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# Estimates of a System of Demand Equations Using Alternative Commodity Classifications of Irish Data, 1953–1974*

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## I INTRODUCTION

THE estimation of price and income elasticities for broad commodity groups has attracted a sizeable amount of attention from Irish researchers in recent years. As well as a series of single commodity studies, both from time-series and cross-sections, O'Riordan (1976) has presented a set of complete-system estimates. In this paper, a series of estimates using alternative commodity classifications is presented. The theoretical demand model employed is the Linear Expenditure System and the object of the exercise is to obtain a model suitable for the analysis of Government indirect tax revenues.

The Linear Expenditure System is discussed briefly in the next section and the empirical results in section three. Comparisons with earlier Irish studies are effected in the fourth section followed by a discussion and conclusions. Data, sources, and methods are treated in a separate Appendix.

## II THE LINEAR EXPENDITURE SYSTEM

The Linear Expenditure System (LES) is one of the most widely used classical demand models. The direct utility function associated with the LES, called the Stone-Geary utility function, may be written

$$U = \sum_{i=1}^{n} b_i Ln(q_i - c_i) \qquad (1)$$

Where, $U$ = utility; $n$ = the number of goods; $q_i$ = the quantity of good $i$; $b$, $c$ = parameters.

Maximising (1) subject to the budget constraint yields demand functions of the form

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$$q_i = c_i + (B - \sum_{j=1}^{n} c_j p_j)\, b_i / p_i \qquad (2)$$

where the additional symbols are $p_i$ = price of good $i$,
and

$$B = \sum_{i=1}^{n} p_i q_i \qquad (3)$$

Provided

$$\sum_{i=1}^{n} b_i = 1,\ o \leqslant b_i \leqslant 1 \text{ all } i \qquad (4)$$

and $c_i \geqslant o$ all $i$,

these demand functions will behave in a "classical" fashion.

The economic interpretation of the $b$ and $c$ parameters is that the $b$'s are marginal budget shares while the $c$'s are minimum quantities of the various commodities to be purchased. Thus the demand equation (2) says that quantity is equal to some fixed amount ($c_i$) plus a fraction ($b_i$) of the budget left over after all the minimum quantities have been paid for. The expression in parentheses in (2) is nominal, hence the divisor $p_i$.

The additivity of the Stone-Geary utility function implies that substitution of one good for another in response to price changes operates only through the budget constraint. In addition, additivity makes inferior goods inadmissible. Thus the LES is felt to be rather too restrictive for application to very fine commodity categorisations.

The own-price and budget elasticities respectively are

$$E_i(p) = (1 - b_i)(c_i / q_i) - 1 \qquad (5)$$

and

$$E_i(B) = b_i(B) / p_i q_i \qquad (6)$$

Equation (6) defines $E_i(B)$ as the marginal budget share divided by the average budget share. Additivity imposes certain restrictions on the interrelationships of own, cross-price and income elasticities. See Houthakker (1960).

## III ESTIMATION AND RESULTS

The set of $n$ demand equations comprising the system was originally estimated by Stone (1954) using a method which exploits the linearity of the system. For a given set of values for the $b$'s say, the set of equations is linear in the $c$'s, which may be estimated by Ordinary Least Squares. The resulting $c$ estimates may then be inserted to give a system linear in the $b$'s, which are re-estimated and the process repeated until convergence is obtained. The formal properties of the

resulting estimates are not known, and the procedure is rather cumbersome in any event.

A modification of Stone's procedure which produces Maximum Likelihood estimates under the assumption of disturbance normality is presented in Parks (1971). The estimates presented in this section are obtained using Professor Parks' Maxles programme. Being Maximum Likelihood estimates, their (asymptotic) variance-covariance matrix may be obtained.

Five models in all have been estimated from the 1953/1974 time-series. The first three of these exclude the two major durables categories, which are called Durable Household Goods and Transport Equipment in the National Accounts. Model 1 contains six goods, Food, Drink and Tobacco, Clothing, Fuel, Other Goods and Other Expenditure. The Fuel category includes domestic heating oil, gas and electricity. Other Goods is largely petrol while Other Expenditure includes rent and all services. The parameter estimates appear in Table 1. Standard errors of the *b* and *c* coefficients are given in parentheses.

Table 1: *Estimates for the first model (six goods)*

| | *Parameter Estimates* | | *Elasticities* | | | |
|---|---|---|---|---|---|---|
| | | | 1964 | | 1974 | |
| *Commodity Group* | *b* | *c* | *Price* | *Budget* | *Price* | *Budget* |
| Food | ·203 (·005) | 246·0 (4·4) | −·32 | ·62 | −·43 | ·72 |
| Drink and Tobacco | ·160 (·008) | 144·0 (5·2) | −·31 | ·93 | −·54 | ·91 |
| Clothing | ·146 (·005) | 61·9 (2·9) | −·37 | 1·45 | −·60 | 1·28 |
| Fuel | ·050 (·002) | 29·9 (1·0) | −·25 | 1·04 | −·49 | ·91 |
| Other Goods | ·135 (·005) | 37·5 (3·5) | −·45 | 2·00 | −·73 | 1·51 |
| Other Expenditure | ·307 (·009) | 201·0 (8·5) | −·48 | 1·09 | −·60 | 1·09 |

All of the *b* and *c* coefficients have correct signs, plausible values and low standard errors. The price and budget elasticities of the LES vary from observation to observation. Those calculated in the tables are for 1964, about the middle of the period and for 1974, the most recent year. The elasticities, as well as the *b* coefficients, are dimensionless, but the *c* coefficients are in £m (1970).

The own-price elasticities are all less than one in absolute value, as they must be, given equation (5) when the $c_i$ are positive. The lowest budget elasticity is for Food, the highest for Other Goods. For 1974 both the price and budget elasticities tend to be closer to one in absolute value than for 1964, a phenomenon observable for the other models also and one which will be commented upon later.

Table 2: *Estimates for the second model (seven goods).*

| | *Parameter Estimates* | | *Elasticities* | | | |
|---|---|---|---|---|---|---|
| | | | 1964 | | 1974 | |
| *Commodity Group* | *b* | *c* | *Price* | *Budget* | *Price* | *Budget* |
| Food | ·203 (·006) | 249·9 (4·1) | −·31 | ·62 | −·42 | ·72 |
| Drink | ·116 (·005) | 73·6 (3·3) | −·30 | 1·23 | −·63 | ·94 |
| Tobacco | ·046 (·010) | 74·0 (2·8) | −·13 | ·59 | −·23 | ·86 |
| Clothing | ·147 (·004) | 64·4 (7·7) | −·35 | 1·46 | −·59 | 1·29 |
| Fuel | ·050 (·002) | 30·7 (1·0) | −·23 | 1·04 | −·48 | ·92 |
| Other Goods | ·134 (·005) | 40·3 (3·2) | −·41 | 1·99 | −·70 | 1·51 |
| Other Expenditure | ·303 (·009) | 200·8 (97·7) | −·46 | 1·07 | −·59 | 1·07 |

From the point of view of modelling taxation receipts, it is unfortunate that the expenditure categorisations in the Irish National Accounts do not correspond more closely to the categorisations used in levying indirect taxes. However, it is possible to construct some of the required series using other information (see Appendix) and a seven-good model, identical with the six-good model aside from the separation of Drink and Tobacco, was next estimated. These results are given in Table 2.

The estimates for the five goods other than Drink and Tobacco are close to those for the six-good model of Table 1. The expenditure elasticity for Drink comes out higher than the estimate for Tobacco, but perhaps not as much higher as one might expect. Note however that the estimate of the marginal budget share for Tobacco has the largest (relative) standard error of any of the categories.

Expenditure on Petrol forms the largest part of the category Other Goods. In the third model, Petrol is distinguished as a separate commodity and the remaining element of Other Goods is aggregated with Other Expenditure to form what we call Residual Expenditures. This yields another seven-good model and the estimates are given in Table 3.

The Residual Expenditure category is made up mainly of what was Other Expenditure and the estimates are similar.

Petrol has a high budget elasticity, as one might expect. The remaining categories have elasticity estimates close to those of the earlier models, except for Drink and Tobacco. Their total marginal budget share remains about the same, but it has shifted towards Drink as between Tables 2 and 3. The effect is to increase the budget elasticity for Drink and to drastically reduce that for Tobacco.

While certain of the categories in Models 1, 2 and 3 contain some expenditure on durable items (clothing, for example) these models exclude the two categories in the Irish expenditure tables for Durable Household Goods and Transport Equipment.

Strictly static neoclassical demand models, such as the LES are designed to deal only with perishable commodities. On the other hand, their exclusion, aside from rendering the commodity classification inexhaustive, is fully justified

Table 3: *Estimates for the third model (seven goods)*

| | *Parameter Estimates* | | *Elasticities* | | | |
|---|---|---|---|---|---|---|
| | | | 1964 | | 1974 | |
| *Commodity Group* | *b* | *c* | *Price* | *Budget* | *Price* | *Budget* |
| Food | ·203 (·006) | 247·1 (3·9) | −·32 | ·62 | −·42 | ·72 |
| Drink | ·155 (·007) | 67·6 (4·4) | −·39 | 1·65 | −·67 | 1·26 |
| Tobacco | ·008 (·004) | 77·6 (1·0) | −·05 | ·10 | −·15 | ·15 |
| Clothing | ·147 (·004) | 62·7 (2·6) | −·36 | 1·45 | −·60 | 1·29 |
| Fuel | ·050 (·002) | 30·1 (0·9) | −·25 | 1·04 | −·49 | ·92 |
| Petrol | ·089 (·002) | 22·2 (1·6) | −·43 | 2·12 | −·73 | 1·59 |
| Residual Expenditure | ·349 (·007) | 220·1 (8·46) | −·51 | 1·13 | −·64 | 1·11 |

only to the extent that holdings of durables, or the consumption of the flow of services of durables, do not affect the consumption pattern for perishables.

The addition of these two durable categories to Model 1 yields an eight-good model, the estimates of which are given in Table 4. The total budget to be allocated is about 10 per cent greater than with the six-good model, so the marginal budget shares for the perishable categories must fall slightly. As one might expect, the two durable categories attract large expenditure elasticities. The inclusion of the two durable categories appears to have little effect on the estimates for the other categories.

Table 4: *Estimates for the fourth model (eight goods)*

| | *Parameter Estimates* | | *Elasticities* | | | |
|---|---|---|---|---|---|---|
| | | | 1964 | | 1974 | |
| *Commodity Group* | *b* | *c* | *Price* | *Budget* | *Price* | *Budget* |
| Food | ·168 (·003) | 225·3 (4·0) | −·35 | ·56 | −·45 | ·65 |
| Drink and Tobacco | ·145 (·005) | 119·1 (5·3) | −·42 | ·91 | −·62 | ·89 |
| Clothing | ·118 (·004) | 49·1 (2·5) | −·49 | 1·26 | −·68 | 1·13 |
| Fuel | ·040 (·002) | 25·5 (1·0) | −·35 | ·91 | −·56 | ·81 |
| Durable Household Goods | ·077 (·007) | 14·6 (1·9) | −·71 | 1·58 | −·80 | 1·58 |
| Transport Equipment | ·064 (·002) | 4·4 (1·8) | −·88 | 2·16 | −·92 | 1·83 |
| Other Goods | ·116 (·004) | 21·1 (3·4) | −·69 | 1·87 | −·84 | 1·42 |
| Other Expenditure | ·273 (·008) | 158·4 (9·2) | −·57 | 1·05 | −·67 | 1·06 |

The final model has nine goods; Drink and Tobacco are separated and Petrol is distinguished from the remaining elements of Other Goods. These latter are aggregated into Residual Expenditure as in Model 3. There were some difficulties in achieving full convergence of the computer algorithm in this case, perhaps because of the large number (17) of free parameters. For the estimates given in Table 5, the value of the Likelihood had been constant to eight digits for several

iterations, so the parameter estimates can be taken to be arbitrarily close to a maximum.

Table 5: *Estimates for the fifth model (nine goods)*

| | *Parameter Estimates* | | *Elasticities* | | | |
|---|---|---|---|---|---|---|
| | | | 1964 | | 1974 | |
| *Commodity Group* | *b* | *c* | *Price* | *Budget* | *Price* | *Budget* |
| Food | ·169 (·004) | 223·4 (4·8) | −·36 | ·56 | −·46 | ·65 |
| Drink | ·139 (·006) | 41·2 (5·8) | −·62 | 1·61 | −·80 | 1·24 |
| Tobacco | ·007 (·003) | 76·1 (1·4) | −·06 | ·10 | −·17 | ·15 |
| Clothing | ·117 (·005) | 48·2 (2·9) | −·49 | 1·25 | −·68 | 1·12 |
| Fuel | ·040 (·002) | 25·1 (1·1) | −·36 | ·91 | −·57 | ·81 |
| Petrol | ·072 (·002) | 12·6 (1·9) | −·67 | 1·86 | −·84 | 1·40 |
| Durable Household Goods | ·077 (·003) | 13·8 (2·2) | −·73 | 1·58 | −·81 | 1·58 |
| Transport Equipment | ·063 (·002) | 3·8 (2·0) | −·89 | 2·15 | −·93 | 1·82 |
| Residual Expenditure | ·316 (·012) | 164·2 (13·6) | −·61 | 1·11 | −·71 | 1·09 |

The estimates correspond fairly closely to those in the earlier tables. The two durable items, as well as Petrol and Drink, have high expenditure elasticities. The lowest is for Tobacco, the next lowest for Food.

Overall, the estimates do not seem highly sensitive to changes in the commodity classification. The exception is the expenditure elasticity for Tobacco, which is lower in Models 3 and 5 than it is in Model 2. It may be possible to obtain theoretical restrictions on the possible changes in parameter values as the categorisation is altered, but the problem does not seem to be addressed in the literature.

Two features of the estimates for all five models might be noted. The price and expenditure elasticities are closer to unity in absolute value when computed to a

1974 base as against the 1964 based calculations. This, however, is almost bound to happen when the LES is estimated from a long time-series. Consider the consequences for elasticity computations of a constantly growing budget and constantly growing $q$'s. Since the $c_i$ are fixed and positive numbers, the first part of the expression for the own-price elasticity in equation (5) will eventually go to zero, leaving $-1$ as the estimate. In addition, the marginal budget shares being constant, the average budget shares will tend to stability as the budget grows, settling down at a level which asymptotes to the marginal shares. Thus the expenditure elasticities also have a limiting value of unity. Of course, if relative prices change rapidly, these long-run tendencies for elasticity estimates will be masked.

Secondly, there is an obvious tendency for commodities having large budget elasticities to attract large price elasticities also. This tendency (for price and budget elasticities to be correlated) is a further restrictive feature of the LES and indeed of additive models generally. See Deaton (1974).

## IV COMPARISONS WITH EARLIER IRISH STUDIES

The only set of estimates of the Linear Expenditure System for broad commodity groups which has been computed from Irish data is that contained in O'Riordan (1976). His grouping is comparable with that contained in Table 4, except that he excluded Tobacco from the second category, placing it in category 5 (Other Goods) instead. His data period was 1953/1972 and there are some data revisions in the 1974 National Income and Expenditure tables for the later years of his period which affect comparability also. In Table 6, the elasticity estimates in O'Riordan's paper are shown alongside the corresponding estimates from Table 4. Note that O'Riordan's estimates are 1972 based and that he used *per capita* data for quantities and expenditures.

For the six categories which are directly comparable, the new results are reasonably close to O'Riordan's estimates. When Tobacco is included with Drink as in the present Model 4, the expenditure elasticity is lower than O'Riordan's estimate for Drink alone, which in turn is lower than the estimate for Drink alone in Model 5. The lower expenditure elasticity for Tobacco pulls down the estimate for the Other Goods category, where O'Riordan included it.

On the question of the treatment of Tobacco in the commodity categorisation O'Riordan makes the following remarks in his paper:

> Initially, Tobacco was included as a separate commodity group. However, the quantity consumed per head (the dependent variable) showed very little variation throughout the period and the results were generally statistically insignificant. Further the inclusion of a series which was virtually a vector of constants tended to interfere with the results in the other commodity groups.

Table 6: *Comparisons of elasticity estimates*

| *Category* | *O'Riordan's Estimates* | | *Table 4 Estimates* | |
|---|---|---|---|---|
| | *Price* | *Budget* | *Price* | *Budget* |
| Food | −·39 | ·57 | −·45 | ·65 |
| Drink and Tobacco | — | — | −·62 | ·89 |
| Drink | −·75 | 1·31 | — | — |
| Clothing | −·69 | 1·27 | −·68 | 1·13 |
| Fuel | −·59 | ·98 | −·56 | ·81 |
| Other Goods | — | — | −·84 | 1·42 |
| Other Goods and Tobacco | −·51 | ·88 | — | — |
| Other Expenditure | −·62 | 1·01 | −·67 | 1·06 |
| Durable Household Goods | −·83 | 1·58 | −·80 | 1·58 |
| Transport Equipment | −·98 | 1·91 | −·92 | 1·83 |

This does not seem to have been a problem in the present case, although the instability of the Tobacco elasticity estimates between the different models has been noted. It may well be due to the limited variation in the data to which O'Riordan refers.

Several single-equation studies have been undertaken on the Irish time-series data. O'Riordan (1969) found price elasticities between −·7 and −·9 for Tobacco and an income (as distinct from a budget) elasticity around ·5. In a study of the demand for Petrol, O'Riordan (1972) finds price elasticities around −1 and income elasticities of 1·5, 2·0 and higher, depending on the specification. These results are roughly in line with the estimates in Tables 3 and 5. The Tobacco price elasticity computed by O'Riordan is, however, much higher than the LES estimates.

Walsh and Walsh (1970) present estimates of demand equations for Beer and Spirits separately, which show income elasticity estimates of between ·5 and ·7 for Beer and from 1·5 to 2·0 for Spirits. Their price elasticities are very low for Beer and in a region around −·6 for Spirits. In a further paper on the same topic Kennedy, Walsh and Ebrill (1973) found elasticity estimates for Beer and Spirits in the same ranges.

All of these single-equation studies used scale variables and relative-price variables which affect comparability with the National Accounts based complete-system estimates.

## V CONCLUSION

For the purpose of modelling indirect tax revenue as a whole, the obvious approach is to estimate a system of demand equations for a commodity classification corresponding as closely as possible to the classifications in the tax system itself. Such a correspondence is difficult to achieve with the Irish data, but the estimates given in this paper go some way towards that objective.

However, the estimation of demand models from long time-series is not entirely satisfactory for a number of reasons. Tastes can change, new products are introduced and price indices can become biased due to quality change, for example. See the comments on O'Riordan's most recent paper by McCarthy (1976) and Sloane (1976).

Two suggestions for further work by way of conclusion. The additivity of the standard demand models, in so far as it imposes a correlated pattern on price and budget responses, is a serious objection. It would be interesting to see estimates of a non-additive model from the Irish data. Secondly, some of the objections to the use of long time-series would be overcome if a dynamic specification were used. A dynamisation of the LES has been presented in Phlips (1972). Of course, non-additive and dynamic models would be more expensive in terms of degrees-of-freedom.

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Table A1: *Time-series Data* 1953–1974

| | *Food* | | *Drink* | | *Tobacco* | | *Clothing* | | *Fuel* | | *Petrol* | | *Durable Household Goods* | | *Transport Equipment* | | *Residual Expenditure* | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | *Q* | *P* | *Q* | *P* | *Q* | *P* | *Q* | *P* | *Q* | *P* | *Q* | *P* | *Q* | *P* | *Q* | *P* | *Q* | *P* |
| 1953 | 241·1 | ·61809 | 71·2 | ·43655 | 83·3 | ·37946 | 67·5 | ·71834 | 29·5 | ·64492 | 23·2 | ·57470 | 22·1 | ·65055 | 12·6 | ·59661 | 211·1 | ·45312 |
| 54 | 244·1 | ·62137 | 74·0 | ·43502 | 78·5 | ·37946 | 65·4 | ·71835 | 29·8 | ·64492 | 24·3 | ·57180 | 23·8 | ·64214 | 16·3 | ·58429 | 217·8 | ·45834 |
| 55 | 253·4 | ·64809 | 78·7 | ·43726 | 81·0 | ·38136 | 67·4 | ·71835 | 35·0 | ·66490 | 25·5 | ·57180 | 26·1 | ·64674 | 18·1 | ·59106 | 225·9 | ·46311 |
| 56 | 251·6 | ·64313 | 78·0 | ·43524 | 73·6 | ·43220 | 68·1 | ·73157 | 33·3 | ·71692 | 26·4 | ·63190 | 24·4 | ·67919 | 11·2 | ·62333 | 226·3 | ·49198 |
| 57 | 248·2 | ·66523 | 76·5 | ·46388 | 74·1 | ·47129 | 63·2 | ·73733 | 30·1 | ·75463 | 21·7 | ·75400 | 22·8 | ·69890 | 11·4 | ·64924 | 228·8 | ·51096 |
| 58 | 250·0 | ·69370 | 73·3 | ·50209 | 75·6 | ·49102 | 65·3 | ·72753 | 29·6 | ·79011 | 24·2 | ·75590 | 26·4 | ·69594 | 15·3 | ·64905 | 233·3 | ·54313 |
| 59 | 256·0 | ·68745 | 71·8 | ·52808 | 76·5 | ·49292 | 64·2 | ·73220 | 31·0 | ·76432 | 24·9 | ·76090 | 27·7 | ·70316 | 16·0 | ·65527 | 236·5 | ·54946 |
| 1960 | 265·1 | ·67409 | 76·5 | ·53203 | 79·0 | ·50127 | 70·1 | ·72040 | 32·4 | ·76543 | 26·0 | ·75330 | 29·6 | ·69595 | 20·8 | ·61538 | 252·1 | ·57954 |
| 61 | 264·5 | ·69112 | 82·0 | ·53902 | 81·6 | ·52696 | 75·9 | ·72596 | 34·2 | ·78363 | 28·3 | ·74570 | 33·8 | ·71006 | 21·5 | ·61860 | 256·3 | ·60005 |
| 62 | 272·5 | ·70312 | 85·5 | ·59766 | 80·3 | ·56787 | 76·1 | ·74507 | 36·3 | ·80165 | 29·9 | ·74900 | 37·7 | ·71618 | 23·7 | ·62447 | 265·0 | ·63248 |
| 63 | 276·9 | ·71073 | 89·4 | ·61745 | 84·3 | ·59075 | 79·8 | ·76065 | 36·3 | ·82645 | 32·3 | ·74730 | 42·5 | ·72706 | 27·5 | ·63636 | 277·3 | ·65908 |
| 64 | 288·8 | ·76073 | 93·3 | ·67310 | 80·7 | ·65180 | 84·1 | ·80380 | 37·9 | ·84697 | 35·7 | ·78790 | 46·5 | ·75699 | 33·1 | ·64653 | 291·5 | ·70660 |
| 65 | 289·5 | ·80449 | 96·8 | ·70764 | 79·0 | ·70380 | 89·5 | ·82458 | 38·9 | ·84319 | 39·2 | ·82700 | 46·3 | ·78186 | 32·3 | ·66563 | 292·2 | ·73915 |
| 66 | 295·9 | ·81480 | 96·7 | ·75698 | 77·0 | ·76623 | 85·5 | ·84211 | 40·3 | ·85112 | 41·6 | ·86820 | 47·1 | ·79406 | 31·3 | ·69649 | 301·8 | ·77430 |
| 67 | 298·4 | ·82574 | 101·4 | ·79389 | 78·1 | ·81690 | 98·7 | ·85005 | 41·5 | ·87470 | 44·7 | ·89510 | 48·9 | ·82618 | 32·0 | ·74063 | 309·1 | ·80199 |
| 68 | 314·4 | ·88899 | 110·7 | ·82927 | 77·9 | ·85237 | 107·8 | ·88590 | 42·8 | ·89252 | 48·6 | ·93090 | 53·4 | ·86142 | 40·7 | ·81081 | 342·4 | ·83545 |
| 69 | 323·7 | ·93513 | 117·0 | ·92906 | 77·8 | ·94344 | 121·3 | ·92168 | 45·5 | ·95824 | 53·7 | ·96640 | 57·1 | ·92469 | 42·9 | ·90210 | 357·3 | ·90485 |
| 1970 | 325·1 | 1·00000 | 128·3 | 1·00000 | 78·0 | 1·00000 | 121·2 | 1·00000 | 48·4 | 1·00000 | 58·0 | 1.00000 | 57·8 | 1·00000 | 42·1 | 1·00000 | 356·7 | 1·00000 |
| 71 | 334·0 | 1·07156 | 136·4 | 1·07771 | 77·2 | 1·03497 | 124·2 | 1·09340 | 50·3 | 1·10934 | 62·7 | 1·05140 | 61·9 | 1·08078 | 40·1 | 1·12469 | 359·6 | 1·12646 |
| 72 | 334·1 | 1·20952 | 149·4 | 1·12517 | 82·1 | 1·03289 | 130·8 | 1·20336 | 53·1 | 1·24859 | 67·3 | 1·06580 | 68·3 | 1·16984 | 49·2 | 1·21341 | 370·2 | 1·24408 |
| 73 | 338·1 | 1·42325 | 161·9 | 1·23718 | 85·3 | 1·11372 | 139·0 | 1·39712 | 54·9 | 1·30965 | 72·3 | 1·11020 | 73·7 | 1·30801 | 58·1 | 1·33046 | 388·1 | 1·36134 |
| 74 | 342·0 | 1·61696 | 174·0 | 1·37356 | 91·0 | 1·15385 | 133·0 | 1·66917 | 56·0 | 1·89286 | 74·0 | 1·47360 | 66·0 | 1·56061 | 49·0 | 1·51020 | 394·0 | 1·55825 |

## APPENDIX: DATA, SOURCES AND METHODS

The *National Income and Expenditure* tables, published annually by the Central Statistics Office, give real and nominal data for Personal Expenditure on Consumers' Goods and Services back to 1953 and eight commodity groups may be distinguished. These are:

Food and Non-Alcoholic Beverages
Alcoholic Beverages and Tobacco
Clothing, Footwear and Personal Equipment
Fuel and Power
Durable Household Goods
Transport Equipment
Other Goods
Other Expenditure

These categories include expenditures by non-residents. The 1974, 1971 and 1962 volumes between them contain the full run of data and the most recent available figures are used for each year. The quantity figures are computed to base price = 1·0 for 1970.

The first modification of the basic NIE data which was undertaken concerns the Alcoholic Beverages and Tobacco item. The NIE tables do not give a price figure pre-1960 for the two components, although the expenditure figures in current terms are given. In order to split the category, we need a price series for one or the other component. The one used is the Tobacco item from the Wholesale Price Index, which is published in the *Irish Statistical Bulletin*. This series includes duties and can be taken to move closely with retail prices. Pre-1960, this 1953-based series is re-calculated and spliced to the 1970-based Tobacco item in the NIE tables for the post-1960 period. The data for Alcoholic Beverages are obtained by subtraction.

The second modification concerns the series for the Petrol component of Other Goods. These figures were kindly supplied by Mr. Joseph Durkan of The Economic and Social Research Institute.

The data in the table give quantity (Q) figures in £m. (1970) and price figures (P) base 1·0 in 1970 for each of the nine categories distinguished in Model 5.