

EMPIRICAL REGULARITIES IN CONSUMPTION PATTERNS IN EMERGING ECONOMIES

DONGLING CHEN
KENNETH W. CLEMENTS

I. INTRODUCTION

THE objective of this paper is to use data on disaggregated consumption patterns in a number of emerging/developing economies to identify several important empirical regularities. Rather than proceeding on a commodity-by-commodity basis, we mainly adopted a systemwide approach to analyze the consumption basket as a whole. In a similar way, we also analyzed the countries in question as a group in seeking to identify patterns in consumption behavior which seem to be widely applicable.

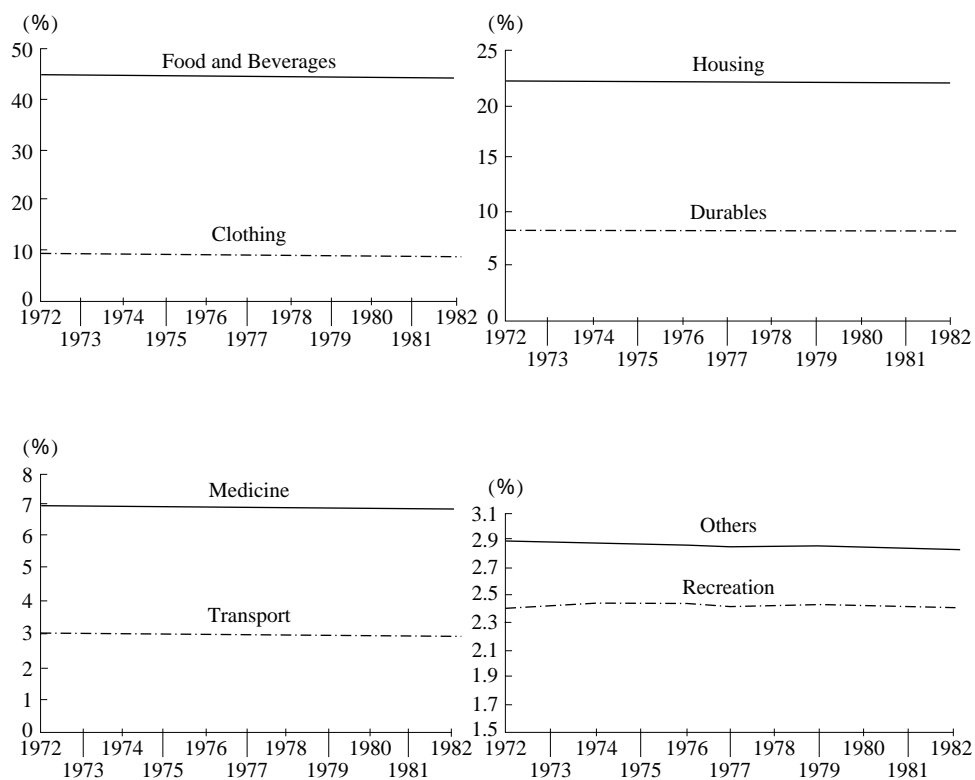
It is generally recognized that economic data in many of these countries are not excellent. As *The Economist* of March 4, 1995 puts it: "Governments in rich countries are often accused of publishing ropey economic statistics. Yet the quality of their numbers shines in comparison with those churned out in some emerging economies." That article also refers to an official investigation in China in 1994 that identified "60,000 instances of false statistics on a range of indicators including output, income, investment and inflation."¹ Consumption data also suffer from quality problems, as is indicated by Figure 1 which presents time-series plots of eight budget shares in Honduras. As can be seen, in each case the share is effectively constant which indicates that there is a high probability that the data are fictitious. Accordingly, in this paper we paid particular attention to the quality of the data.

The topic of international comparisons of consumption patterns has been widely covered in the literature, the modern strand of which started with Houthakker [6] who examined Engel curves for a large number of countries. Systems of demand equations have been estimated using cross-country data by Gamaletsos [4],

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¹ Interestingly, in discussing the trade-off between timeliness and accuracy of economic data, *The Economist* notes that "some statistics are rather too timely to be trusted. China's GDP figures for 1994 were published before the year had even ended" (pp. 79-80).

Fig. 1. Budget Shares for Eight Commodities in Honduras



Source : [20].

Goldberger and Gamaletsos [5], Kravis et al. [7], Lluch and Powell [8], Lluch et al. [9], Lluch and Williams [10], Parks and Barten [11], Pollak and Wales [12], Selvanathan [14], Theil [17], Theil et al. [18], and Theil and Suhm [19]. As none of these previous studies focused exclusively on consumption in emerging/developing countries, this paper complements and extends this literature. Rather than just estimating demand equations, we also used Divisia index number methodology to summarize the data and identify empirical regularities which seem to characterize consumption patterns in a number of cases.

Section II of the paper presents consumption data in a large variety of emerging/developing economies. In the next section, we investigate the quality of the data by analyzing outlying observations. Section IV presents summarized measures of the data in the form of Divisia indices of prices and quantities and the associated variances. We estimate in Section V demand elasticities for each good and each country. Concluding comments are given in Section VI.

II. CONSUMPTION IN THIRTEEN EMERGING ECONOMIES

Our database consists of consumption patterns in thirteen countries, obtained from various issues of the U.N. *Yearbook of National Accounts Statistics* [20] and, for Taiwan, the *Statistical Yearbook of the Republic of China* [13]. Table I gives a summary of the data with countries listed in descending order of per capita GDP in 1980.² As can be seen, over the sampling period Hong Kong showed the highest per capita GDP of \$7,268, while Zimbabwe the lowest (\$930).

Let p_{it} , q_{it} be the price and per capita quantity demanded of good i ($i = 1, \dots, n$) in year t and $M_t = \sum_{i=1}^n p_{it} q_{it}$ be total expenditure ("income" for short). The budget share for good i is then defined as $w_{it} = p_{it} q_{it} / M_t$ and the arithmetic average of this share over the years $t-1$ and t is $\bar{w}_{it} = (w_{it} + w_{i,t-1})/2$. Table II gives for each country and commodity the sample means of the \bar{w}_{it} 's, while Table III gives the correspond-

TABLE I
CHARACTERISTICS OF THE DATABASE

Country	Sample Period	Sample Size	Per Capita GDP in 1980		Number of Commodity Groups	Comments
			International Dollars	(4) with H.K.=100		
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. Hong Kong	1970-84	15	7,268	100	9	
2. Israel	1970-84	15	6,145	85	9	
3. Singapore	1967-84	18	5,817	80	9	
4. Malta	1973-84	12	4,630	64	9	
5. Mexico	1970-83	14	4,333	60	8	Beverages are included in food
6. Puerto Rico	1963-84	22	2,978	41	9	
7. Taiwan	1962-86	25	2,921	40	8	Beverages are included in food
8. Ecuador	1973-84	12	2,607	36	8	Recreation is included in others
9. Colombia	1972-83	12	2,552	35	9	
10. Korea	1963-84	22	2,369	33	9	
11. Thailand	1967-84	18	1,694	23	9	
12. Sri Lanka	1963-84	22	1,119	15	9	
13. Zimbabwe	1970-82	13	930	13	9	

Sources: Except for Puerto Rico, per capita GDPs are cited from Summers and Heston [15]; Puerto Rico's GDP is cited from the World Bank [21].

Note: Sample size is taken before lagging.

² These countries were chosen on the following basis: (i) fairly comparable disaggregated consumption data had been collected; and (ii) data were available for a sufficient number of years. It should be noted that although the data do not extend beyond the mid-1980s, the results should not be appreciably affected if, as seems to be the case, tastes are more or less stable (see Section V).

TABLE II
 SAMPLE MEANS FOR ARITHMETIC AVERAGES OF BUDGET SHARES OF NINE
 COMMODITIES FOR THIRTEEN COUNTRIES

(%)

Country (1)	Food (2)	Bever- ages (3)	Cloth- ing (4)	Hous- ing (5)	Dura- bles (6)	Medi- cine (7)	Trans- port (8)	Recrea- tion (9)	Others (10)
1. Hong Kong	25.95	3.14	18.77	14.43	10.10	5.43	7.54	8.06	6.56
2. Israel	25.13	4.08	6.84	22.14	12.54	3.51	11.14	5.64	8.99
3. Singapore	22.44	6.24	8.88	9.59	8.46	2.67	12.43	11.00	18.29
4. Malta	25.03	11.20	9.01	6.88	11.00	3.89	13.83	6.59	12.59
5. Mexico	38.95	—	11.15	9.93	12.21	3.60	9.02	5.02	10.11
6. Puerto Rico	24.60	6.95	10.07	13.83	8.73	4.34	14.35	6.45	10.68
7. Taiwan	48.85	—	5.34	16.21	4.68	4.63	3.79	9.37	7.15
8. Ecuador	32.03	6.47	10.32	10.32	6.84	3.81	10.02	—	20.20
9. Colombia	33.59	5.82	7.57	12.40	5.69	5.38	12.67	5.37	11.51
10. Korea	45.60	7.91	8.91	9.00	4.32	3.12	7.36	6.22	7.56
11. Thailand	43.93	9.34	9.31	6.82	5.65	5.02	8.91	6.25	4.76
12. Sri Lanka	55.96	9.21	6.61	6.29	4.26	2.23	8.09	4.76	2.59
13. Zimbabwe	23.22	12.05	8.26	10.31	14.72	1.42	5.93	2.11	21.99
Mean	34.25	7.49	9.31	11.40	8.40	3.77	9.62	6.40	11.00

TABLE III
 COEFFICIENTS OF VARIATION OF ARITHMETIC AVERAGES OF BUDGET SHARES

(%)

Country (1)	Food (2)	Bever- ages (3)	Cloth- ing (4)	Hous- ing (5)	Dura- bles (6)	Medi- cine (7)	Trans- port (8)	Recrea- tion (9)	Others (10)
1. Hong Kong	17.0	24.2	9.1	9.0	16.6	8.7	7.7	5.4	14.2
2. Israel	4.1	9.7	15.4	7.0	5.7	9.3	9.1	5.5	5.8
3. Singapore	10.2	9.3	8.0	6.7	4.4	6.2	8.7	9.3	8.0
4. Malta	7.1	4.2	16.5	6.5	7.1	14.7	4.1	5.3	26.9
5. Mexico	5.8	—	4.0	12.5	4.9	15.7	13.9	7.4	7.4
6. Puerto Rico	5.5	13.5	8.4	7.7	16.3	8.9	10.1	11.2	6.2
7. Taiwan	12.6	—	2.9	6.4	19.2	9.1	41.0	32.5	4.2
8. Ecuador	8.3	3.4	2.8	9.5	6.2	5.4	14.7	—	4.3
9. Colombia	5.0	1.6	12.4	4.2	5.7	7.6	11.4	5.6	6.5
10. Korea	13.3	9.7	12.5	11.0	19.3	13.3	26.6	35.3	19.0
11. Thailand	6.6	2.9	9.2	12.4	5.7	16.7	17.8	31.9	70.7
12. Sri Lanka	7.2	8.9	9.0	17.5	12.8	35.0	40.9	27.4	37.9
13. Zimbabwe	11.4	15.0	4.0	5.1	9.8	20.4	8.2	20.2	6.0
Mean	8.8	9.3	8.8	8.9	10.3	13.2	16.5	16.4	16.7

ing coefficients of variation, the ratios of the standard deviations to the means.³ The last row of Table II reveals that, on average, emerging economy consumers spend 34 per cent of their income on food, 7 per cent on beverages, 9 per cent on clothing, and 11 per cent on housing, or 61 per cent on these four “necessities of life.” Column 2 of Table II indicates that, if we ignore Zimbabwe, there is a distinct tendency for the food budget share to rise as we go down the column, i.e., as income falls, which is in agreement with Engel’s law.

The price and per capita quantity log-changes are defined as $Dp_{it} = \log p_{it} - \log p_{i,t-1}$, $Dq_{it} = \log q_{it} - \log q_{i,t-1}$ and Tables IV–VII contain the sample means of the Dp_{it} ’s and Dq_{it} ’s, as well as the corresponding coefficients of variation. As the prices in Table IV are undeflated, they exhibit a great deal of variability across countries, largely reflecting differences in inflation rates. Regarding the quantities, the last row of Table VI shows that on average food consumption increases at the slowest rate (1.6 per cent per year), while the category “others” is the fastest to grow (5.9 per cent).

Looking at the coefficients of variation given in Tables III, V, and VII, on average the quantity changes show the largest variability, followed by prices and budget shares. Roughly speaking, the coefficients of variation follow a 300:100:10 rule; i.e., the coefficients of variations for the Dq_{it} ’s are on average about 300 per cent, prices 100 per cent, and budget shares 10 per cent.

The Divisia price and volume indices are budget-share-weighted averages of the n price and quantity log-changes,

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

The last columns of Tables IV and VI give the means of DP_t and DQ_t . Column 11 of Table IV reveals that Israel, Mexico, and Colombia are high-inflation countries. On average, prices increase by 14 per cent per year in these thirteen countries. The Divisia volume indices (given in column 11 of Table VI) measure the growth in per capita real income. The growth in real income ranges from 5.6 per cent per year for Singapore to 0.9 per cent for Zimbabwe. Averaging over all countries, real income grows at 3.4 per cent per year.

III. OUTLYING OBSERVATIONS

As previously mentioned, in many cases the quality of data in emerging economies is not excellent. Time-series plots of the relative prices and quantities (available on

³ Note that the category beverages includes tobacco; clothing includes footwear; housing includes gross rent, fuel, and power; durables includes furniture, furnishings, household equipment, and operation; medicine refers to health care; transport includes communication; recreation includes entertainment, cultural services, and education; and the category others includes everything else. A full listing of the data for each country is available on request.

TABLE IV
PRICES OF NINE COMMODITIES AND PRICE INDEX FOR THIRTEEN COUNTRIES

(Mean log-changes × 100)

Country	Food	Beverages	Clothing	Housing	Durables	Medicine	Transport	Recreation	Others	Divisia Price Index
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Hong Kong	8.49	10.03	8.99	8.51	6.53	9.54	9.61	8.33	10.40	8.74
2. Israel	54.41	52.05	50.21	54.70	50.42	54.87	53.40	54.87	54.72	53.50
3. Singapore	4.16	5.14	2.85	4.18	4.01	5.22	3.85	1.19	3.90	3.71
4. Malta	5.56	6.80	2.66	3.00	4.79	4.80	10.87	4.67	4.83	5.66
5. Mexico	21.38	—	22.34	19.62	22.60	22.11	23.97	22.14	23.99	22.13
6. Puerto Rico	6.16	6.08	3.79	5.17	3.97	5.98	5.14	3.37	5.12	5.13
7. Taiwan	5.85	—	3.95	5.50	6.59	5.93	4.64	6.75	6.27	5.89
8. Ecuador	19.50	17.72	16.85	16.42	17.99	15.47	15.57	—	16.13	17.47
9. Colombia	20.72	21.30	20.73	21.74	19.78	22.01	20.97	21.10	21.78	21.08
10. Korea	14.92	12.32	13.93	16.79	14.17	11.93	14.58	18.50	16.59	14.99
11. Thailand	7.11	4.68	8.29	6.37	6.21	5.00	8.32	4.81	6.50	6.78
12. Sri Lanka	10.61	6.86	5.05	7.87	7.44	8.34	8.73	8.53	7.64	9.38
13. Zimbabwe	7.94	8.92	7.08	5.07	7.57	8.66	9.67	11.24	8.81	8.05
Mean	14.37	13.81	12.82	13.46	13.24	13.83	14.56	13.79	14.36	14.04

TABLE V
COEFFICIENTS OF VARIATION OF PRICE LOG-CHANGES

(%)

Country	Food	Beverages	Clothing	Housing	Durables	Medicine	Transport	Recreation	Others	Divisia Price Index
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Hong Kong	68.8	84.1	129.7	59.7	73.5	55.2	58.1	61.5	87.8	58.5
2. Israel	75.1	80.2	78.2	74.4	79.7	75.2	77.6	73.4	72.2	75.2
3. Singapore	182.1	74.6	201.7	70.9	136.4	88.7	94.6	330.0	127.1	113.2
4. Malta	116.4	113.5	252.5	152.4	79.8	180.2	98.5	113.4	235.4	85.1
5. Mexico	71.0	—	78.2	69.6	78.2	81.4	88.5	74.2	68.6	74.5
6. Puerto Rico	94.8	90.2	57.4	73.1	81.5	38.3	105.9	110.7	62.5	67.5
7. Taiwan	142.1	—	187.2	125.6	159.8	104.1	163.1	110.3	126.1	124.3
8. Ecuador	72.9	67.2	69.3	32.6	73.1	50.7	55.0	—	40.7	51.7
9. Colombia	25.7	13.4	23.6	18.8	14.9	21.7	31.7	14.3	14.0	13.0
10. Korea	68.3	76.7	66.8	48.1	132.5	123.9	74.7	69.4	68.1	55.0
11. Thailand	111.9	123.8	82.2	92.0	98.2	120.2	100.6	116.2	86.4	91.5
12. Sri Lanka	85.8	111.9	171.1	168.9	107.5	91.9	171.5	322.2	230.2	74.4
13. Zimbabwe	58.0	97.4	69.4	131.7	71.8	146.8	86.0	154.8	66.2	49.6
Mean	90.2	84.8	112.9	86.0	91.3	90.6	92.8	129.2	98.9	71.8

CONSUMPTION PATTERNS

TABLE VI
PER CAPITA QUANTITIES CONSUMED OF NINE COMMODITIES AND VOLUME INDEX FOR THIRTEEN COUNTRIES

(Mean log-changes \times 100)

Country	Food	Beverages	Clothing	Housing	Durables	Medicine	Transport	Recreation	Others	Divisia Volume Index
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Hong Kong	2.34	-0.82	5.91	6.36	10.26	6.26	4.55	5.97	7.41	5.27
2. Israel	1.20	2.62	0.49	3.50	4.06	4.04	4.83	1.40	2.31	2.78
3. Singapore	3.05	3.16	5.32	5.62	5.69	5.77	6.88	9.72	6.72	5.64
4. Malta	3.29	1.23	2.32	3.96	3.12	4.27	-0.65	3.51	12.46	3.49
5. Mexico	1.50	—	1.17	1.09	1.30	5.84	3.33	2.13	1.81	1.72
6. Puerto Rico	1.19	0.74	2.96	3.95	2.19	3.67	4.19	5.59	4.30	2.98
7. Taiwan	3.68	—	7.30	6.49	7.69	6.07	12.74	8.50	5.04	5.41
8. Ecuador	0.28	1.85	4.08	2.44	1.48	2.72	5.85	—	4.30	2.54
9. Colombia	1.58	1.32	-1.05	1.96	1.72	1.36	4.21	1.10	3.52	1.95
10. Korea	3.09	8.35	4.37	3.40	7.26	9.13	9.62	7.19	6.36	4.99
11. Thailand	1.86	6.12	3.67	3.06	5.18	5.05	4.54	2.12	13.18	3.71
12. Sri Lanka	0.35	4.71	6.29	2.70	3.42	0.26	8.24	0.84	9.00	3.23
13. Zimbabwe	-2.40	3.60	1.12	3.57	2.60	2.31	0.98	0.92	-0.35	0.91
Mean	1.62	2.99	3.38	3.70	4.31	4.37	5.33	4.08	5.85	3.36

TABLE VII
COEFFICIENTS OF VARIATION OF QUANTITY LOG-CHANGES

(%)

Country	Food	Beverages	Clothing	Housing	Durables	Medicine	Transport	Recreation	Others	Divisia Volume Index
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
1. Hong Kong	126.9	-1,093.2	286.8	42.6	80.6	149.5	159.7	73.0	162.2	102.7
2. Israel	250.5	284.0	2,151.5	57.0	287.0	152.1	251.3	474.7	173.4	160.1
3. Singapore	96.8	161.1	74.4	52.1	66.8	79.6	81.0	55.9	58.7	41.5
4. Malta	168.1	883.7	511.5	288.7	353.4	247.1	-1,432.1	295.9	165.6	208.1
5. Mexico	123.2	—	434.2	96.9	471.1	49.0	219.2	341.9	294.2	206.2
6. Puerto Rico	505.8	1,148.8	200.9	92.6	322.9	177.4	184.8	145.8	176.8	129.3
7. Taiwan	61.0	—	47.8	39.1	74.1	64.0	79.2	63.8	69.1	40.1
8. Ecuador	1,429.6	358.7	170.3	87.9	809.0	134.3	87.8	—	63.5	140.6
9. Colombia	159.4	276.3	-686.0	64.3	313.7	565.7	94.3	301.9	105.8	115.6
10. Korea	81.3	115.9	190.8	87.4	155.3	92.9	58.4	70.3	73.4	52.8
11. Thailand	79.6	91.3	66.7	72.0	102.7	147.3	119.4	618.1	328.3	39.8
12. Sri Lanka	1,859.1	169.3	173.3	186.3	387.2	7,941.5	128.0	2,963.4	416.8	212.3
13. Zimbabwe	-404.7	97.9	872.1	306.3	685.1	813.0	1,383.6	2,519.1	-2,849.7	818.6
Mean	349.0	226.7	345.7	113.3	316.1	816.4	108.8	660.3	-58.6	174.4

CONSUMPTION PATTERNS

TABLE VIII
LARGE RELATIVE PRICE AND QUANTITY CHANGES

Country	Commodities	Year	Log-Change in Relative		Sample Size with Outliers Omitted
			Price	Quantity	
(1)	(2)	(3)	(4)	(5)	(6)
1. Malta	Others	1974	-24.22	44.28	10
2. Taiwan	Transport	1964	-4.82	35.21	23
3. Korea	Durables	1971	-40.02	2.45	19
	Durables	1973	37.03	6.89	
	Medicine	1973	-41.26	7.62	
4. Thailand	Recreation	1976	-11.75	-54.61	16
	Others	1976	11.76	172.80	
5. Sri Lanka	Housing	1979	41.79	-6.28	15
	Medicine	1973	14.08	-85.41	
	Transport	1978	-13.73	39.52	
	Recreation	1972	75.78	-83.02	
	Recreation	1973	-83.29	31.61	
	Others	1969	9.38	91.44	
	Others	1970	31.86	-65.50	
	Others	1972	-70.52	13.23	
	Others	1973	7.16	94.00	
6. Zimbabwe	Medicine	1978	-9.63	53.48	11
	Recreation	1978	53.58	-46.02	

Note: The year in column 3 refers to the change from the previous year to the listed year. For example, the first entry, 1974, refers to the change from 1973 to 1974. All entries in columns 4 and 5 are to be divided by 100. The sample size is taken after lagging.

request) reveal a number of large jumps in the data and in this section we analyzed these outlying observations.

Let $Dp_{it}^* = Dp_{it} - DP_t$ be the change in the relative price of good i and $Dq_{it}^* = Dq_{it} - DQ_t$ be the corresponding quantity change. Table VIII presents those countries and years in which either $Dp_{it}^* \times 100$ or $Dq_{it}^* \times 100$ exceeds 35 per cent in absolute value. While the choice of a 35 per cent figure is to some extent arbitrary, it was adopted to strike a balance between reasonable and implausibly large changes.

For a given country, we removed from the sample the year t for all n goods if t is listed in column 3 of Table VIII and then recalculated the averages and coefficients of variation. As a result, (i) there is a negligible impact on the means and standard deviations of the budget shares; (ii) again there is only a limited impact on most of the means of the price and quantity log-changes; and (iii) the standard deviations of most of the price and quantity log-changes decrease, as anticipated.⁴

Next, we determined whether the outliers are significantly different from the

⁴ The detailed results are available on request.

TABLE IX
ESTIMATES OF DEMAND EQUATIONS FOR COUNTRIES AND COMMODITIES WITH OUTLIERS

Country	Commodity	Constant $\alpha_i \times 100$	Income Elasticities β_i	Price Elasticities γ_i	Dummy Variable Coefficients $\times 100$				F	$D.W.$	R^2	$SEE \times 100$
					δ_{i1}	δ_{i2}	δ_{i3}	δ_{i4}				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Malta	Others	4.93	2.00	-0.67						2.46	0.72	12.23
		(4.17)	(0.54)	(0.33)					4.03	2.90	0.82	10.41
		3.20	1.84	-0.18	29.73							
		(3.62)	(0.47)	(0.38)	(14.80)							
Taiwan	Transport	-7.18	3.54	-0.60						1.37	0.64	6.32
		(3.54)	(0.61)	(0.38)					11.11*	1.65	0.77	5.19
		-3.69	2.80	-0.37	19.84*							
		(3.09)	(0.55)	(0.32)	(5.95)							
Korea	Durables	-2.64	1.95	-0.19						1.83	0.27	10.16
		(4.85)	(0.86)	(0.14)					3.53	1.94	0.49	8.97
	-5.59	2.51	-0.61	-29.14	24.81							
	(4.47)	(0.83)	(0.20)	(12.96)	(11.79)							
	Medicine	5.48	0.69	-0.06						1.47	0.05	8.69
(4.23)		(0.74)	(0.12)					0.05	1.52	0.06	8.93	
		5.64	0.65	-0.05	2.45							
		(4.41)	(0.79)	(0.15)	(11.22)							
Thailand	Recreation	1.95	1.37	3.14						2.42	0.47	9.96
		(3.33)	(1.62)	(1.04)					316.10*	2.65	0.99	1.47
	0.24	1.07	-0.24	-59.38*								
	(0.51)	(0.28)	(0.21)	(2.56)								
	Others	-32.78	12.80	5.17						2.33	0.58	29.90
(20.58)		(5.17)	(1.68)					351.05*	1.70	0.99	5.86	
		-3.98	1.74	-0.60	178.97*							
		(4.32)	(1.17)	(0.45)	(9.55)							
Sri Lanka	Housing	2.97	-0.13	-0.01						2.13	0.02	5.25
		(1.36)	(0.29)	(0.11)					0.01	2.12	0.02	5.40
		2.87	-0.12	-0.02	1.15							
		(1.63)	(0.30)	(0.19)	(9.58)							

CONSUMPTION PATTERNS

TABLE IX (Continued)

Country	Commodity	Constant $\alpha_i \times 100$	Income Elasticities β_i	Price Elasticities γ_i	Dummy Variable Coefficients $\times 100$				<i>F</i>	<i>D.W.</i>	<i>R</i> ²	<i>SEE</i> $\times 100$
					δ_{i1}	δ_{i2}	δ_{i3}	δ_{i4}				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
	Medicine	-0.14 (4.39)	-0.59 (0.85)	-1.65 (0.57)						1.51	0.33	17.94
		1.32 (2.84)	1.03 (0.63)	-0.46 (0.43)	-80.68* (15.64)				26.62*	2.22	0.74	11.53
	Transport	6.85 (2.67)	0.54 (0.55)	-0.27 (0.23)						2.30	0.08	10.64
		5.45 (2.03)	0.52 (0.42)	-0.10 (0.18)	32.81* (8.48)				14.95*	2.28	0.51	7.99
	Recreation	-0.71 (3.84)	0.41 (0.80)	-0.73 (0.14)						1.83	0.64	15.68
		2.46 (3.47)	0.28 (0.78)	-0.26 (0.45)	-67.89 (38.66)	15.76 (43.07)			4.66*	2.54	0.77	13.22
	Others	0.66 (8.53)	3.44 (1.65)	-0.37 (0.40)						2.90	0.22	35.00
		2.19 (4.10)	-0.30 (0.92)	-1.10 (0.43)	105.61* (16.77)	-33.3 (20.61)	-69.94 (35.38)	114.59* (18.92)	20.02*	2.36	0.88	15.31
Zimbabwe	Medicine	2.55 (4.56)	0.42 (0.64)	-1.03 (0.40)						2.06	0.43	15.66
		-1.67 (1.75)	0.47 (0.23)	-0.72 (0.15)	47.90* (6.19)				59.91*	2.63	0.93	5.70
	Recreation	2.29 (4.56)	1.35 (0.63)	-0.82 (0.26)						1.32	0.64	15.34
		3.07 (4.92)	1.36 (0.65)	-0.54 (0.55)	-20.16 (34.27)				0.35	1.15	0.66	15.98

Notes: 1. $Dq_{it} = \alpha_i + \beta_i DQ_t + \gamma_i Dp_{it}^* + \sum_{j=1}^k \delta_{ij} d_{ijt}$.

2. Standard errors are indicated in parentheses.

3. The variable d_{ijt} is a dummy variable for commodity i which takes the value of 1 if observation t is an outlying year listed in column 3 of Table VIII, 0 otherwise, for $j = 1, \dots, k$ outliers.

4. The F -values test joint hypothesis that all the dummy variable coefficients are zero.

* Significant at the 5 per cent level.

TABLE X
 FREQUENCY DISTRIBUTION OF ESTIMATES OF DEMAND
 PARAMETERS WITH AND WITHOUT OUTLIERS

Range	Outlying Observations	
	Included	Excluded
Constants ($\alpha_i \times 100$):		
(∞ , 5]	15	15
(5 , 1]	38	46
(1 , 0]	8	8
(0 , -0.5]	8	0
(-0.5 , -1]	8	0
(-1 , $-\infty$)	23	31
Mean	-1.21	0.89
Income elasticities (β_i):		
(∞ , 1]	54	54
(1 , 0]	31	31
(0 , -0.5]	8	15
(-0.5 , -1]	8	0
(-1 , $-\infty$)	0	0
Mean	2.14	1.07
Price elasticities (γ_i):		
(∞ , 1]	15	0
(1 , 0]	0	0
(0 , -0.5]	38	62
(-0.5 , -1]	31	31
(-1 , $-\infty$)	15	8
Mean	0.15	-0.40

Note: Except for the means, the entries are expressed in percentages.

corresponding means by regressing the prices and quantities on a constant and a dummy variable for each outlying year. In all cases, the t -values of the coefficients of the dummy variable are significant at the 5 per cent level (the detailed results are available on request), which confirms that these observations are outliers in a statistical sense.

To investigate the possibility that large changes in quantities are a response to large changes in prices and/or income, we estimated demand equations for countries and commodities involving outliers. These are double-log demand equations and the results are given in Table IX. Here there are two rows for each country and commodity for which there is an outlier, the first without dummy variables for the years in question and the second with dummy variables. The F -values in column 10 test the joint significance of the dummies; eight of the thirteen of these values are significant at the 5 per cent level. Again, this fact suggests that these observations are genuine outliers.

Table X summarizes the effects of the outliers on the estimates of the demand equations in the form of frequencies (overall countries and goods in Table IX) for the constants, income elasticities, and price elasticities. As can be seen, by omitting the outliers (i) the constants are substantially reduced (in absolute value); (ii) the income elasticities decrease by about 50 per cent; and (iii) the price elasticities become more negative. As the demand equations are formulated in terms of changes over time, the constants play the role of residual trends. Consequently, the exclusion of the outliers reduces the residual trends in consumption, which is an attractive proposition as these trends do not have a well-defined economic interpretation. On the basis of the results of this section, in what follows we shall exclude all the outliers.

IV. DIVISIA MOMENTS

We return to the Divisia price and volume indices defined in equation (1). Tables XI and XII present these indices for all years.⁵ These indices can be considered as budget-share-weighted first-order moments of the n price and quantity changes, $Dp_{1t}, \dots, Dp_{nt}, Dq_{1t}, \dots, Dq_{nt}$. The analogous second-order moments are the Divisia price and quantity variances,

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

which measure the extent to which the prices and quantities of the individual goods change disproportionately; when all prices and quantities change proportionately, the two variances disappear (Theil [16, Chap. 5]). The measure Π is also known as the "variability of relative prices." Tables XIII and XIV present these variances and, as can be seen, the quantity variance exceeds the corresponding price variance in 115 out of 192 cases (about 60 per cent). This pattern agrees with previous findings for the OECD countries (Selvanathan [14, p. 68]).

The Divisia price-quantity covariance is defined as $\Gamma_t = \sum_{i=1}^n \bar{w}_{it} (Dp_{it} - DP_t)(Dq_{it} - DQ_t)$, which measures the co-movement of the prices and quantities. Table XV presents the corresponding Divisia correlations, defined as $\rho_t = \Gamma_t / \sqrt{\Pi_t K_t}$. As can be seen, 147 of the 192 correlations are negative, accounting for about 77 per cent of the cases. Selvanathan carried out a similar analysis with eighteen OECD countries and observed that ρ_t was negative in 241 of the 322 cases, or about 75 per cent of the time, a result remarkably close to ours [14, p. 73]. The last row of Table

⁵ In addition to omitting the outliers discussed in the previous section, we also excluded the observations for 1975 for Puerto Rico and those for 1974 and 1975 for Sri Lanka on the basis that when these observations were included, the estimated food income elasticity was not less than unity in both cases. This deviation from Engel's law raises suspicions about the legitimacy of these observations. For full details, see Chen [1, pp. 68-72]. In all subsequent computations, we omit (i) the outlying observations of Section III and (ii) 1975 for Puerto Rico and 1974 and 1975 for Sri Lanka.

TABLE XI
DIVISIA PRICE INDICES IN THIRTEEN COUNTRIES

Year (1)	Hong Kong (2)	Israel (3)	Singapore (4)	Malta (5)	Mexico (6)	Puerto Rico (7)	Taiwan (8)	Ecuador (9)	Colombia (10)	Korea (11)	Thailand (12)	Sri Lanka (13)	Zimbabwe (14)
1963	—	—	—	—	—	—	0.53	—	—	—	—	—	—
1964	—	—	—	—	—	1.61	—	—	—	32.12	—	4.03	—
1965	—	—	—	—	—	1.91	1.20	—	—	4.85	—	-0.03	—
1966	—	—	—	—	—	4.98	0.87	—	—	13.39	—	0.13	—
1967	—	—	—	—	—	2.68	4.34	—	—	11.29	—	3.64	—
1968	—	—	1.36	—	—	4.27	6.39	—	—	9.81	0.93	8.13	—
1969	—	—	-0.13	—	—	4.21	3.79	—	—	11.52	1.24	—	—
1970	—	—	1.20	—	—	3.75	3.36	—	—	21.48	-0.41	—	—
1971	0.58	11.58	3.37	—	6.52	4.40	2.26	—	—	—	1.33	3.76	2.18
1972	9.55	13.86	2.60	—	5.56	4.56	4.06	—	—	13.25	4.52	—	0.73
1973	17.84	18.08	14.74	—	11.90	11.55	11.13	—	17.51	—	14.40	—	5.65
1974	15.19	32.61	12.75	—	20.96	13.34	32.11	19.29	23.60	28.48	20.27	—	6.90
1975	1.44	34.27	2.75	4.05	12.84	—	5.76	13.50	21.88	24.46	4.96	—	8.12
1976	4.55	25.01	0.59	1.87	17.15	2.15	1.37	10.13	18.91	16.25	—	3.33	10.26
1977	3.85	29.55	2.15	7.73	24.12	5.81	7.78	11.90	24.02	14.28	6.47	4.86	10.35
1978	5.45	42.29	2.82	3.23	15.52	5.85	6.58	11.27	16.44	18.25	9.10	—	—
1979	13.09	55.87	3.66	6.47	16.21	11.13	9.39	10.50	23.07	18.23	10.93	—	11.99
1980	13.00	82.83	6.96	14.17	22.54	9.52	18.50	13.25	23.25	25.40	17.19	20.64	8.34
1981	10.96	78.03	5.36	9.93	23.35	5.83	14.74	15.75	23.05	17.60	11.43	12.19	13.17
1982	9.32	77.53	1.58	4.85	45.20	2.36	3.56	17.40	21.89	6.30	5.41	13.72	12.98
1983	8.94	90.21	0.30	-1.12	65.82	1.39	1.78	37.55	18.28	2.28	3.45	17.42	—
1984	8.67	157.30	0.98	-0.23	—	1.76	0.14	31.61	—	2.53	-0.14	14.93	—
1985	—	—	—	—	—	—	0.12	—	—	—	—	—	—
1986	—	—	—	—	—	—	0.68	—	—	—	—	—	—
Mean	8.74	53.50	3.71	5.09	22.13	5.15	6.11	17.47	21.08	15.36	6.94	8.21	8.24

Note: All entries are to be divided by 100.

CONSUMPTION PATTERNS

TABLE XII
DIVISIA VOLUME INDICES IN THIRTEEN COUNTRIES

Year (1)	Hong Kong (2)	Israel (3)	Singapore (4)	Malta (5)	Mexico (6)	Puerto Rico (7)	Taiwan (8)	Ecuador (9)	Colombia (10)	Korea (11)	Thailand (12)	Sri Lanka (13)	Zimbabwe (14)
1963	—	—	—	—	—	—	3.33	—	—	—	—	—	—
1964	—	—	—	—	—	5.72	—	—	—	2.13	—	0.88	—
1965	—	—	—	—	—	5.81	6.31	—	—	6.53	—	-0.20	—
1966	—	—	—	—	—	2.26	3.12	—	—	2.43	—	4.75	—
1967	—	—	—	—	—	4.70	6.49	—	—	5.02	—	0.38	—
1968	—	—	6.69	—	—	9.03	6.26	—	—	7.87	3.02	3.23	—
1969	—	—	6.73	—	—	4.65	5.10	—	—	7.77	2.80	—	—
1970	—	—	10.51	—	—	8.73	5.73	—	—	7.71	3.59	—	—
1971	2.99	3.69	6.74	—	2.22	4.02	6.68	—	—	—	2.54	-1.40	8.70
1972	7.78	7.50	7.52	—	3.59	3.11	8.27	—	—	4.78	3.64	—	3.88
1973	6.14	3.07	6.73	—	3.58	-2.00	9.98	—	1.72	—	5.37	—	-2.73
1974	-6.61	3.86	3.81	—	0.95	-2.50	2.74	6.20	3.03	4.59	2.28	—	4.59
1975	0.16	-2.14	1.12	-1.40	1.29	—	4.25	6.83	0.07	3.74	2.96	—	-2.46
1976	7.92	4.10	4.12	9.17	0.89	4.06	5.17	5.12	3.85	6.88	—	2.12	-5.51
1977	13.36	3.20	4.94	14.35	0.92	3.27	4.85	4.57	4.33	5.00	6.17	9.64	-11.52
1978	15.84	6.80	6.83	6.99	4.29	0.89	6.63	2.79	5.37	7.54	4.00	—	—
1979	1.91	4.49	7.83	8.62	5.53	-2.35	7.79	2.69	2.45	6.31	3.08	—	2.72
1980	5.62	-5.42	6.99	7.99	3.64	-0.66	3.44	3.75	2.38	-2.29	3.98	5.56	12.41
1981	5.19	7.52	5.96	-4.82	3.29	-4.97	1.61	1.36	0.86	1.73	2.65	1.98	9.75
1982	2.98	4.53	2.66	-6.69	1.02	1.21	2.73	-0.13	-0.34	2.77	0.79	2.75	-8.41
1983	5.98	4.46	4.16	-6.22	-8.91	4.70	4.19	-5.88	-2.29	5.02	5.06	-0.81	—
1984	4.57	-6.80	2.50	1.92	—	4.37	6.77	0.61	—	4.09	4.49	-1.10	—
1985	—	—	—	—	—	—	3.73	—	—	—	—	—	—
1986	—	—	—	—	—	—	5.03	—	—	—	—	—	—
Mean	5.27	2.78	5.64	2.99	1.72	2.70	5.23	2.54	1.95	4.72	3.53	2.14	1.04

Note: All entries are to be divided by 100.

TABLE XIII
DIVISIA PRICE VARIANCES IN THIRTEEN COUNTRIES

Year (1)	Hong Kong (2)	Israel (3)	Singapore (4)	Malta (5)	Mexico (6)	Puerto Rico (7)	Taiwan (8)	Ecuador (9)	Colombia (10)	Korea (11)	Thailand (12)	Sri Lanka (13)	Zimbabwe (14)
1963	—	—	—	—	—	—	1.32	—	—	—	—	—	—
1964	—	—	—	—	—	3.18	—	—	—	104.99	—	4.32	—
1965	—	—	—	—	—	2.56	1.35	—	—	155.04	—	3.47	—
1966	—	—	—	—	—	24.67	14.81	—	—	33.32	—	5.25	—
1967	—	—	—	—	—	6.06	15.01	—	—	29.61	—	4.07	—
1968	—	—	1.42	—	—	6.20	5.59	—	—	19.65	0.67	9.78	—
1969	—	—	5.63	—	—	2.43	8.50	—	—	7.67	3.87	—	—
1970	—	—	2.97	—	—	2.39	13.03	—	—	203.17	4.56	—	—
1971	87.50	3.29	4.51	—	3.87	6.14	1.79	—	—	—	20.17	22.58	3.38
1972	69.43	25.31	6.16	—	0.77	12.68	5.44	—	—	9.77	6.23	—	12.48
1973	63.96	14.98	57.31	—	4.89	43.34	13.80	—	25.74	—	47.37	—	31.40
1974	31.72	38.39	22.86	—	16.81	10.83	64.32	19.44	10.17	22.24	25.71	—	13.10
1975	32.33	54.05	12.50	82.84	5.06	—	8.36	32.31	14.89	17.59	5.50	—	14.30
1976	2.64	21.69	9.28	4.21	3.83	12.37	6.58	9.14	11.31	25.28	—	10.82	20.46
1977	15.44	41.77	2.12	13.88	10.47	4.07	6.00	7.95	17.95	15.70	2.38	5.28	18.49
1978	2.52	10.98	1.48	2.56	3.15	0.76	4.63	14.29	38.58	10.30	16.20	—	—
1979	11.48	65.16	1.66	16.85	5.42	16.52	10.15	9.51	15.80	18.87	19.13	—	33.12
1980	9.82	102.15	19.71	52.71	7.08	9.06	27.09	6.71	9.85	19.54	8.23	124.10	91.34
1981	10.88	87.65	17.91	26.07	4.21	8.95	18.71	25.07	2.63	11.83	11.48	34.48	17.06
1982	8.85	5.73	14.77	52.76	22.27	4.53	2.55	3.38	3.78	11.96	12.02	67.72	4.58
1983	14.48	16.01	9.18	2.90	47.88	5.20	0.37	200.25	2.97	6.68	7.79	60.52	—
1984	4.36	14.59	11.06	1.06	—	2.24	3.66	79.06	—	0.72	11.18	35.30	—
1985	—	—	—	—	—	—	3.10	—	—	—	—	—	—
1986	—	—	—	—	—	—	4.02	—	—	—	—	—	—
Mean	26.10	35.84	11.80	25.58	10.44	9.21	10.44	37.01	13.97	38.10	12.66	29.82	23.61

Note: All entries are to be divided by 10,000.

CONSUMPTION PATTERNS

TABLE XIV
DIVISIA QUANTITY VARIANCES IN THIRTEEN COUNTRIES

Year (1)	Hong Kong (2)	Israel (3)	Singapore (4)	Malta (5)	Mexico (6)	Puerto Rico (7)	Taiwan (8)	Ecuador (9)	Colombia (10)	Korea (11)	Thailand (12)	Sri Lanka (13)	Zimbabwe (14)
1963	—	—	—	—	—	—	6.04	—	—	—	—	—	—
1964	—	—	—	—	—	28.46	—	—	—	60.15	—	31.30	—
1965	—	—	—	—	—	12.62	9.53	—	—	77.01	—	25.21	—
1966	—	—	—	—	—	111.46	9.13	—	—	49.01	—	4.72	—
1967	—	—	—	—	—	17.64	24.70	—	—	50.49	—	5.55	—
1968	—	—	8.25	—	—	42.84	9.94	—	—	20.88	4.21	8.91	—
1969	—	—	23.77	—	—	18.31	8.26	—	—	27.26	12.18	—	—
1970	—	—	7.08	—	—	15.90	9.64	—	—	28.15	10.56	—	—
1971	16.27	20.65	7.25	—	6.22	28.39	14.52	—	—	—	14.34	120.30	19.25
1972	64.61	13.79	5.37	—	8.78	37.00	7.36	—	—	19.57	4.71	—	32.75
1973	58.19	19.95	20.66	—	3.75	25.08	17.35	—	15.73	—	17.89	—	33.04
1974	173.61	20.26	53.67	—	10.76	18.48	21.69	9.40	15.14	10.25	12.76	—	29.51
1975	22.35	43.03	12.83	38.94	2.70	—	2.95	9.07	13.78	9.48	12.09	—	19.87
1976	38.55	8.47	2.21	20.30	4.11	40.54	3.41	7.10	9.13	7.50	—	61.36	44.40
1977	156.38	7.13	13.04	124.70	3.36	30.94	9.90	46.94	16.53	23.06	14.89	65.61	35.57
1978	107.76	31.23	14.91	35.39	7.92	20.46	16.26	23.59	10.10	37.67	20.47	—	—
1979	46.40	58.52	13.89	63.44	7.58	28.60	46.50	4.61	19.32	23.70	25.98	—	52.15
1980	13.37	34.68	7.38	128.34	3.16	14.68	3.87	6.64	2.76	27.24	10.31	169.61	327.01
1981	24.81	41.92	22.69	20.49	3.72	21.21	3.44	4.50	2.18	9.93	4.45	87.18	147.54
1982	9.86	6.99	10.19	40.78	6.17	2.73	3.79	0.66	9.26	8.90	11.55	49.77	58.67
1983	42.92	26.50	14.97	16.81	38.57	25.01	2.18	61.76	9.54	5.50	3.56	54.30	—
1984	20.07	93.20	20.93	6.47	—	10.63	4.79	4.61	—	6.63	5.40	83.41	—
1985	—	—	—	—	—	—	2.02	—	—	—	—	—	—
1986	—	—	—	—	—	—	3.16	—	—	—	—	—	—
Mean	56.80	30.45	15.24	49.57	8.21	27.55	10.45	16.26	11.22	26.44	11.58	59.02	72.71

Note: All entries are to be divided by 10,000.

TABLE XV
DIVISIA PRICE-QUANTITY CORRELATIONS IN THIRTEEN COUNTRIES

Year (1)	Hong Kong (2)	Israel (3)	Singapore (4)	Malta (5)	Mexico (6)	Puerto Rico (7)	Taiwan (8)	Ecuador (9)	Colombia (10)	Korea (11)	Thailand (12)	Sri Lanka (13)	Zimbabwe (14)
1963	—	—	—	—	—	—	77.39	—	—	—	—	—	—
1964	—	—	—	—	—	5.38	—	—	—	8.09	—	-69.66	—
1965	—	—	—	—	—	-21.28	-28.97	—	—	-43.88	—	-71.30	—
1966	—	—	—	—	—	-40.35	-51.31	—	—	-3.05	—	-0.30	—
1967	—	—	—	—	—	-41.08	-7.54	—	—	-80.29	—	-13.30	—
1968	—	—	-62.97	—	—	-64.74	-42.12	—	—	55.99	-54.33	-79.96	—
1969	—	—	25.25	—	—	-45.47	25.96	—	—	-44.83	-56.31	—	—
1970	—	—	13.15	—	—	-18.02	-49.51	—	—	-45.41	32.98	—	—
1971	-72.19	70.84	-27.52	—	-6.61	-51.86	-65.74	—	—	—	33.39	-58.99	-47.32
1972	3.89	9.40	69.09	—	85.17	-68.62	-77.84	—	—	-17.52	-73.24	—	-96.21
1973	-49.80	-1.55	-64.34	—	-69.85	-45.79	-45.03	—	-30.10	—	-72.88	—	-75.38
1974	-61.77	-69.76	-56.01	—	-16.21	-20.61	-84.99	-16.73	-44.29	-33.67	-50.53	—	-61.48
1975	66.33	-63.16	-19.82	-7.01	9.77	—	-48.12	-49.38	25.47	-36.58	-31.61	—	22.37
1976	51.98	-16.41	-37.75	-30.88	-22.75	-22.69	55.44	0.65	-36.24	-53.44	—	-53.05	-14.86
1977	-84.47	-3.18	-45.97	2.87	-44.63	-85.83	-4.23	-25.39	-83.20	-33.58	-31.72	-51.33	-80.45
1978	-78.81	5.06	21.40	-24.13	-10.17	13.42	-7.37	42.64	-30.68	-74.46	-62.80	—	—
1979	-39.42	-52.40	-12.44	-17.46	76.01	-41.60	62.28	-50.86	-56.31	-21.74	-43.13	—	-81.32
1980	-18.78	-28.18	-46.39	-61.01	-30.19	-16.50	5.65	38.55	3.51	9.76	-9.20	-18.08	-30.86
1981	12.14	-25.20	-65.79	-40.46	1.10	-17.51	-40.47	27.76	16.75	-29.90	40.53	-38.78	-76.42
1982	-19.52	-69.21	-61.10	-7.51	-58.07	-5.83	-37.83	-50.74	-52.29	-6.09	-43.54	-62.10	3.90
1983	-69.95	18.43	-44.71	-46.22	-76.46	-87.50	-3.63	-56.20	-21.13	4.74	-69.30	-43.18	—
1984	-26.07	-60.45	-50.45	-13.89	—	-12.87	53.32	16.05	—	-40.68	14.92	-46.32	—
1985	—	—	—	—	—	—	24.79	—	—	—	—	—	—
1986	—	—	—	—	—	—	-90.54	—	—	—	—	—	—
Mean	-27.60	-20.41	-27.43	-24.57	-12.53	-34.47	-16.54	-11.24	-28.05	-25.61	-29.80	-46.64	-48.91

Note: All entries are to be divided by 100.

CONSUMPTION PATTERNS

XV shows that, on average, the correlations are negative for each country, reflecting the tendency of the consumer to move away from those commodities having above-average price increases.

V. DEMAND ELASTICITIES

In this section we summarize estimates of demand elasticities for each good in the thirteen countries. These elasticities are of interest in their own right and may be useful in applied general equilibrium modeling of emerging economies.

Consider a double-log demand equation for commodity i :

$$Dq_{it} = \alpha_i + \beta_i DQ_t + \gamma_i Dp_{it}^* + \varepsilon_{it}, \quad (2)$$

where Dq_{it} is the log-change in the quantity demanded of good i ; α_i is an intercept which is interpreted as an autonomous trend; β_i is the income elasticity; DQ_t is the log-change in real income; γ_i is the compensated own-price elasticity; $Dp_{it}^* = Dp_{it} - DP_t$ is the log-change in the relative price of good i ; and ε_{it} is an error term.

We endow all variables and parameters in equation (2) with a country superscript c ($c = 1, \dots, 13$):

$$Dq_{it}^c = \alpha_i^c + \beta_i^c DQ_t^c + \gamma_i^c Dp_{it}^{*c} + \varepsilon_{it}^c. \quad (3)$$

As the relative price of good i is defined as $Dp_{it}^{*c} = Dp_{it}^c - DP_t^c$, cross-price effects operate in equation (3) via the Divisia price index $DP_t^c = \sum_{i=1}^{n^c} \bar{w}_{it}^c Dp_{it}^c$. Accordingly, the cross-price elasticity takes the form $\partial(\log q_{it}^c)/\partial(\log p_{jt}^c) = -\gamma_i^c \bar{w}_{jt}^c$ for $i \neq j$. It should be noted that this is a fairly restrictive approach to modeling cross-price effects, but it is probably not too inappropriate given the limited amount and limited quality of data available for the countries in question. The least-squares estimates of equation (3) for $i = 1, \dots, n^c$ goods for each country are given in the Appendix. These estimates are summarized in Table XVI in the form of cross-country frequency distributions. It is assumed that the coefficients of equation (3) for a given country are stable over time. Although the sample size precludes testing this assumption, the results (to be discussed) regarding the stability of demand elasticities across countries suggest the presence of a certain degree of stability over time.

As can be seen from Table XVI, on average the autonomous trends for food, beverages, clothing, and durables are negative, while those for the other commodities are positive. Regarding the income elasticities, those for food always lie between zero and one, implying that this commodity is always a necessity. Housing is nearly always a necessity (but a positive autonomous trend should be noted) and durables and transport are almost always luxuries. The bottom part of column 11 of the table shows that 21 per cent of the price elasticities are positive, the wrong sign. On the other hand, Appendix Table III indicates that only three (out of twenty-four)

TABLE XVI

FREQUENCY DISTRIBUTION OF AUTONOMOUS TRENDS AND INCOME AND PRICE ELASTICITIES FOR NINE COMMODITIES IN THIRTEEN COUNTRIES

Range (1)	Food (2)	Beverages (3)	Clothing (4)	Housing (5)	Durables (6)	Medicine (7)	Transport (8)	Recreation (9)	Others (10)	All Goods (11)
Autonomous trends ($\alpha_i^c \times 100$):										
$(-\infty, -1]$	31	46	54	8	69	15	38	38	23	36
$(-1, 0]$	38	23	23	8	8	8	15	31	8	18
$(0, 1]$	23	15	15	8	8	8	8	0	23	12
$(1, \infty)$	8	15	8	77	15	69	38	31	46	34
Mean	-0.59	-1.09	-1.87	2.30	-1.63	1.93	0.28	0.74	0.51	0.07
Income elasticities (β_i^c):										
$(-\infty, -1]$	0	0	0	0	0	0	0	0	0	0
$(-1, 0]$	0	15	8	8	0	0	0	15	0	5
$(0, 1]$	100	31	8	85	15	62	15	23	46	43
$(1, \infty)$	0	54	85	8	85	38	85	62	54	52
Mean	0.63	1.11	1.33	0.36	1.77	0.81	1.54	1.22	1.19	1.11
Price elasticities (γ_i^c):										
$(-\infty, -1]$	8	23	8	0	31	8	0	8	8	10
$(-1, 0]$	62	62	85	54	38	77	85	92	69	69
$(0, 1]$	31	15	8	46	23	15	15	0	23	20
$(1, \infty)$	0	0	0	0	8	0	0	0	0	1
Mean	-0.34	-0.65	-0.36	-0.15	-0.51	-0.31	-0.28	-0.45	-0.32	-0.37

Note: Except for the means, the entries are expressed in percentages.

of these are significant while the vast majority (almost 70 per cent) of the price elasticities lie between zero and minus one.

To what extent are the demand elasticities for the emerging economies different from those in the OECD countries? Selvanathan estimated the demand equation (3) for $i = 1, \dots, 10$ goods with data from eighteen OECD countries [14, Chap. 2]. To compare these data with our results, we aggregated the OECD elasticities to $n = 8$ goods by combining (i) food and beverages and (ii) recreation and education; and for the emerging economies, we combined food and beverages into one group, so that $n = 8$ here also.⁶ We then took the average of each estimate over all countries in each group.⁷

The comparison of the two sets of demand parameters is given in Table XVII. Except for transport, the trends are fairly close in the two groups of countries. Columns 4 and 5 of the table reveal that the food income elasticity is higher in the emerging economies, which is plausible as consumers' incomes are on average lower in those countries. The bottom part of the table indicates that the difference between the income elasticities of food as a t -value of -1.66 , which is almost significant at the 10 per cent level. It should also be noted that the difference between the transport income elasticities is highly significant, while the remaining six income elasticities are fairly similar. Regarding the price elasticities, only the differences for clothing and transport are highly significant. It should be noted that in all three instances (i.e., the autonomous trends, income and price elasticities), the differences for transport are significant.

Some further comment on the autonomous trend terms in Table XVII is appropriate. First, it should be noted that housing demand grows autonomously at 2.6 per cent per year in the OECD countries and 2.3 per cent in the EE. Similarly, expenses related to health care (hereafter referred to as medicine) are growing at 2.6 and 1.9 per cent in the two groups of countries. To a certain extent, these relatively high trend rates of growth are offset by small income elasticities (0.3 and 0.4 for housing and 0.7 and 0.8 for medicine). That is, if income moves upwards, then the modest expansion of consumption, associated with the low income elasticities, would be added to the autonomous trend increase to yield an overall rise in consumption which would be quite reasonable. The second point to make about the trend terms relates to transport. Why is this term negative for the OECD countries, but positive for the EE (with the difference being significant)? At least part of the explanation could lie in the differences in the income elasticities (2.0 and 1.5 for the two groups). As the relative price of transport in the OECD countries has been approximately stable and as per capita income has grown at about 3 per cent per year

⁶ See Chen [1, pp. 98–100] for details.

⁷ Thus for the emerging economies, we used the means given in Table XVI.

TABLE XVII
COMPARISON OF DEMAND PARAMETERS IN THE OECD AND EMERGING ECONOMIES

Commodities	Autonomous Trends $\times 100$		Income Elasticities		Price Elasticities	
	OECD (1)	EE (3)	OECD (4)	EE (5)	OECD (6)	EE (7)
Estimates (standard errors in parentheses):						
1. Food	-0.22 (0.19)	-0.67 (0.25)	0.57 (0.05)	0.71 (0.07)	-0.36 (0.04)	-0.39 (0.10)
2. Clothing	-2.86 (0.31)	-1.87 (0.46)	1.46 (0.07)	1.33 (0.12)	-0.67 (0.09)	-0.36 (0.09)
3. Housing	2.58 (0.17)	2.30 (0.33)	0.31 (0.04)	0.36 (0.07)	-0.13 (0.04)	-0.15 (0.07)
4. Durables	-2.39 (0.37)	-1.63 (0.52)	1.74 (0.09)	1.77 (0.14)	-0.62 (0.11)	-0.51 (0.12)
5. Medicine	2.61 (0.44)	1.93 (0.54)	0.66 (0.12)	0.81 (0.16)	-0.17 (0.11)	-0.31 (0.12)
6. Transport	-1.22 (0.40)	0.28 (0.45)	2.00 (0.10)	1.54 (0.12)	-0.73 (0.12)	-0.28 (0.07)
7. Recreation	0.59 (0.37)	0.74 (0.43)	1.19 (0.09)	1.22 (0.12)	-0.72 (0.09)	-0.45 (0.11)
8. Others	0.24 (0.27)	0.51 (0.47)	1.05 (0.06)	1.19 (0.14)	-0.37 (0.08)	-0.32 (0.11)
Differences, OECD – EE (standard errors in parentheses):						
9. Food		0.45 (0.31)		-0.13 (0.08)		0.02 (0.11)
10. Clothing		-0.99 (0.55)		0.13 (0.14)		-0.31 (0.13)
11. Housing		0.28 (0.37)		-0.05 (0.08)		0.02 (0.08)
12. Durables		-0.76 (0.64)		-0.03 (0.17)		-0.11 (0.16)
13. Medicine		0.68 (0.70)		-0.15 (0.20)		0.14 (0.16)
14. Transport		-1.50 (0.60)		0.46 (0.16)		-0.45 (0.14)
15. Recreation		-0.15 (0.57)		-0.03 (0.15)		-0.27 (0.14)
16. Others		-0.27 (0.54)		-0.14 (0.15)		-0.05 (0.14)
<i>t</i> -values of differences:						
17. Food		1.46		-1.66		0.22
18. Clothing		-1.78		0.94		-2.44
19. Housing		0.75		-0.62		0.25
20. Durables		-1.19		-0.18		-0.68
21. Medicine		0.98		-0.75		0.86
22. Transport		-2.49		2.94		-3.24
23. Recreation		-0.27		-0.18		-1.90
24. Others		-0.50		-0.92		-0.37
25. Mean		-0.38		-0.05		-0.91

Note: EE stands for emerging economies. Food includes beverages, and recreation includes education. The standard errors of the differences (given in the middle part of the table) are the square roots of the sums of the two corresponding variances.

(Clements and Chen [3]), the OECD income elasticity of 2 implies that transport demand increases by $2 \times 3 = 6$ per cent per year, which is quite substantial. The role of the negative trend term is to reduce this 6 per cent growth to a more reasonable figure. In the EE, the relative price of transport has risen (Clements and Chen [3]), leading to lower use. This, together with the lower income elasticity, is offset by the positive value of the trend term for transport in the EE.

Taken as a whole, the results indicate more similarities than differences in the

behavior of consumers in the OECD and emerging/developing economies, which points to the constancy of tastes.⁸

VI. CONCLUDING COMMENTS

This paper has analyzed consumption patterns in a group of emerging/developing economies to identify key empirical regularities. As the quality of the data is not excellent, we have had to pay particular attention to outlying observations, a practice we recommend to all analysts who deal with emerging economy data.

The main findings of the study are as follows.

- (i) The variability of quantities systematically exceeds that of prices. This is reflected over time in the pattern of the coefficients of variation and in the cross-commodity variances. Interestingly, the same pattern has also been observed in OECD countries.
- (ii) The correlation between prices and quantities is negative in almost 80 per cent of the near two hundred cases, reflecting the tendency of consumers to move away from those goods with above-average price increases and vice versa. Again, a similar pattern holds in the OECD countries.
- (iii) There is a great deal of similarity between the demand elasticities in emerging economies and those in the OECD countries. Accordingly, much of the observed differences in consumption patterns internationally can be explained by differences in prices and income—we do not have to resort to the old favorite concept of differences in tastes.

⁸ Interestingly, this conclusion is not particularly sensitive to alternative definitions of what constitutes an emerging economy. See Clements and Chen [2]. For an extensive comparison of budget shares, prices, quantities, and demand elasticities (with outliers included) in the two groups of countries, see Clements and Chen [3].

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APPENDIX

DEMAND EQUATIONS FOR INDIVIDUAL COUNTRIES

Appendix Tables I–III give the estimates of the demand equation (3) for $i = 1, \dots, n^c$ goods in each of the thirteen countries. Note that row 14 of each table (labeled "mean") corresponds to the means of each parameter given in Table XVI. The last row of each table gives the estimates when the parameters are constrained to take the same value in each country, which involves pooling the data. A comparison of these estimates with the means (row 14) reveals that in most instances the two sets of estimates are fairly similar. For the summary of statistics for all the demand equations, see Chen [1, App. 3.2].

APPENDIX TABLE I

ESTIMATES OF THE AUTONOMOUS TRENDS FOR NINE COMMODITIES IN THIRTEEN COUNTRIES

Country	Food	Bever- ages	Cloth- ing	Hous- ing	Dura- bles	Medi- cine	Trans- port	Recrea- tion	Others
(1)	α_1^c (2)	α_2^c (3)	α_3^c (4)	α_4^c (5)	α_5^c (6)	α_6^c (7)	α_7^c (8)	α_8^c (9)	α_9^c (10)
1. Hong Kong	0.44 (0.60)	-3.18 (2.01)	-8.93 (1.48)	6.84 (0.76)	8.82 (2.58)	1.91 (1.83)	-1.65 (1.17)	2.68 (0.87)	1.11 (2.19)
2. Israel	0.69 (0.40)	0.27 (0.77)	-1.10 (2.23)	3.12 (0.35)	-4.69 (0.94)	1.16 (0.72)	-2.13 (0.79)	-2.10 (0.64)	0.53 (0.58)
3. Singapore	-0.72 (1.21)	-5.02 (3.44)	-0.95 (1.99)	4.53 (1.69)	4.42 (1.76)	1.25 (3.21)	-3.43 (2.01)	-1.13 (2.86)	-1.30 (1.47)
4. Malta	1.22 (0.48)	0.37 (0.73)	-1.86 (1.90)	-2.19 (2.61)	-2.30 (0.66)	2.12 (1.36)	-0.29 (0.94)	-1.22 (0.65)	3.20 (1.41)
5. Mexico	0.71 (0.17)	—	-0.97 (0.29)	0.87 (0.53)	-1.70 (0.54)	4.59 (0.18)	3.18 (0.89)	-1.22 (0.44)	-0.53 (1.02)
6. Puerto Rico	-1.47 (0.50)	-1.25 (0.78)	-3.25 (1.64)	3.04 (0.47)	-4.48 (1.17)	2.07 (1.03)	-0.79 (0.77)	-0.97 (1.15)	3.41 (1.19)
7. Taiwan	-1.21 (0.45)	—	-1.41 (1.21)	4.41 (1.28)	0.46 (2.43)	-0.01 (1.34)	-3.69 (2.82)	-0.10 (2.06)	0.75 (1.39)
8. Ecuador	-0.92 (1.04)	-2.48 (0.90)	0.35 (1.14)	2.20 (1.08)	-7.49 (1.34)	0.50 (0.84)	3.40 (0.84)	—	2.88 (0.78)
9. Colombia	-0.20 (0.23)	-1.16 (0.86)	-3.80 (1.24)	1.48 (0.33)	-1.75 (1.40)	-1.00 (2.03)	1.48 (0.64)	-0.09 (0.87)	1.88 (0.60)
10. Korea	-0.10 (0.87)	-3.59 (2.56)	-6.61 (2.59)	1.04 (1.33)	-5.59 (3.86)	5.74 (3.89)	2.85 (1.46)	6.44 (2.33)	2.00 (1.53)
11. Thailand	-0.86 (0.81)	1.03 (3.10)	0.63 (1.59)	2.80 (1.18)	-3.60 (2.40)	6.88 (1.72)	-3.10 (3.35)	6.23 (1.39)	-3.99 (3.91)
12. Sri Lanka	-2.47 (0.80)	-0.35 (1.66)	3.81 (2.13)	2.26 (0.95)	-2.92 (1.68)	1.59 (2.62)	7.45 (1.70)	-2.68 (1.53)	-3.49 (2.24)
13. Zimbabwe	-2.78 (0.31)	3.34 (0.15)	-0.18 (0.30)	-0.44 (0.62)	-0.41 (0.33)	-1.67 (0.30)	0.34 (0.68)	3.07 (0.93)	0.22 (0.30)
14. Mean	-0.59 (0.19)	-1.09 (0.56)	-1.87 (0.46)	2.30 (0.33)	-1.62 (0.52)	1.93 (0.54)	0.28 (0.45)	0.74 (0.43)	0.51 (0.47)
15. All countries	-0.40 (0.19)	0.14 (0.35)	-1.74 (0.38)	1.53 (0.24)	-1.72 (0.40)	2.39 (0.41)	1.04 (0.34)	0.63 (0.39)	0.33 (0.39)

Notes: 1. Standard errors are indicated in parentheses.

2. All entries are to be divided by 100. The figures in parentheses in row 14 are the standard errors of the means, not the means of the standard errors for the individual countries.

APPENDIX TABLE II
ESTIMATES OF INCOME ELASTICITIES FOR NINE COMMODITIES IN THIRTEEN COUNTRIES

Country	Food	Bever- ages	Cloth- ing	Hous- ing	Dura- bles	Medi- cine	Trans- port	Recrea- tion	Others
(1)	β_1^c (2)	β_2^c (3)	β_3^c (4)	β_4^c (5)	β_5^c (6)	β_6^c (7)	β_7^c (8)	β_8^c (9)	β_9^c (10)
1. Hong Kong	0.37 (0.11)	0.56 (0.37)	2.83 (0.28)	-0.09 (0.14)	0.78 (0.32)	1.02 (0.36)	1.16 (0.21)	0.61 (0.16)	1.40 (0.42)
2. Israel	0.28 (0.12)	0.61 (0.28)	1.18 (0.53)	0.18 (0.14)	2.11 (0.26)	1.14 (0.23)	2.50 (0.29)	1.30 (0.24)	0.37 (0.23)
3. Singapore	0.70 (0.21)	1.43 (0.55)	1.11 (0.34)	0.17 (0.30)	0.28 (0.31)	0.81 (0.53)	1.84 (0.35)	1.56 (0.45)	1.44 (0.26)
4. Malta	0.31 (0.14)	1.13 (0.21)	1.38 (0.35)	1.28 (0.35)	1.20 (0.21)	0.22 (0.48)	1.11 (0.13)	1.05 (0.25)	1.84 (0.44)
5. Mexico	0.47 (0.07)	—	1.29 (0.17)	0.15 (0.14)	1.69 (0.23)	0.72 (0.10)	0.91 (0.32)	1.96 (0.26)	1.37 (0.19)
6. Puerto Rico	0.77 (0.16)	1.05 (0.27)	1.57 (0.35)	0.44 (0.18)	1.48 (0.28)	0.51 (0.45)	1.71 (0.29)	1.45 (0.32)	0.61 (0.43)
7. Taiwan	0.89 (0.09)	—	1.44 (0.20)	0.41 (0.25)	1.25 (0.48)	1.16 (0.26)	2.80 (0.53)	1.72 (0.39)	0.79 (0.27)
8. Ecuador	0.65 (0.29)	1.71 (0.34)	1.44 (0.44)	0.14 (0.37)	3.37 (0.50)	0.49 (0.26)	1.06 (0.31)	—	0.60 (0.21)
9. Colombia	0.86 (0.12)	1.45 (0.48)	1.25 (0.66)	0.25 (0.18)	1.72 (0.60)	1.40 (1.09)	1.40 (0.33)	0.61 (0.45)	1.17 (0.31)
10. Korea	0.66 (0.19)	1.97 (0.56)	2.09 (0.55)	0.47 (0.27)	2.52 (0.81)	0.57 (0.81)	1.35 (0.31)	0.20 (0.54)	0.92 (0.34)
11. Thailand	0.76 (0.23)	1.08 (0.93)	0.88 (0.46)	0.16 (0.33)	2.27 (0.70)	0.07 (0.49)	2.35 (0.90)	-0.46 (0.43)	1.75 (1.13)
12. Sri Lanka	0.93 (0.32)	0.86 (0.64)	-0.20 (0.69)	0.11 (0.34)	2.68 (0.82)	1.91 (1.12)	0.57 (0.79)	3.33 (0.72)	2.32 (1.04)
13. Zimbabwe	0.58 (0.29)	0.36 (0.12)	1.04 (0.20)	0.98 (0.19)	1.72 (0.33)	0.47 (0.22)	1.33 (0.33)	1.36 (0.61)	0.84 (0.28)
14. Mean	0.63 (0.05)	1.11 (0.15)	1.33 (0.12)	0.36 (0.07)	1.77 (0.14)	0.81 (0.16)	1.54 (0.12)	1.22 (0.12)	1.99 (0.14)
15. All countries	0.59 (0.05)	0.81 (0.10)	1.46 (0.10)	0.68 (0.07)	1.66 (0.11)	0.72 (0.12)	1.40 (0.10)	1.32 (0.11)	1.25 (0.11)

Notes: 1. Standard errors are indicated in parentheses.

2. The figures in parentheses in row 14 are the standard errors of the means, not the means of the standard errors for the individual countries.

APPENDIX TABLE III

ESTIMATES OF PRICE ELASTICITIES FOR NINE COMMODITIES IN THIRTEEN COUNTRIES

Country	Food	Bever- ages	Cloth- ing	Hous- ing	Dura- bles	Medi- cine	Trans- port	Recrea- tion	Others
(1)	γ_1^c (2)	γ_2^c (3)	γ_3^c (4)	γ_4^c (5)	γ_5^c (6)	γ_6^c (7)	γ_7^c (8)	γ_8^c (9)	γ_9^c (10)
1. Hong Kong	0.20 (0.24)	-0.45 (0.20)	-0.37 (0.21)	0.01 (0.19)	1.21 (0.66)	-1.29 (0.42)	0.11 (0.21)	-0.16 (0.21)	-0.66 (0.23)
2. Israel	-0.28 (0.09)	-0.46 (0.12)	0.51 (0.29)	-0.09 (0.09)	-0.94 (0.20)	-0.21 (0.30)	-0.20 (0.33)	-0.08 (0.25)	0.61 (0.44)
3. Singapore	-0.38 (0.14)	0.08 (0.38)	-0.04 (0.22)	0.25 (0.19)	-0.96 (0.28)	-0.03 (0.27)	-0.28 (0.26)	-0.81 (0.32)	-0.56 (0.24)
4. Malta	-0.18 (0.35)	-1.20 (0.37)	-0.04 (0.48)	-0.90 (0.70)	-0.46 (0.42)	-0.30 (0.35)	-0.68 (0.31)	-1.00 (0.68)	-0.17 (0.35)
5. Mexico	0.01 (0.10)	—	-0.33 (0.17)	0.02 (0.12)	0.23 (0.45)	-0.19 (0.09)	-0.76 (0.21)	-0.32 (0.46)	-0.01 (0.52)
6. Puerto Rico	-0.33 (0.18)	-1.26 (0.21)	-1.24 (0.57)	-0.53 (0.31)	-1.88 (0.55)	0.50 (0.72)	-0.12 (0.38)	-1.28 (0.37)	0.60 (0.65)
7. Taiwan	-0.08 (0.08)	—	-0.38 (0.12)	-0.25 (0.22)	0.04 (0.14)	-0.34 (0.09)	-0.37 (0.31)	-0.39 (0.15)	-0.51 (0.16)
8. Ecuador	-0.23 (0.18)	0.02 (0.23)	-0.13 (0.26)	0.10 (0.13)	0.82 (0.31)	-0.49 (0.17)	0.12 (0.14)	—	0.07 (0.20)
9. Colombia	-0.31 (0.07)	-1.60 (0.70)	-0.92 (0.32)	0.00 (0.10)	-0.10 (0.39)	-0.40 (0.63)	-0.11 (0.13)	-0.09 (0.38)	-0.91 (0.30)
10. Korea	0.02 (0.14)	-0.82 (0.23)	-0.11 (0.21)	0.04 (0.13)	-0.61 (0.19)	-0.08 (0.17)	-0.26 (0.08)	-0.11 (0.18)	-0.14 (0.11)
11. Thailand	-0.18 (0.11)	-0.57 (0.22)	-0.01 (0.13)	0.54 (0.16)	-1.08 (0.43)	0.31 (0.14)	-0.28 (0.32)	-0.47 (0.25)	-0.60 (0.43)
12. Sri Lanka	0.02 (0.39)	-0.83 (0.31)	-0.93 (0.32)	-0.37 (0.28)	-1.15 (0.47)	-0.79 (1.00)	-0.16 (0.24)	-0.18 (0.32)	-1.29 (0.33)
13. Zimbabwe	-2.68 (1.05)	-0.03 (0.13)	-0.71 (0.46)	-0.75 (0.26)	-1.75 (0.68)	-0.72 (0.14)	-0.71 (0.34)	-0.54 (0.51)	-0.55 (0.55)
14. Mean	-0.34 (0.10)	-0.65 (0.10)	-0.36 (0.09)	-0.15 (0.07)	-0.51 (0.12)	-0.31 (0.12)	-0.28 (0.07)	-0.45 (0.11)	-0.32 (0.11)
15. All countries	-0.26 (0.06)	-0.64 (0.07)	-0.28 (0.08)	-0.17 (0.06)	-0.51 (0.09)	-0.33 (0.07)	-0.29 (0.07)	-0.36 (0.09)	-0.58 (0.09)

Note: See Appendix Table II.