations for the two groups are remarkably close (-.26 and -.27).

3. The Constancy of Tastes

Utility maximization theory usually postulates that tastes are fixed, so that it is only the observable variables income and prices that explain consumption. There is a compelling reason for treating tastes (an unobservable) as constant: As the necessarily ad hoc auxiliary assumptions about the evolution of tastes are avoided, utility theory thereby has more applicability, generality and explanatory power. In a highly-influential paper, Stigler and Becker (1977) advocate treating tastes as fixed along these lines. They show that a number of examples of apparently capricious behavior (addiction, custom, tradition, fashion, etc.) can in fact be reconciled with the assumption of stable preferences. Stigler and Becker (p. 89) argue that

no significant behavior has been illuminated by the assumption of differences in tastes. Instead, they, along with the assumption of unstable tastes, have been a convenient crutch to lean on when the analysis has bogged down. They give the appearance of considered judgement, yet really have only been ad hoc arguments that disguise analytical failures.

The hypothesis of stable preferences can be tested by estimating demand equations for different groups of consumers and then analysing the extent to which the parameters (such as the income and price elasticities) differ across consumers. In this section we pursue this idea by comparing estimates of demand equations for the OECD with those for the LDCs.

We start with a double-log demand equation for good i in country

c :

$$(3.1) \quad Dq_{it}^c = a_i^c + \eta_i^c Dq_t^c + \gamma_i^c D\left(\frac{p_{it}^c}{p_t^c}\right),$$

where a_i^c is an intercept, which, in view of the first-difference formulation, plays the role of a trend term; η_i^c is the i^{th} income elasticity; γ_i^c is the own-price elasticity of i ; and $D(p_{it}^c/p_t^c) = Dp_{it}^c - DP_t^c$ is the log-change in the i^{th} deflated price. We use the data described in the previous section for the $c=1, \dots, 31$ countries to estimate by least squares (3.1) for $i=1, \dots, 8$ goods. The upper part of Table 4 contains the estimates averaged over the members of the OECD countries and the LDCs.² Looking at columns 2 and 3, we see that the autonomous trends are fairly close in the two groups of countries, the only major exception being for transport. Columns 4 and 5 reveal that the food income elasticity is lower in the OECD, which is plausible as this means that food is less of a luxury (or more of a necessity) at higher income levels. The lower part of the table indicates that the difference between the food income elasticities has a t -value of -1.66, which is almost significant at the 10 percent level. The same column also shows that the difference in the income elasticities for transport is significant. The remaining six income elasticities are again fairly similar. Finally, regarding the price elasticities, only the differences for clothing and transport are highly significant. Note that in all three instances (i.e., the autonomous trends, income and price elasticities), the differences for transport are significant, which points to the possibility of some fundamental differences between the OECD and the LDCs regarding this commodity.

Table 4

Comparison of Autonomous Trends and Demand Elasticities in the OECD and LDCs

Commodity (1)	Autonomous trends x 100		Income elasticities		Price elasticities	
	OECD	LDC	OECD	LDC	OECD	LDC
	(2)	(3)	(4)	(5)	(6)	(7)
<u>Estimates (standard errors in parentheses)</u>						
1. Food	-.24 (.18)	-.57 (.23)	.50 (.04)	.71 (.06)	-.37 (.05)	-.34 (.08)
2. Clothing	-2.86 (.31)	-1.87 (.46)	1.46 (.07)	1.33 (.12)	-.67 (.09)	-.36 (.09)
3. Housing	2.58 (.17)	2.30 (.33)	.31 (.04)	.36 (.07)	-.13 (.04)	-.15 (.07)
4. Durables	-2.39 (.37)	-1.63 (.52)	1.74 (.09)	1.77 (.14)	-.62 (.11)	-.51 (.12)
5. Medicine	2.61 (.44)	1.93 (.54)	.66 (.12)	.81 (.16)	-.17 (.11)	-.31 (.12)
6. Transport	-1.22 (.40)	.28 (.45)	2.00 (.09)	1.55 (.12)	-.74 (.12)	-.28 (.07)
7. Recreation	.64 (.36)	.69 (.40)	1.19 (.09)	1.13 (.12)	-.74 (.09)	-.42 (.10)
8. Other	.24 (.27)	.51 (.47)	1.05 (.06)	1.19 (.14)	-.37 (.08)	-.32 (.11)
<u>Differences, OECD - LDC (standard errors in parentheses)</u>						
9. Food	.33 (.29)		-.12 (.07)		-.03 (.09)	
10. Clothing	-.99 (.55)		.13 (.14)		-.31 (.13)	
11. Housing	.28 (.37)		-.05 (.08)		.02 (.08)	
12. Durables	-.76 (.64)		-.03 (.17)		-.11 (.16)	
13. Medicine	.68 (.70)		-.15 (.20)		.14 (.16)	
14. Transport	-1.50 (.60)		.45 (.15)		-.46 (.14)	
15. Recreation	-.05 (.54)		.06 (.15)		-.32 (.13)	
16. Other	-.27 (.54)		-.14 (.15)		-.05 (.14)	
<u>t-values of differences</u>						
17. Food	1.13		-1.66		-.32	
18. Clothing	-1.78		.94		-2.44	
19. Housing	.75		-.62		.25	
20. Durables	-1.19		-.18		-.68	
21. Medicine	.98		-.75		.86	
22. Transport	-2.49		3.00		-3.31	
23. Recreation	-.09		.40		-2.38	
24. Other	-.50		-.92		-.37	
25. Mean of t	1.11		1.03		1.34	

The standard errors of the differences (given in the middle part of the table) are the squared roots of the sums of the two corresponding variances. The t-values (bottom part) are computed as the ratios of the differences and their standard errors.

The upper part of Figure 3 illustrates the closeness of the autonomous trends and income elasticities in the two groups of countries. The correlation coefficients here are both .96. For $n = 8$, the t-value of $r = .96$ is $r\sqrt{n-2}/\sqrt{1-r^2} = 8.40$ (Johnston, 1972, p. 36), which is significantly different from zero at the 5 percent level. The lower part of the figure shows that the price elasticities are not so highly correlated, mainly because of the higher absolute values of the elasticities for clothing, transport and recreation in the OECD.

Taken as a whole, the results are quite striking: There is a surprising degree of similarity in consumer behavior across widely differing groups of countries. In other words, if we control for observable differences in incomes and prices, then consumption patterns are more or less the same worldwide, at least to a first approximation. That is, differences in tastes play no role. This strong result is, of course, subject to two qualifications: First, we are only dealing with commodities that are broad aggregates and presumably it would be reasonable to expect more idiosyncrasy and heterogeneity for goods which are more narrowly defined.³ Second, our analysis deals with groups of countries, rather than individual countries (let alone individual consumers), and again heterogeneity may rise as the unit of analysis becomes smaller.⁴

4. What Constitutes a Rich Country?

In the two previous sections we divided countries into two groups: OECD and non-OECD, which we called LDCs. In order to assess the sensitivity of the results with respect to the grouping of countries, in this section we experiment with some alternatives which are set out in Table 5. In the first version of the grouping, the USA

Figure 3
Comparison of Demand Elasticities in
the OECD and LDCs

Table 5

Alternative Definitions of Rich and Poor Countries

Country	Mean per capita GDP in international dollars in 1985 prices	Definition of country groups					
		1	2	3	4	5	6
1. USA	13,012	Rich	Rich	Rich	Rich	Rich	Rich
2. Switzerland	12,224						
3. Canada	10,879						
4. Australia	9,659						
5. Sweden	9,538						
6. Denmark	9,109						
7. France	9,086						
8. Norway	8,898						
9. Germany	8,548						
10. UK	8,466						
11. Japan	8,237						
12. Belgium	7,925						
13. Austria	7,520						
14. Italy	7,512						
15. Netherlands	6,881						
16. Finland	6,702						
17. Iceland	6,673						
18. Spain	5,381	Poor	Poor	Poor	Poor	Poor	Poor
19. Israel	8,077						
20. Hong Kong	7,035						
21. Singapore	6,420						
22. Puerto Rico	5,831						
23. Mexico	4,939						
24. Malta	4,398						
25. Colombia	3,053						
26. Ecuador	2,809						
27. Taiwan	2,677						
28. Korea	2,271						
29. Thailand	1,795						
30. Sri Lanka	1,469						
31. Zimbabwe	1,290						

to Iceland are classified as rich, while Spain to Zimbabwe are poor; version 2 corresponds to the previous OECD/LDC split; and in the sixth version those countries with a GDP per capita of less than \$5,000 are classified as poor.

Table 6 summarises the results for the comparisons of the budget shares, prices and quantities. As can be seen, for all six versions of the grouping, the budget shares are highly correlated in the rich and poor countries; the same is true for the quantities; and the prices display more diversity internationally. Table 7 presents the Divisia measures for the various country groups; this is the 6-version extension of Table 3. Here also none of the results is particularly sensitive to alternative country groupings.

Table 6
Correlations between Consumption
Patterns in Rich and Poor Countries

Version of country groupings	Budget shares	Prices	Per capita quantities
(1)	(2)	(3)	(4)
1	.958	.583	.950
2	.962	.570	.945
3	.949	.430	.911
4	.950	.375	.922
5	.954	.346	.935
6	.951	.273	.935

See Table 5 for the definitions of the country groups. The detailed results (corresponding to Table 2) are given in the Appendix.

Table 7
Divisia Measures for Rich and Poor Countries

Country group	Price index $\times 10^{-2}$	Per capita volume index $\times 10^{-2}$	Price variance $\times 10^{-4}$	Quantity variance $\times 10^{-4}$	Price-quantity correlation
(1)	(2)	(3)	(4)	(5)	(6)
<u>Version 1</u>					
Rich	6.87	2.96	6.46	12.97	-.26
Poor	13.68	3.33	20.89	29.16	-.27
<u>Version 2</u>					
Rich	7.05	3.05	6.54	12.96	-.26
Poor	13.97	3.23	21.88	30.43	-.27
<u>Version 3</u>					
Rich	9.49	3.03	8.08	13.88	-.26
Poor	10.67	3.28	20.73	30.43	-.28
<u>Version 4</u>					
Rich	9.45	3.14	8.99	16.02	-.26
Poor	10.85	3.10	20.24	28.03	-.28
<u>Version 5</u>					
Rich	9.18	3.26	9.12	15.99	-.26
Poor	11.56	2.84	21.08	29.31	-.28
<u>Version 6</u>					
Rich	9.00	3.24	9.12	16.51	-.26
Poor	12.27	2.85	22.40	29.50	-.27

See Table 5 for the definition of the rich and poor countries.

Regarding the differences in the demand parameters, Table 8 gives the results. In just about all cases, the trends and income elasticities are fairly highly correlated, while for the price elasticities the relationship is weaker. Also, in all cases the mean $|t|$ -values of the differences between the rich and the poor are not highly significant.

To summarise this section, the identification of the differences between rich and poor countries is not particularly sensitive to how we define these countries. In a similar vein, the lack of systematic differences in demand parameters across countries also seems to be quite robust. Accordingly, we can have some confidence that the results are not just an artefact of the initial grouping of countries.

5. Food Consumption

In most countries, food dominates the consumer's budget. Going back to Table 2, it can be seen that it is the largest single commodity with a budget share of 30 percent for the OECD countries and 40 percent in the LDCs. In recognition of the importance of this commodity, in this and the next three sections we present some intriguing empirical regularities pertaining to international food consumption patterns.

Table 9 presents the budget share of food and income at sample means in 43 countries. As can be seen, Americans devote 18 percent of total consumption expenditure to food, while Koreans (row 43), with a per capita income of 7.4 percent that of the Americans, spend 60 percent on food. Figure 4 is a scatter plot of the food budget share against the logarithm of GDP per capita. The solid line is the least-squares regression line and, with one major exception, it is clear

Table 8
Relationship Between Demand Parameters in Rich and Poor Countries

Version of country groupings	Autonomous trends		Income elasticities		Price elasticities	
	Correlation coefficient	Mean t -value of difference	Correlation coefficient	Mean t -value of difference	Correlation coefficient	Mean t -value of difference
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	.964	1.21	.973	1.08	.613	1.46
2	.957	1.11	.956	1.03	.607	1.34
3	.935	1.32	.931	1.20	.648	1.17
4	.855	1.52	.917	1.38	.687	.88
5	.746	1.89	.873	1.49	.712	.86
6	.717	1.81	.839	1.56	.488	1.25

See Table 5 for the definition of the country groups. For a given type of parameter, the mean |t|-value is the mean (over the 8 commodities) of the absolute values of the t-statistics for the test that the parameter is equal in the rich and poor countries. The detailed results (corresponding to Table 4) are given in the Appendix.

Table 9

Characteristics of the Second Database

Country	Sample period	Food budget share x 100	Mean per capita GDP		Country	Sample period	Food budget share x 100	Mean per capita GDP	
			International dollars in 1985 prices	(4) with USA=100				International dollars in 1985 prices	(9) with USA=100
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. USA	1968-1981	17.6	14125	100.0	23. UK*	1955-1968	39.7	6594	46.7
2. Switzerland	1960-1981	32.2	12224	86.5	24. Singapore	1967-1984	28.7	6420	45.5
3. Canada	1960-1981	22.6	10879	77.0	25. Spain	1964-1977	37.6	5381	38.1
4. USA*	1955-1968	26.7	10700	75.8	26. Mexico	1970-1983	38.9	4939	35.0
5. Australia	1966-1981	26.9	10431	73.8	27. Israel*	1959-1968	31.9	4736	33.5
6. Sweden	1968-1981	27.8	9953	70.5	28. Italy*	1955-1968	46.3	4731	33.5
7. Denmark	1966-1981	28.3	9109	64.5	29. Puerto Rico	1967-1984	31.0	4686	33.2
8. France	1964-1981	25.9	9086	64.3	30. Malta	1973-1984	36.0	4398	31.1
9. Norway	1964-1981	31.0	8898	63.0	31. Puerto Rico*	1955-1967	35.6	3723	26.4
10. UK	1968-1981	24.1	8816	62.4	32. Ireland	1955-1968	49.2	3481	24.6
11. Germany	1960-1981	30.1	8548	60.5	33. South Africa	1955-1968	36.8	3262	23.1
12. Japan	1970-1981	27.4	8237	58.3	34. Colombia	1972-1983	39.4	3059	21.7
13. Israel	1970-1984	29.2	8077	57.2	35. Taiwan	1962-1986	48.5	2677	19.0
14. Italy	1968-1981	35.2	8074	57.2	36. Korea	1968-1984	50.8	2601	18.4
15. Belgium	1960-1981	30.1	7925	56.1	37. Greece	1958-1968	46.8	2412	17.1
16. Austria	1964-1981	29.3	7520	53.2	38. Panama	1960-1968	45.5	1924	13.6
17. Australia*	1955-1966	33.3	7296	51.7	39. Thailand	1969-1984	52.6	1852	13.1
18. Hong Kong	1970-1984	29.1	7035	49.8	40. Sri Lanka	1963-1984	64.2	1469	10.4
19. Sweden*	1955-1968	36.6	7010	49.6	41. Zimbabwe	1970-1982	35.1	1290	9.1
20. Netherlands	1952-1977	32.6	6881	48.7	42. Thailand*	1960-1969	57.6	1182	8.4
21. Finland	1960-1977	36.9	6702	47.4	43. Korea*	1955-1968	59.9	1048	7.4
22. Iceland	1960-1973	31.4	6673	47.2					
					44. Mean		36.2	6304	44.6

An asterisk (*) indicates a second period for a country. The means in row 44 exclude the values in row 41.

Source: See Appendix.

Figure 4

Food Budget Share and GDP in 43 Countries

that the points are scattered fairly closely around this line. The model underlying the scatter is Working's (1943):

$$(5.1) \quad w = \alpha + \beta \log M ,$$

where w is the budget share of food and M is now per capita GDP. With Zimbabwe omitted, the LS estimate of the income coefficient β in (5.1) is

$$(5.2) \quad \hat{\beta} = -.148 (.010) ,$$

where the figure in parenthesis is the standard error.⁵ The value of R^2 associated with model (5.1) is .84, which is impressively high in view of the great differences among the 42 countries.⁶

Although Working's model seems to work satisfactorily, before proceeding further it is proper to analyse alternative functional forms. A simple generalisation of (5.1) is

$$(5.3) \quad w = \gamma + \delta M^{(\lambda)} ,$$

where $M^{(\lambda)} = (M^\lambda - 1)/\lambda$ is a Box-Cox (1964) transformation of income with parameter λ . Model (5.3) has been previously proposed by Laitinen et al. (1983). Let p, q be the price and quantity consumed of food and $\theta = \partial(pq)/\partial M$ be the corresponding marginal share. This share answers the question, when income rises by one dollar, by how much does food expenditure increase? Multiplying both sides of (5.3) by M , using $w = pq/M$ and then differentiating with respect to M , we obtain

$$(5.4) \quad \theta = \gamma + \frac{\delta}{\lambda} \left[(\lambda + 1) M^\lambda - 1 \right] .$$

Consider four special cases of equation (5.3), with each case corresponding to a particular value of the Box-Cox parameter λ :

- (i) When $\lambda \rightarrow 0$, equation (5.3) becomes Working's model, $w = \gamma + \delta \log M$, with γ and δ now interpreted as α and β of model (5.1). If we use (5.3) to write (5.4) as $\theta = w + \delta M^\lambda$, it then follows that in this case the marginal share takes the form $\theta = w + \delta$.
- (ii) When $\lambda = -1$, equation (5.3) becomes $w = \gamma - \delta(1/M - 1)$. Multiplying both sides by M , we obtain $pq = -\delta + (\gamma + \delta)M$, which is an equation of the linear expenditure system, LES (Stone, 1954). Here, $\theta = \gamma + \delta$, a constant.
- (iii) When $\lambda = 1$, equation (5.3) becomes equivalent to $pq = (\gamma - \delta)M + \delta M^2$, the quadratic expenditure system (Pollak and Wales, 1978) and $\theta = \gamma - \delta + 2\delta M$.
- (iv) For $\lambda = -2$, equation (5.3) implies that expenditure on food is homogeneously linear in income and its reciprocal: $pq = (\gamma + \delta')M - \delta' M^{-1}$, where $\delta' = \delta/2$. In this case, $\theta = \gamma + \delta'(1 + M^{-2})$.

Using the data in Table 9 (excluding row 41 for Zimbabwe), we estimate equation (5.3) by least squares with λ fixed at the above values. The estimates are presented in first four rows of Table 10. Column 5 tabulates the marginal share (at means) implied by the estimates of each model. Three of the four values of θ are fairly similar, while that from the linear reciprocal model is very different at -.01. As this value implies that food is an inferior good, this

Table 10

Estimates of Alternative Engel Curves for Food: 42 Countries

$$w = \gamma + \delta M^{(\lambda)}$$

(Standard errors in parentheses)

Model	Box-Cox parameter λ	Intercept γ	Income coefficient δ	Implied marginal share θ	R^2	SEE	Log- likelihood value	χ^2
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1. Working's	0	1.627 (8.878×10 ⁻²)	-1.475×10 ⁻¹ (1.032×10 ⁻²)	.21	.84	.043	73.55	.42
2. LES	-1	4.542×10 ² (3.948×10)	-4.539×10 ² (3.949×10)	.26	.77	.051	66.21	15.10
3. Quadratic	1	5.388×10 ⁻¹ (1.876×10 ⁻¹)	-2.800×10 ⁻⁵ (2.658×10 ⁻⁶)	.19	.74	.054	63.46	20.60
4. Linear reciprocal	-2	4.355×10 ⁵ (5.611×10 ⁴)	-8.711×10 ⁵ (1.122×10 ⁵)	-.01	.60	.069	54.80	37.92
5. Box-Cox	-.129	2.579 (1.544×10 ⁻¹)	-4.274×10 ⁻¹ (2.973×10 ⁻²)	.20	.84	.043	73.76	-

SEE denotes the standard error of estimate. The χ^2 value tests the hypothesis H_0 : The Box-Cox parameter $\lambda = \lambda_0$, $\lambda_0 = 0, -1, 1, -2$, against the alternative H_A : $\lambda \neq \lambda_0$.

model must be regarded as implausible. Row 5 of the table presents the maximum likelihood estimates (under normality) when λ is treated as an unknown parameter.

We test whether the four special cases of the model lead to a significant reduction in the goodness of fit by means of a likelihood ratio test and column 9 of Table 10 contains the results. These test statistics follow an asymptotic chi-squared distribution with 1 degree of freedom. The conclusion is that all except one of the χ^2 values are significant at the 5 percent level (the critical value being 3.84), indicating that the associated models must be rejected. For Working's model, however, the observed χ^2 value is .42, which is not significant, so we are unable to reject that model. In other words, among the four alternatives, Working's model dominates and is not significantly different from the more general Box-Cox case.⁷

6. The Income Elasticity of Food

According to Engel's law, food is a necessity, its income elasticity being less than one. There is possibly no other law in all of economics that has received such strong empirical support (see, e.g., Houthakker, 1957). Engel's law relates to the level of the income elasticity; in this section we consider something a little different, viz., how this elasticity changes with income.

Consider moving from a poor consumer (or country) to a rich one. What would we expect the food income elasticity to do? As food is always a necessity, the elasticity will be less than one for both consumers. As income rises, however, we would not expect food to become more of a luxury (or less of a necessity), as it would if the elasticity were to rise. Rather, the effect of higher affluence would

be to cause the income elasticity to fall (Theil, 1983). This idea is confirmed by the evidence presented in Table 4 where the average income elasticity of food in the OECD countries is lower than that in the LDCs.

The food income elasticity implied by the Box-Cox model (5.3) takes the form $\eta = 1 + (\delta/w)M^\lambda$. We evaluate this elasticity for each country (by using the observed budget share) and the parameter values associated with Working's model, LES and the quadratic,⁸ from Table 10. Table 11 contains the results and, as can be seen by going up column 3, the elasticities from Working's model decrease from .8 for Korea (the poorest country) to .2 for the USA (the richest). This decrease in the elasticities agrees with intuition, as discussed above. Under LES (column 4), however, the elasticities move in the opposite (i.e., wrong) direction: moreover, for some rich countries the elasticity now exceeds one, implying that food is a luxury which is completely implausible. The elasticities from the quadratic decrease with income, but there is the problem that they decrease so much that food is inferior for the six richest countries, which is unacceptable.

It should be emphasised that these changes in the value of the food elasticity reflect properties of the underlying model, i.e., they are general and not data dependent.⁹ The results of this section thus provide additional support for Working's model. Only for this model does the food income elasticity behave in an entirely satisfactory manner. Accordingly, not only does Working's model provide the best fit (as discussed in the previous section), it also has highly desirable economic implications.

Table 11

GDP and the Food Income Elasticity for Three Models in 42 Countries

Country (1)	GDP per capita (2)	Model		
		Working's (3)	LES (4)	Quadratic (5)
1. USA	100	.165	1.477	-1.434
2. Switzerland	87	.543	.807	-.453
3. Canada	77	.350	1.150	-.312
4. USA*	76	.449	.970	-.227
5. Australia	74	.454	.967	-.169
6. Sweden	70	.471	.935	-.067
7. Denmark	64	.481	.919	.101
8. France	64	.432	1.004	.115
9. Norway	63	.526	.839	.130
10. UK	62	.390	1.079	.187
11. Germany	61	.512	.864	.199
12. Japan	58	.464	.949	.283
13. Israel	57	.497	.890	.296
14. Italy	57	.582	.739	.246
15. Belgium	56	.512	.864	.315
16. Austria	53	.498	.887	.401
17. Australia*	52	.559	.781	.391
18. Hong Kong	50	.495	.893	.498
19. Sweden*	50	.598	.710	.399
20. Netherlands	49	.549	.798	.471
21. Finland	47	.602	.705	.443
22. Iceland	47	.532	.828	.526
23. UK*	47	.630	.655	.427
24. Singapore	45	.488	.906	.624
25. Spain	38	.609	.691	.631
26. Mexico	35	.622	.668	.674
27. Israel*	34	.539	.815	.857
28. Italy*	33	.683	.562	.591
29. Puerto Rico	33	.526	.839	.891
30. Malta	31	.592	.722	.812
31. Puerto Rico*	26	.587	.730	.928
32. Ireland	25	.701	.528	.699
33. South Africa	23	.601	.707	.968
34. Colombia	22	.627	.660	.933
35. Taiwan	19	.697	.536	.802
36. Korea	18	.711	.512	.774
37. Greece	17	.686	.556	.863
38. Panama	14	.677	.571	.947
39. Thailand	13	.721	.494	.827
40. Sri Lanka	10	.771	.405	.711
41. Thailand*	8	.745	.451	.820
42. Korea*	7	.755	.434	.801
Mean	45	.562	.774	.427

An asterisk (*) indicates a second period for a country.

7. The Strong Version of Engel's Law

As Working's model possesses such attractive properties, it is worthwhile to investigate further the implications of that model. The estimate of the income coefficient β is given in equation (5.2), $\hat{\beta} = -.148$. Interestingly, Table 12 reveals that this value is remarkably consistent with previous cross-sectional estimates.¹⁰

The equation (5.2) estimate is obtained with data from the 42 countries. Another way to analyse the constancy of β is to re-estimate for sub-groups of countries and then examine the extent to which the parameter is stable. Chen (1993) extends model (5.1) by adding a substitution term and then obtains $\hat{\beta} = -.142$, a value very close to the previous estimate (5.2).^{11, 12} This estimate refers to all 42 countries and is given in row 1 of Table 13. Row 2 gives the estimate of β when the sample is restricted to the first 20 countries, row 3 refers to countries 2 to 21 and so on. As can be seen, the estimates are quite stable and all fall in the narrow range of $-.13$ to $-.15$. Furthermore, none of the sub-group estimates is significantly different from $-.14$, the estimated coefficient for all 42 countries. Taken as a whole, these results again support the idea that Working's income coefficient for food seems to be more or less a natural constant, centred around $-.15$.

To analyse the implications of this income coefficient being $-.15$, consider moving from one country to another which is twice as affluent as the first, so that the incomes are M and $2M$ and $\Delta(\log M) = \log 2 = .69$. It follows from equation (5.1) that $\Delta w = \beta \Delta(\log M)$, so that when $\beta = -.15$ the effect of doubling income on

Table 12

Previous Estimates of Working's Income Coefficient for Food

(Standard errors in parentheses)

Author (1)	Estimate (2)	Country (3)
1. Aasness and Rodseth (1983)	-.174 (.008)	Norway
2. Chung and Lopez (1988)	-.183 (.013)	Spain
3. Chung and Lopez (1988)	-.156 (.017)	Spain
4. Fiebig et al. (1988)	-.140 (.008)	Cross country
5. Izan and Clements (1979)	-.104 (.007)	Cross country
6. Musgrove (1985)	-.139 (.003)	Dom. Rep.
7. Rajapakse (1992)	-.139	Sri Lanka
8. S. Selvanathan (1993)	-.128 (.014)	Cross country
9. Theil (1987)	-.154 (.010)	Cross country
10. Theil et al. (1987)	-.134 (.020)	China
Mean - unweighted	-.145 (.007)	
- weighted	-.143 (.003)	

The weights for the weighted mean are inversely proportional to the individual standard errors. The value for Sri Lanka is excluded from the weighted mean as this has no standard error.

Barten (1985), using Engel's (1857) original data, estimates the coefficient at -.065. Seale and Theil (1991) argue that under reporting the consumption of home-produced food by poor households causes this estimate to be seriously biased towards zero; consequently, we disregard this estimate.

the food budget share is $\Delta w = -.15 \times .69 = -.10$. That is, when income doubles, the food budget share declines by 10 percentage points. Theil et al. (1989) refer to this as the strong version of Engel's law.

Table 13

Working's Income Coefficient for Food
for Sub-Groups of 42 Countries

(Asymptotic standard errors in parentheses)

Sub-group of countries		Coefficient × 100
(1)		(2)
1.	1 - 42	-14.19 (.97)
2.	1 - 20	-14.89 (.59)
3.	2 - 21	-14.67 (.58)
4.	3 - 22	-14.73 (.52)
5.	4 - 23	-15.01 (.52)
6.	5 - 24	-14.70 (.56)
7.	6 - 25	-14.56 (.51)
8.	7 - 26	-14.40 (.46)
9.	8 - 27	-13.73 (.55)
10.	9 - 28	-13.26 (.61)
11.	10 - 29	-13.32 (.75)
12.	11 - 30	-13.25 (.74)
13.	12 - 31	-13.78 (1.11)
14.	13 - 32	-13.81 (1.13)
15.	14 - 33	-13.86 (1.14)
16.	15 - 34	-13.76 (1.12)
17.	16 - 35	-14.00 (1.13)
18.	17 - 36	-14.05 (1.13)
19.	18 - 37	-13.75 (1.09)
20.	19 - 38	-12.96 (1.20)
21.	20 - 39	-13.00 (1.19)
22.	21 - 40	-13.23 (1.65)
23.	22 - 41	-13.50 (1.70)
24.	23 - 42	-14.06 (1.74)
25.	Mean	-13.93 (.94)

See column 1 of Table 11 for the countries. The row 25 mean is over the entries in rows 2-24.

8. The Price Responsiveness of Food Consumption

In this section we identify a striking empirical regularity in the food price elasticity of demand.

We proceed the assumption that food forms a strongly separable block in the consumer's utility function. For a broad aggregate such as food, this is not an unreasonable assumption.¹³ The Frisch (F),

Slutsky (S) and Cournot (C) own-price elasticities for food then take the form (Chen, 1993)

$$(8.1) \quad F = \phi\eta, \quad S = F(1 - \theta), \quad C = S - \theta,$$

where $\phi < 0$ is the income flexibility (the reciprocal of the income elasticity of the marginal utility of income); η is the food income elasticity; and θ is the marginal share of food. The Frisch elasticity holds constant the marginal utility of income; Slutsky holds real income constant; and money income remains constant in the Cournot elasticity. It can be shown that $|C| > |F| > |S|$ (Chen, 1993).

To implement (8.1), we use $\phi = -.5$, which is the central value of estimates of the income flexibility emerging from a number of studies;¹⁴ the income elasticities for the 42 countries given in column 3 of Table 11, the elasticities implied by Working's model; and for the marginal share, we use the product of η and w , the budget share given in columns 3 and 8 of Table 9. As can be seen from Table 14, the Frisch and Slutsky elasticities are similar, especially at high levels of income when the food marginal share is small.

While the Frisch and Slutsky elasticities do not show a great deal of variability, this is not the case for Cournot which declines (in absolute value) markedly as income rises. The decline in $|C|$ reflects the reduction in the income effect of a food price change as the budget share of this commodity is smaller for more affluent countries. To explore this relationship further, recall from Section 5 that under Working's model, the marginal share θ equals the corresponding budget share w plus β . It then follows from the third member of (8.1) that $|C| = |S| + \theta = |S| + w + \beta$. Using (5.1) to

Table 14

Own-Price Elasticities of Food in 42 Countries

Country	Frisch	Slutsky	Cournot
(1)	(2)	(3)	(4)
1. USA	-.082	-.080	-.109
2. Switzerland	-.272	-.224	-.399
3. Canada	-.175	-.161	-.240
4. USA*	-.225	-.198	-.318
5. Australia	-.227	-.199	-.321
6. Sweden	-.236	-.205	-.336
7. Denmark	-.240	-.208	-.344
8. France	-.216	-.192	-.304
9. Norway	-.263	-.220	-.383
10. UK	-.195	-.177	-.271
11. Germany	-.256	-.216	-.370
12. Japan	-.232	-.202	-.329
13. Israel	-.248	-.212	-.357
14. Italy	-.291	-.231	-.436
15. Belgium	-.256	-.216	-.370
16. Austria	-.249	-.213	-.359
17. Australia*	-.279	-.227	-.413
18. Hong Kong	-.247	-.212	-.356
19. Sweden*	-.299	-.234	-.453
20. Netherlands	-.275	-.225	-.404
21. Finland	-.301	-.234	-.456
22. Iceland	-.266	-.222	-.389
23. UK*	-.315	-.236	-.486
24. Singapore	-.244	-.210	-.350
25. Spain	-.305	-.235	-.464
26. Mexico	-.311	-.236	-.478
27. Israel*	-.270	-.223	-.395
28. Italy*	-.341	-.233	-.549
29. Puerto Rico	-.263	-.220	-.383
30. Malta	-.296	-.233	-.446
31. Puerto Rico*	-.294	-.232	-.441
32. Ireland	-.351	-.230	-.575
33. South Africa	-.300	-.234	-.455
34. Colombia	-.313	-.236	-.483
35. Taiwan	-.348	-.231	-.569
36. Korea	-.355	-.227	-.588
37. Greece	-.343	-.233	-.554
38. Panama	-.338	-.234	-.542
39. Thailand	-.360	-.224	-.603
40. Sri Lanka	-.386	-.195	-.690
41. Thailand*	-.372	-.213	-.642
42. Korea*	-.377	-.207	-.659
Mean	-.281	-.215	-.430

An asterisk (*) indicates a second period for a country.

substitute $a + \beta \log M$ for w , we have $|C| = \{|S| + a + \beta\} + \beta \log M$. As the Slutsky elasticity S is approximately constant, it follows that

$$(8.2) \quad |C| \approx \lambda + \beta \log M ,$$

where $\lambda = |S| + a + \beta$. In words, under Working's model the Cournot own-price elasticity is approximately a linear function of the logarithm of income; the coefficient of $\log M$ in equation (8.2), β , is the same as before, Working's income coefficient for food.

To verify (8.2), Figure 5 is a scatter plot of the Cournot elasticity against the logarithm of income and the solid line is the least-squares regression line. As can be seen, the slope of the regression line is $-.163$ with standard error $.013$. This value is only about one standard error away from $-.148$, the original estimate of Working's income coefficient given in (5.2). Note also that the R^2 of $.79$ indicates a reasonable fit.¹⁵

Recall from Section 7 that the value of β of $-.15$ implies that the food budget share falls by 10 percentage points when income doubles, a relationship known as the strong version of Engel's law. In view of Figure 5, we now have an extension of this law to the food price elasticity, viz., a doubling of income leads to the Cournot own-price elasticity of food falling in absolute value by .10. This new "law" may be of use for obtaining values of the food elasticity in situations where there are little or no reliable data.

Figure 5

Cournot Own-Price Elasticity of Demand
for Food and GDP in 42 Countries

9. Concluding Comments

In this paper we have identified several intriguing empirical regularities in consumer behaviour. A large body of data indicates that the main difference in the structure of consumption between rich and poor countries is that on average the food budget share is about 10 percentage points higher in poor countries. Surprisingly, the coefficient of variation of prices in the rich countries is not too different from that for the poor; and, to a somewhat lesser extent, the same is also true for the quantities in the two groups of countries. The correlation between prices and the corresponding quantities is also very similar in the rich and poor countries.

We also find that, to a first approximation, demand elasticities for the broad aggregates are the same in rich and poor countries, the only major exception being the elasticities pertaining to transport. Accordingly, the observed differences in consumption patterns internationally can be largely explained by the corresponding differences in incomes and prices, implying that we do not have to resort to the all-too-popular, but vacuous, story of differences in tastes. It is thus fair to say that tastes can be characterised by structural parameters that are constant. Friedman (1962, p. 13) argues that "the economist has little to say about the formation of wants; this is the province of the psychologist. The economist's task is to trace the consequences of any given set of wants. The legitimacy of and justification for this abstraction must rest ultimately, in this case as with any other abstraction, on the light that is shed and the power to predict that is yielded by the abstraction." In effect, our results support Friedman's approach.

Data on food consumption in 42 diverse countries seems to conform to the simple rule that a doubling of income leads to a 10-percentage-point decline in the budget share of that commodity. This implies that the food income elasticity declines with increasing affluence, which agrees with intuition. Under the (reasonable) assumption that food forms a strongly separable block in the consumer's utility function, another implication of this rule is that a doubling of income leads to the (absolute value of the) Cournot own-price elasticity also falling by .10.

APPENDIX

Data Sources

Table 1

The data for the OECD are from S. Selvanathan (1993) who in turn obtained them from the United Nations Yearbook of National Accounts Statistics 1981 (United Nations: New York, 1983), Vol. I; National Accounts of OECD Countries 1960-1977 (OECD: Paris, 1979), Vol. II; National Accounts 1964-1981 (Department of Economics and Statistics, OECD: Paris, 1983), Vol II; and various issues of Demographic Yearbook (United Nations: New York). The LDC data are from Chen (1993), the original source being the United Nations Yearbook of National Accounts Statistics 1970-1984 (New York: United Nations) and the Statistical Yearbook of the Republic of China. Per capita GDPs are from the Penn World Table Mark 5 (Summers and Heston, 1991).

Table 2

The data sources for this table are the same as those for Table 1. The averages for the LDCs are computed after omitting observations for which the annual relative price or quantity log-change for any commodity exceeds 35 percent in absolute value. See Chen (1993) for full details.

Table 3

The Divisia measures for the OECD are from S. Selvanathan (1993); these measures for the LDCs are from Chen (1993), where the observations with large changes are omitted as before.

Table 4

The demand elasticities for the OECD are from S. Selvanathan (1993), after using budget-share-weighted averages to combine (i) beverages with food and (ii) education with recreation. The LDC elasticities are from Chen (1993).

Table 9

The countries in Table 9 are selected on the basis of the availability of fairly comparable consumption data and come from three sources, (i) the OECD group discussed above; (ii) the previous LDC group; and (iii) Lluch, Powell and Williams (1977) who obtained their data from the United Nations Yearbook of National Accounts Statistics 1969 (New York: United Nations). To ensure that the data are independent in those cases where a given country appears twice in the three sources, we omit from the underlying sample period the overlapping observations. It is for this reason that sample periods for some countries listed in Table 9 differ from their counterparts in Table 1. See Chen (1993) for details.

GDP per capita in Table 9 is from the Penn World Table Mark 5 (Summers and Heston, 1991) for all countries except Puerto Rico. GDP for Puerto Rico is based on the World Bank (1987).

Alternative Country Groupings:

Detailed Results

Tables A1-A6 contain the detailed comparisons of consumption patterns in the rich and poor countries for the six versions (defined in Table 5) of the country groups. Note that Table A2 (for version 2 which coincides with the original OECD/LDC grouping of countries) reproduces Table 2.

Tables A7-A12 present estimates of the demand parameters for the alternative groupings of countries. As before, Table A8 reproduces Table 4.

Table A1
Comparison of Consumption Patterns
in Rich and Poor Countries: Version 1

Commodity (1)	Budget shares		Prices		Per capita quantities	
	Rich (2)	Poor (3)	Rich (4)	Poor (5)	Rich (6)	Poor (7)
Undeclared log-changes						
1. Food	29.12	40.43	6.60	13.94	1.59	1.78
2. Clothing	9.08	9.38	5.72	12.51	2.35	3.42
3. Housing	16.49	11.60	7.64	13.03	3.27	3.74
4. Durables	9.07	8.44	6.00	13.18	3.25	3.97
5. Medicine	5.08	3.83	7.65	13.69	3.78	4.88
6. Transport	12.54	9.70	7.03	14.07	4.55	5.67
7. Recreation	7.56	5.96	6.50	13.46	4.30	4.87
8. Other	11.06	10.87	7.80	14.28	3.02	4.35
9. Divisia index			6.87	13.68	2.96	3.33
Deflated log-changes						
10. Food			-.27	.26	-1.37	-1.54
11. Clothing			-1.15	-1.17	-.61	.09
12. Housing			.77	-.66	.31	.41
13. Durables			-.87	-.50	.29	.64
14. Medicine			.77	-.01	.82	1.55
15. Transport			.15	.39	1.59	2.35
16. Recreation			-.38	-.22	1.34	1.55
17. Other			.93	.60	.06	1.03

See Table 5 for the definition of the rich and poor countries. All entries are to be divided by 100.

Table A2
Comparison of Consumption Patterns
in Rich and Poor Countries: Version 2

Commodity (1)	Budget shares		Prices		Per capita quantities	
	Rich (2)	Poor (3)	Rich (4)	Poor (5)	Rich (6)	Poor (7)
Undeclared log-changes						
1. Food	29.59	40.44	6.77	14.28	1.67	1.69
2. Clothing	9.17	9.29	6.03	12.61	2.38	3.45
3. Housing	16.35	11.41	7.69	13.37	3.30	3.74
4. Durables	9.04	8.43	6.28	13.34	3.26	4.01
5. Medicine	5.06	3.77	7.87	13.85	4.09	4.54
6. Transport	12.37	9.72	7.07	14.55	4.89	5.29
7. Recreation	7.49	5.93	6.84	13.53	4.34	4.87
8. Other	10.94	11.02	7.97	14.54	3.17	4.25
9. Divisia index			7.05	13.97	3.05	3.23
Deflated log-changes						
10. Food			-.28	.31	-1.38	-1.54
11. Clothing			-1.02	-1.36	-.66	.21
12. Housing			.64	-.60	.26	.50
13. Durables			-.77	-.63	.21	.77
14. Medicine			.83	-.12	1.04	1.30
15. Transport			.03	.58	1.84	2.05
16. Recreation			-.21	-.43	1.29	1.63
17. Other			.93	.58	.12	1.01

See notes to Table A1.

Table A3
Comparison of Consumption Patterns
in Rich and Poor Countries: Version 3

Commodity (1)	Budget shares		Prices		Per capita quantities	
	Rich (2)	Poor (3)	Rich (4)	Poor (5)	Rich (6)	Poor (7)
Undeclared log-changes						
1. Food	29.57	41.37	9.26	10.96	1.65	1.72
2. Clothing	9.04	9.49	8.35	9.48	2.28	3.70
3. Housing	16.65	10.52	10.16	9.92	3.31	3.75
4. Durables	9.22	8.08	8.60	10.25	3.30	4.00
5. Medicine	4.98	3.80	10.35	10.43	4.08	4.58
6. Transport	12.31	9.60	9.51	11.31	4.89	5.33
7. Recreation	7.39	5.95	9.37	9.78	4.18	5.18
8. Other	10.83	11.19	10.44	11.19	3.12	4.41
9. Divisia index			9.49	10.67	3.03	3.28
Deflated log-changes						
10. Food			-.24	.29	-1.37	-1.56
11. Clothing			-1.14	-1.19	-.74	.42
12. Housing			.67	-.74	.29	.48
13. Durables			-.89	-.42	.28	.72
14. Medicine			.85	-.24	1.06	1.30
15. Transport			.02	.64	1.86	2.05
16. Recreation			-.13	-.89	1.16	1.90
17. Other			.94	.53	.10	1.13

See notes to Table A1.

Table A4
Comparison of Consumption Patterns
in Rich and Poor Countries: Version 4

Commodity (1)	Budget shares		Prices		Per capita quantities	
	Rich (2)	Poor (3)	Rich (4)	Poor (5)	Rich (6)	Poor (7)
Undeclared log-changes						
1. Food	29.55	42.49	9.23	11.17	1.67	1.69
2. Clothing	9.53	8.65	8.39	9.52	2.47	3.49
3. Housing	16.54	10.16	10.08	10.05	3.47	3.52
4. Durables	9.27	7.90	8.50	10.59	3.65	3.43
5. Medicine	5.00	3.65	10.30	10.51	4.19	4.43
6. Transport	12.07	9.78	9.52	11.47	4.87	5.40
7. Recreation	7.42	5.76	9.31	9.92	4.27	5.10
8. Other	10.62	11.61	10.43	11.27	3.34	4.14
9. Divisia index			9.45	10.85	3.14	3.10
Deflated log-changes						
10. Food			-.23	.32	-1.47	-1.40
11. Clothing			-1.07	-1.33	-.67	.40
12. Housing			.63	-.80	.33	.42
13. Durables			-.95	-.26	.51	.34
14. Medicine			.85	-.34	1.05	1.33
15. Transport			.06	.62	1.73	2.30
16. Recreation			-.14	-.93	1.13	2.01
17. Other			.98	.42	.20	1.04

See notes to Table A1.

Table A5
Comparison of Consumption Patterns
in Rich and Poor Countries: Version 5

Commodity (1)	Budget shares		Prices		Per capita quantities	
	Rich (2)	Poor (3)	Rich (4)	Poor (5)	Rich (6)	Poor (7)
Undeclared log-changes						
1. Food	29.51	43.87	9.00	11.85	1.74	1.55
2. Clothing	9.50	8.62	8.12	10.19	2.60	3.31
3. Housing	16.21	10.22	9.80	10.64	3.57	3.31
4. Durables	9.23	7.84	8.29	11.25	3.75	3.21
5. Medicine	4.89	3.74	10.06	11.04	4.27	4.29
6. Transport	12.08	9.52	9.25	12.23	4.97	5.25
7. Recreation	7.59	5.24	8.93	10.89	4.53	4.59
8. Other	10.99	10.94	10.12	12.00	3.50	3.88
9. Divisia index			9.18	11.56	3.26	2.84
Deflated log-changes						
10. Food			-.18	.29	-1.52	-1.28
11. Clothing			-1.06	-1.37	-.66	.47
12. Housing			.62	-.92	.31	.47
13. Durables			-.89	-.31	.49	.37
14. Medicine			.88	-.52	1.01	1.46
15. Transport			.07	.67	1.70	2.41
16. Recreation			-.25	-.67	1.27	1.75
17. Other			.94	.44	.24	1.04

See notes to Table A1.

Table A6
Comparison of Consumption Patterns
in Rich and Poor Countries: Version 6

Commodity (1)	Budget shares		Prices		Per capita quantities	
	Rich (2)	Poor (3)	Rich (4)	Poor (5)	Rich (6)	Poor (7)
Undeclared log-changes						
1. Food	29.60	45.25	8.88	12.46	1.67	1.70
2. Clothing	9.53	8.46	7.92	10.91	2.61	3.37
3. Housing	16.10	9.82	9.59	11.25	3.60	3.20
4. Durables	9.20	7.75	8.08	12.08	3.67	3.33
5. Medicine	4.86	3.68	9.88	11.60	4.25	4.34
6. Transport	12.19	8.98	9.06	13.02	4.91	5.40
7. Recreation	7.54	5.10	8.68	11.82	4.56	4.52
8. Other	10.97	10.97	9.89	12.79	3.56	3.76
9. Divisia index			9.00	12.27	3.24	2.85
Deflated log-changes						
10. Food			-.12	.19	-1.57	-1.15
11. Clothing			-1.08	-1.36	-.63	.52
12. Housing			.59	-1.02	.36	.35
13. Durables			-.92	-.20	.44	.48
14. Medicine			.88	-.68	1.01	1.49
15. Transport			.06	.75	1.68	2.55
16. Recreation			-.32	-.45	1.32	1.67
17. Other			.89	.51	.33	1.91

See notes to Table A1.

Table A7

Comparison of Autonomus Trends and Demand Elasticities in Rich and Poor Countries:

Version 1

Commodity (1)	Autonomous trends x 100		Income elasticities		Price elasticities	
	Rich	Poor	Rich	Poor	Rich	Poor
	(2)	(3)	(4)	(5)	(6)	(7)
<u>Estimates (standard errors in parentheses)</u>						
1. Food	-.19 (.16)	-.60 (.25)	.57 (.04)	.72 (.06)	-.38 (.05)	-.34 (.08)
2. Clothing	-2.93 (.31)	-1.86 (.44)	1.47 (.07)	1.32 (.11)	-.69 (.09)	-.36 (.09)
3. Housing	2.54 (.17)	2.37 (.31)	.31 (.04)	.35 (.07)	-.15 (.05)	-.11 (.07)
4. Durables	-2.49 (.38)	-1.57 (.50)	1.78 (.09)	1.73 (.13)	-.62 (.11)	-.52 (.11)
5. Medicine	2.51 (.39)	2.10 (.59)	.62 (.11)	.84 (.17)	-.15 (.11)	-.33 (.12)
6. Transport	-1.19 (.36)	.14 (.49)	1.97 (.09)	1.62 (.13)	-.75 (.12)	-.31 (.07)
7. Recreation	.52 (.34)	.83 (.42)	1.21 (.09)	1.10 (.11)	-.75 (.09)	-.42 (.09)
8. Other	.10 (.27)	.67 (.46)	1.07 (.06)	1.15 (.14)	-.39 (.08)	-.30 (.10)
<u>Differences, Rich - Poor (standard errors in parentheses)</u>						
9. Food	.41 (.30)		-.15 (.07)		-.04 (.09)	
10. Clothing	-1.07 (.54)		.15 (.13)		-.33 (.13)	
11. Housing	.17 (.35)		-.04 (.08)		-.04 (.09)	
12. Durables	-.92 (.63)		.05 (.16)		-.10 (.16)	
13. Medicine	.41 (.71)		-.22 (.20)		.18 (.16)	
14. Transport	-1.33 (.61)		.35 (.16)		-.44 (.14)	
15. Recreation	-.31 (.54)		.11 (.14)		-.33 (.13)	
16. Other	-.57 (.53)		-.08 (.15)		-.09 (.13)	
<u>t-values of differences</u>						
17. Food	1.38		-2.08		-.42	
18. Clothing	-1.99		1.15		-2.59	
19. Housing	.48		-.50		-.46	
20. Durables	-1.46		.32		-.64	
21. Medicine	.58		-1.09		1.11	
22. Transport	-2.19		2.21		-3.17	
23. Recreation	-.57		.77		-2.59	
24. Other	-1.07		-.53		-.70	
25. Mean of t	1.21		1.08		1.46	

The standard errors of the differences (given in the middle part of the table) are the squared roots of the sums of the two corresponding variances. The t-values (bottom part) are computed as the ratios of the differences and their standard errors. See Table A5 for the definition of the rich and poor countries.

Table A8

Comparison of Autonomous Trends and Demand Elasticities in Rich and Poor Countries:

Version 2

Commodity (1)	Autonomous trends x 100		Income elasticities		Price elasticities	
	Rich	Poor	Rich	Poor	Rich	Poor
	(2)	(3)	(4)	(5)	(6)	(7)
<u>Estimates (standard errors in parentheses)</u>						
1. Food	-.24 (.18)	-.57 (.23)	.59 (.04)	.71 (.06)	-.37 (.05)	-.34 (.08)
2. Clothing	-2.86 (.31)	-1.87 (.46)	1.46 (.07)	1.33 (.12)	-.67 (.09)	-.36 (.09)
3. Housing	2.58 (.17)	2.30 (.33)	.31 (.04)	.36 (.07)	-.13 (.04)	-.15 (.07)
4. Durables	-2.39 (.37)	-1.63 (.52)	1.74 (.09)	1.77 (.14)	-.62 (.11)	-.51 (.12)
5. Medicine	2.61 (.44)	1.93 (.54)	.66 (.12)	.81 (.16)	-.17 (.11)	-.31 (.12)
6. Transport	-1.22 (.40)	.28 (.45)	2.00 (.09)	1.55 (.12)	-.74 (.12)	-.28 (.07)
7. Recreation	.64 (.36)	.69 (.40)	1.19 (.09)	1.13 (.12)	-.74 (.09)	-.42 (.10)
8. Other	.24 (.27)	.51 (.47)	1.05 (.06)	1.19 (.14)	-.37 (.08)	-.32 (.11)
<u>Differences, Rich - Poor (standard errors in parentheses)</u>						
9. Food	.33 (.29)		-.12 (.07)		-.03 (.09)	
10. Clothing	-.99 (.55)		.13 (.14)		-.31 (.13)	
11. Housing	.28 (.37)		-.05 (.08)		.02 (.08)	
12. Durables	-.76 (.64)		-.03 (.17)		-.11 (.16)	
13. Medicine	.68 (.70)		-.15 (.20)		.14 (.16)	
14. Transport	-1.50 (.60)		.45 (.15)		-.46 (.14)	
15. Recreation	-.05 (.54)		.06 (.15)		-.32 (.13)	
16. Other	-.27 (.54)		-.14 (.15)		-.05 (.14)	
<u>t-values of differences</u>						
17. Food	1.13		-1.66		-.32	
18. Clothing	-1.78		.94		-2.44	
19. Housing	.75		-.62		.25	
20. Durables	-1.19		-.18		-.68	
21. Medicine	.98		-.75		.86	
22. Transport	-2.49		3.00		-3.31	
23. Recreation	-.09		.40		-2.38	
24. Other	-.50		-.92		-.37	
25. Mean of t	1.11		1.03		1.34	

See notes to Table A7

Table A9

Comparison of Autonomous Trends and Demand Elasticities in Rich and Poor Countries:

Version 3

Commodity (1)	Autonomous trends x 100		Income elasticities		Price elasticities	
	Rich	Poor	Rich	Poor	Rich	Poor
	(2)	(3)	(4)	(5)	(6)	(7)
Estimates (standard errors in parentheses)						
1. Food	-.19 (.17)	-.67 (.25)	.57 (.04)	.74 (.07)	-.36 (.04)	-.35 (.09)
2. Clothing	-2.77 (.32)	-1.93 (.46)	1.44 (.07)	1.34 (.12)	-.61 (.08)	-.43 (.09)
3. Housing	2.61 (.16)	2.24 (.35)	.30 (.04)	.37 (.08)	-.12 (.04)	-.15 (.08)
4. Durables	-2.51 (.36)	-1.38 (.56)	1.76 (.09)	1.75 (.15)	-.64 (.10)	-.47 (.13)
5. Medicine	2.53 (.42)	2.00 (.58)	.68 (.11)	.78 (.17)	-.17 (.10)	-.32 (.13)
6. Transport	-1.27 (.38)	.48 (.48)	2.03 (.09)	1.47 (.13)	-.71 (.11)	-.29 (.08)
7. Recreation	.50 (.34)	.92 (.43)	1.19 (.08)	1.12 (.12)	-.70 (.08)	-.45 (.10)
8. Other	.26 (.26)	.51 (.51)	1.02 (.06)	1.25 (.15)	-.32 (.08)	-.39 (.11)
Differences, Rich - Poor (standard errors in parentheses)						
9. Food	.48 (.30)		-.17 (.08)		-.01 (.10)	
10. Clothing	-.84 (.56)		.10 (.14)		-.18 (.12)	
11. Housing	.37 (.38)		-.07 (.09)		.03 (.09)	
12. Durables	-1.13 (.67)		.01 (.17)		-.17 (.16)	
13. Medicine	.53 (.72)		-.10 (.20)		.15 (.16)	
14. Transport	-1.75 (.61)		.56 (.16)		-.42 (.14)	
15. Recreation	-.42 (.55)		.07 (.14)		-.25 (.13)	
16. Other	-.25 (.57)		-.23 (.16)		.07 (.14)	
t-values of differences						
17. Food	1.59		-2.11		-.10	
18. Clothing	-1.50		.72		-1.49	
19. Housing	.96		-.78		.34	
20. Durables	-1.70		.06		-1.04	
21. Medicine	.74		-.49		.91	
22. Transport	-2.86		3.54		-3.09	
23. Recreation	-.77		.49		-1.95	
24. Other	-.44		-1.42		.51	
25. Mean of t	1.32		1.20		1.17	

See notes to Table A7.

Table A10

Comparison of Autonomous Trends and Demand Elasticities in Rich and Poor Countries:

Version 4

Commodity (1)	Autonomous trends x 100		Income elasticities		Price elasticities	
	Rich	Poor	Rich	Poor	Rich	Poor
	(2)	(3)	(4)	(5)	(6)	(7)
<u>Estimates (standard errors in parentheses)</u>						
1. Food	-.18 (.17)	-.74 (.27)	.56 (.04)	.77 (.07)	-.34 (.04)	-.39 (.09)
2. Clothing	-3.08 (.31)	-1.29 (.49)	1.51 (.07)	1.21 (.13)	-.60 (.08)	-.44 (.10)
3. Housing	2.82 (.16)	1.82 (.38)	.28 (.04)	.41 (.08)	-.12 (.04)	-.17 (.09)
4. Durables	-1.95 (.36)	-2.31 (.56)	1.71 (.08)	1.83 (.16)	-.55 (.10)	-.63 (.13)
5. Medicine	2.50 (.41)	2.01 (.61)	.70 (.11)	.76 (.19)	-.23 (.10)	-.23 (.14)
6. Transport	-1.28 (.36)	.67 (.51)	1.98 (.09)	1.49 (.14)	-.67 (.11)	-.33 (.08)
7. Recreation	.60 (.33)	.76 (.46)	1.16 (.08)	1.16 (.13)	-.68 (.08)	-.47 (.11)
8. Other	.30 (.27)	.46 (.52)	1.04 (.06)	1.24 (.16)	-.34 (.08)	-.37 (.12)
<u>Differences, Rich - Poor (standard errors in parentheses)</u>						
9. Food	.56 (.32)		-.21 (.08)		.05 (.10)	
10. Clothing	-1.79 (.58)		.30 (.15)		-.16 (.13)	
11. Housing	1.00 (.41)		-.13 (.09)		.05 (.10)	
12. Durables	.36 (.67)		-.12 (.18)		.08 (.16)	
13. Medicine	.49 (.73)		-.06 (.22)		.00 (.17)	
14. Transport	-1.95 (.62)		.49 (.17)		-.34 (.14)	
15. Recreation	-.16 (.57)		.00 (.15)		-.21 (.14)	
16. Other	-.16 (.59)		-.20 (.17)		.03 (.14)	
<u>t-values of differences</u>						
17. Food	1.76		-2.60		.51	
18. Clothing	-3.09		2.03		-1.25	
19. Housing	2.43		-1.45		.51	
20. Durables	.54		-.67		.49	
21. Medicine	.67		-.27		.00	
22. Transport	-3.12		2.94		-2.50	
23. Recreation	-.28		.00		-1.54	
24. Other	-.27		-1.17		.21	
25. Mean of t	1.52		1.38		.88	

See notes to Table A7.

Table A11

Comparison of Autonomous Trends and Demand Elasticities in Rich and Poor Countries:

Version 5

Commodity (1)	Autonomous trends x 100		Income elasticities		Price elasticities	
	Rich	Poor	Rich	Poor	Rich	Poor
	(2)	(3)	(4)	(5)	(6)	(7)
<u>Estimates (standard errors in parentheses)</u>						
1. Food	-.25 (.18)	-.65 (.24)	.58 (.04)	.76 (.07)	-.34 (.04)	-.40 (.10)
2. Clothing	-2.98 (.31)	-1.33 (.50)	1.49 (.07)	1.22 (.14)	-.57 (.08)	-.48 (.11)
3. Housing	2.90 (.17)	1.55 (.38)	.28 (.04)	.44 (.09)	-.10 (.04)	-.21 (.09)
4. Durables	-1.64 (.36)	-2.98 (.59)	1.64 (.08)	1.99 (.17)	-.57 (.10)	-.59 (.14)
5. Medicine	2.44 (.42)	2.08 (.59)	.71 (.11)	.75 (.20)	-.22 (.10)	-.25 (.15)
6. Transport	-1.39 (.36)	1.08 (.53)	1.98 (.08)	1.46 (.15)	-.65 (.10)	-.33 (.08)
7. Recreation	.52 (.34)	.95 (.42)	1.18 (.08)	1.12 (.14)	-.68 (.08)	-.44 (.12)
8. Other	.22 (.27)	.63 (.55)	1.06 (.06)	1.22 (.18)	-.35 (.07)	-.35 (.13)
<u>Differences, Rich - Poor (standard errors in parentheses)</u>						
9. Food	.40 (.30)		-.18 (.08)		.06 (.11)	
10. Clothing	-1.65 (.59)		.27 (.16)		-.09 (.14)	
11. Housing	1.35 (.42)		-.16 (.10)		.11 (.10)	
12. Durables	1.34 (.69)		-.35 (.19)		.02 (.17)	
13. Medicine	.36 (.72)		-.04 (.23)		.03 (.18)	
14. Transport	-2.47 (.64)		.52 (.17)		-.32 (.13)	
15. Recreation	-.43 (.54)		.06 (.16)		-.24 (.14)	
16. Other	-.41 (.61)		-.16 (.19)		.00 (.15)	
<u>t-values of differences</u>						
17. Food	1.33		-2.23		.56	
18. Clothing	-2.80		1.72		-.66	
19. Housing	3.24		-1.62		1.12	
20. Durables	1.94		-1.86		.12	
21. Medicine	.50		-.18		.17	
22. Transport	-3.86		3.06		-2.50	
23. Recreation	-.80		.37		-1.66	
24. Other	-.67		-.84		.00	
25. Mean of t	1.89		1.49		.86	

See notes to Table A7.

Table A12

Comparison of Autonomous Trends and Demand Elasticities in Rich and Poor Countries:

Version 6

Commodity (1)	Autonomous trends x 100		Income elasticities		Price elasticities	
	Rich (2)	Poor (3)	Rich (4)	Poor (5)	Rich (6)	Poor (7)
<u>Estimates (standard errors in parentheses)</u>						
1. Food	-.30 (.17)	-.56 (.26)	.59 (.04)	.75 (.08)	-.35 (.04)	-.39 (.11)
2. Clothing	-2.99 (.30)	-1.12 (.52)	1.50 (.07)	1.18 (.15)	-.60 (.08)	-.40 (.10)
3. Housing	2.91 (.17)	1.38 (.42)	.28 (.04)	.44 (.09)	-.12 (.04)	-.17 (.10)
4. Durables	-1.77 (.34)	-2.81 (.65)	1.64 (.08)	2.05 (.19)	-.63 (.10)	-.45 (.14)
5. Medicine	2.43 (.40)	2.08 (.64)	.70 (.10)	.78 (.22)	-.18 (.10)	-.33 (.14)
6. Transport	-1.36 (.34)	1.29 (.58)	1.96 (.08)	1.43 (.17)	-.63 (.10)	-.36 (.08)
7. Recreation	.45 (.33)	1.16 (.45)	1.20 (.08)	1.09 (.15)	-.71 (.08)	-.34 (.13)
8. Other	.37 (.26)	.32 (.59)	1.04 (.06)	1.29 (.19)	-.31 (.08)	-.46 (.12)
<u>Differences, Rich - Poor (standard errors in parentheses)</u>						
9. Food	.26 (.31)		-.16 (.09)		.04 (.12)	
10. Clothing	-1.87 (.60)		.32 (.17)		-.20 (.13)	
11. Housing	1.53 (.45)		-.16 (.10)		.05 (.11)	
12. Durables	1.04 (.73)		-.41 (.21)		-.18 (.17)	
13. Medicine	.35 (.75)		-.08 (.24)		.15 (.17)	
14. Transport	-2.65 (.67)		.53 (.19)		-.27 (.13)	
15. Recreation	-.71 (.56)		.11 (.17)		-.37 (.15)	
16. Other	.05 (.64)		-.25 (.20)		.15 (.14)	
<u>t-values of differences</u>						
17. Food	.84		-1.79		.34	
18. Clothing	-3.11		1.93		-1.56	
19. Housing	3.38		-1.62		.46	
20. Durables	1.42		-1.99		-1.05	
21. Medicine	.46		-.33		.87	
22. Transport	-3.94		2.82		-2.11	
23. Recreation	-1.27		.65		-2.42	
24. Other	.08		-1.25		1.04	
25. Mean of t	1.81		1.56		1.25	

See notes to Table A7.

Footnotes

1. Important contributions to the literature on cross-country consumption comparisons include Goldberger and Gamaletsos (1970), Houthakker (1957, 1965), Lluch and Powell (1975), Lluch et al. (1977), S. Selvanathan (1993), Theil (1987), Theil et al. (1981) and Theil et al. (1989).
2. For further details of Table 4, see the Appendix.
3. Consider tastes with respect to the more narrowly defined good alcoholic beverages (beer, wine and spirits, appropriately weighted via a Divisia index). E.A. Selvanathan and Clements (1988) (see also Clements and S. Selvanathan, 1991) estimate demand equations for alcohol for Australia (1956-77), the UK (1955-75) and the USA (1949-82). They cannot reject the hypotheses that (i) the income elasticity is the same in each country; and (ii) the own-price elasticity is the same. Thus, for alcoholic beverages, which on average absorb only between 3 and 6 percent of the budget of consumers in these countries, it does not seem to be true that there is more dispersion in tastes relative to the broader aggregates.

Next, consider the further disaggregation of alcohol into beer, wine and spirits. E.A. Selvanathan (1991) estimates conditional demand equations (i.e., within alcohol) for these three beverages and obtains the following estimates:

Country	Sample period	Conditional income elasticities		
		Beer	Wine	Spirits
1. Australia	1955-85	.8	.7	1.9
2. Canada	1953-82	.7	1.0	1.3
3. Finland	1969-83	.4	1.6	1.3
4. Japan	1964-83	1.4	.3	.5
5. New Zealand	1965-82	.9	1.1	1.2
6. Norway	1960-86	.3	1.4	1.6
7. Sweden	1960-86	.2	.5	1.5
8. UK	1955-85	.5	1.3	1.8
9. US	1949-82	.7	.6	1.4

Although there is a good deal of dispersion across countries, it is still the case that these elasticities show a distinct pattern: Except for Japan, in all countries beer is a conditional necessity and spirits a conditional luxury. On the other hand, however, there seems to be no particular pattern among the wine income elasticities; and the same is true for the price elasticities (see E.A. Selvanathan, 1991, for details).

4. Interestingly, however, this is not the case within the OECD countries. S. Selvanathan (1993, Chap. 4) analyses differences in tastes across the individual OECD countries by estimating (i) country-specific demand equations; and (ii) common demand equations for all countries whereby the data are pooled over countries. The weighted mean (over commodities and countries) of the root-mean-squared percentage prediction errors is 1.87 percent for the individual country models and 1.95 percent for the pooled model. Accordingly, the average "cost" of taking tastes to be identical within the OECD is $1.95 - 1.87 = .08$

percentage points. This is clearly small and indicates that tastes are very similar in these countries. See also Clements and S. Selvanathan (1992). For a different finding, however, see Pollak and Wales (1987).

5. Four aspects of this regression should be noted. First, treating the observation for Zimbabwe as an outlier agrees with Seale and Theil's (1986) findings for the African countries in the data compiled by Kravis et al. (1975, 1978, 1982) and the UN Commission of the European Communities (1985). Second, re-estimating (5.1) with Zimbabwe included and adding a dummy variable for that country establishes that it is a significant outlier (the t-value of the dummy variable coefficient is -4.8). Third, the LS regression line in Figure 4 is computed with Zimbabwe omitted. Fourth, re-estimating to allow for heteroscedasticity does not change the results appreciably.
6. Note that model (5.1) does not allow for cross-country differences in the relative price of food. However, with these data income and food prices are approximately orthogonal (Chen, 1993), so that when (5.1) is extended to deal with income and prices simultaneously, the estimates do not change materially. This will be discussed subsequently below in Section 7.
7. As before, allowing for heteroscedasticity does not affect the results appreciably. Note that as the budget share is a linear function of income, a possible defect of Working's model is that the predicted budget share can fall outside the $[0, 1]$ interval for sufficiently high or low levels of income (Cooper and

McLaren, 1992, Rimmer and Powell, 1992a, b). With our data, $w = 0$ when per capita income is 439 percent that of the USA (the richest country in the sample) and $w = 1$ when income is 6.71 percent of the income of Korea (the poorest country). As these values are far away from observed income, the problem is not too serious.

8. We omit the linear reciprocal model as it implies that food is inferior at means. We also omit the unrestricted Box-Cox model as it is insignificantly different from Working's model.
9. To establish this, consider the income derivative of the income elasticity from the Box-Cox model: $\partial\eta/\partial(\log M) = (\eta - 1)(\lambda + 1 - \eta)$. Under Working's model ($\lambda = 0$), this becomes $-(\eta - 1)^2$, which is always negative; for LES ($\lambda = -1$), the derivative equals $-\eta(\eta - 1)$, which is positive for $0 < \eta < 1$; and for the quadratic ($\lambda = 1$), the derivative is $(\eta - 1)(2 - \eta)$, which is negative for $\eta < 1$. This analysis follows the advice of Flood et al. (1984) who advocate choosing between alternative models on the basis of the behavior of the implied income elasticities.
10. The estimates of β derived from time-series data are, however, on average about 20 percent lower (in absolute value) than $-.15$; see Chen (1993) for details. One possible reason for this difference is that the time-series estimates could largely reflect short-run adjustments to changes in income, while the cross-sectional counterparts could be picking up the longer-run effects.

11. See footnote 6.
12. Note that equation (5.1) with a substitution term added is applied by Chen (1993) to each of 8 goods simultaneously, so that it becomes a system-wide model. As this extended model is nonlinear in the parameters and has cross-equation constraints, it is estimated as a system by maximum likelihood. The interpretation of the income coefficient of food remains unchanged, however.
13. Moreover, recent empirical results tend to support this assumption (S. Selvanathan, 1993, Sec. 3.10).
14. For a brief survey of previous estimates of ϕ , see Clements and S. Selvanathan (1993).
15. The intercept in equation (8.2) is $\lambda = |S| + \alpha + \beta$; using the mean of the Slutsky elasticity S of $-.215$ (given in the last entry of column 3 of Table 14) and the LS estimates of α and β of 1.627 and $-.148$ (from row 1 of Table 10), yields $\hat{\lambda} = .22 + 1.63 - .15 = 1.70$. This agrees quite well with the estimated intercept in Figure 5 of 1.83 .

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