Expenditure Patterns and the Welfare Effects of Inflation: Estimates of a "True" Cost-of-Living Index *

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I INTRODUCTION

Inflation can have two principal kinds of redistributive effects. Even when relative prices are constant, the position of creditors worsens *vis-à-vis* that of debtors, unless the inflation is perfectly anticipated. If relative prices change as well, consumers of the goods whose relative prices have risen are also at a disadvantage.

Inflation need not be accompanied by relative price movements, which in turn can occur when the overall price level is stable. Changes in relative prices have, however, been a noticeable feature of the recent inflation and in this paper an attempt is made to quantify their redistributive consequences. The theoretical tool employed is the "true" cost-of-livimg index, by no means a new idea in demand analysis but one which is not often utilised and which has never, to our knowledge, been used with Irish data.

The second section of the paper discusses true cost-of-living indices and their estimation. The third section contains the empirical results and is followed by a discussion and conclusions. Data, sources and methods are treated in the appendix.

II TRUE COST-OF-LIVING INDICES

Conventional price indices, such as the Irish Consumer Price Index, are fixed-weight indices. When relative prices change, consumers will re-allocate

their expenditure except in the extreme case when their preferences are such as to permit no substitution whatsoever. Such a state of affairs is, *a priori*, unlikely and is, in any event, inconsistent with the evidence of numerous studies of consumer behaviour. Consequently, the measurement of consumer prices is more realistically approached through the construction of true cost-of-living indices, that is, indices which measure the ratio of the cost of attaining a given standard of living (utility level) in some year to the cost of attaining the same standard in a base year. A fixed weight index ignores the fact that consumers have the option of re-allocating their expenditures in the fact of relative price movements.

The relationship between the true index and the most common fixed weight indices is well known. The Laspeyres (base period weighted) index forms an upper bound to the true index using the base year level of utility; the Paasche (current period weights) index would form a lower bound if the current utility level were the reference.

In general, a true index of the cost-of-living is defined as:

$$I(U^0) = \frac{M^1(P^1, U^0)}{M^0(P^0, U^0)} \qquad (1)$$

where $I(U^0)$ = the index for utility level U^0

$M^1(P^1, U^0)$ = the cost of attaining U^0 at prices P^1

$M^0(P^0, U^0)$ = the cost of attaining U^0 at prices P^0

The form of the functions M^1 and M^0 will depend on the demand model being employed. In this paper, we employ the Stone-Geary Linear Expenditure System, whose underlying utility function is of the form

$$U = \Sigma \beta_i Ln(x_i - \gamma_i) \qquad (2)$$

where   U = utility level; x_i = quantity of good i; and β, γ = parameters.

This system is one of the most popular neo-classical demand models and has been estimated from Irish data by O'Riordan (1976) and McCarthy (1977).

The true cost-of-living index associated with this system is:

$$I(u^0) = (\Sigma p_j^1 \gamma_j / M^0) + [1 - (\Sigma p_j^0 \gamma_j / M^0)] [\Pi(p_j^1/p_j^0)^{\beta_j}] \qquad (3)$$

The full derivation, which it would be tedious to repeat, is given in Phlips (1974).

The Linear Expenditure System is not homothetic to the origin unless all the γ's are estimated to be zero, an empirically pathological case. Thus values of the index for different utility levels can be computed simply by considering different levels of base-period expenditure, M^0.

The theory of true cost-of-living indices goes back to Konüs (1939) and has been developed in the context of the static Linear Expenditure System by Klein and Rubin (1947) and Geary (1949).

III EMPIRICAL ESTIMATES

McCarthy (1977) has presented estimates of a nine-commodity LES demand model which we have re-estimated using *per capita* data. The results are given in Table 1.

Table 1: *Estimates of a nine-commodity LES demand model, per capita Irish data, 1953-1974*

Commodity	γ_i	β_i
Food	78.4	.163
	(51.1)	(27.0)
Drink	15.1	.139
	(7.8)	(20.3)
Tobacco	26.8	.003
	(46.6)	(.79)
Clothing	17.2	.117
	(18.1)	(23.9)
Fuel	8.9	.040
	(25.4)	(18.0)
Petrol	4.5	.074
	(7.2)	(29.5)
Durable Household Goods	4.8	.079
	(7.1)	(33.9)
Transport Equipment	1.5	.065
	(2.1)	(23.5)
Residual Expenditure	57.5	.319
	(14.5)	(42.5)

The figures given in parentheses beneath each parameter estimate are the ratios of the estimated coefficients to their sample standard errors. The estimation method used is Maximum Likelihood.

Table 2: *Comparison of the true index, base year utility level T (B), with the Laspeyres index, L, 1968—1974*

Year	Expenditure in Real (1970) £s														Consumer price index, all items
	400		600		800		1,000		2,000		5,000		10,000		
	T (B)	L	T (B)	L	T (B)	L	T (B)	L	T (B)	L	T (B)	L	T (B)	L	*items*
1968	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1969	1.0739	1.0741	1.0745	1.0747	1.0747	1.0750	1.0749	1.0752	1.0752	1.0756	1.0754	1.0758	1.0755	1.0758	1.0742
1970	1.1607	1.1611	1.1622	1.1627	1.1629	1.1635	1.1633	1.1640	1.1642	1.1650	1.1647	1.1656	1.1649	1.1658	1.1623
1971	1.2667	1.2678	1.2702	1.2716	1.2719	1.2735	1.2730	1.2747	1.2751	1.2770	1.2763	1.2783	1.2767	1.2788	1.2665
1972	1.3829	1.3847	1.3858	1.3881	1.3872	1.3898	1.3881	1.3908	1.3898	1.3928	1.3908	1.3940	1.3911	1.3944	1.3755
1973	1.5467	1.5493	1.5467	1.5501	1.5468	1.5505	1.5468	1.5508	1.5468	1.5513	1.5468	1.5516	1.5468	1.5517	1.5325
1974	1.7947	1.7967	1.8001	1.8027	1.8028	1.8057	1.8044	1.8075	1.8076	1.8110	1.8096	1.8132	1.8102	1.8139	1.7927

It will be recalled that the Laspeyres index exceeds the true index where the reference utility level is base year utility. Using the current year's utility level as the reference, the true index will exceed the Paasche (current weighted) index. Tables 2 and 3 show our calculation of these four indices for the years 1968 to 1974 for a range of "income" groups. The indices are in fact calculated for different levels of expenditure in constant (1970) £ s. Note that the predicted budget shares, not the actual ones, are used for computing the Paasche and Laspeyres indices: if this were not done, the theoretical rankings of the indices might not hold.

Table 2 is perhaps the more interesting, since the price indices in everyday use are Laspeyres indices. As the theory would predict, the Laspeyres index overestimates the increase in the cost-of-living for all income groups. The extent of the overestimation is small, however, nowhere exceeding about one-third of one per cent. But the true indices differ significantly for the different income classes. Those at the richer end of the scale experienced a rate of price increase about one and a half per cent greater than those in the lowest class shown. The Laspeyres indices show the same pattern but, of course, published price index numbers would not do so, since they typically give just one series for an "average" commodity bundle. The final column in Table 2 shows the annual average levels of the "all-items" Consumer Price Index for Ireland. There is no reason why it should bear any particular relation to the other indices in the table, but as it transpires it follows fairly closely the true and Laspeyres indices for the lowest income class.

In Table 3, the true indices, using the current utility level as the reference, exceed the Paasche indices in all cases, as they should. The differences are again small.

The higher income groups again appear to have experienced higher rates of price inflation than the low income groups, with differences of as much as two and half per cent. Note that in Table 3, the reference utility level is changing from year-to-year, as are the weights in the Paasche indices.

It would have been interesting to compute the indices for incomes (expenditure, in fact) below £400, but the sum of the subsistence expenditures in the Linear Expenditure System as estimated is too great to permit this. The utility function is not defined when expenditure is less than the subsistence level given by the γ (intercept) parameters so computing true cost-of-living indices for such expenditure levels would be misleading.

In a recent paper, Kennedy and Bruton (1975) have presented an analysis of the effects of the recent inflation on households of different composition and income. Their study uses fixed weight Laspeyres indices based on the Household Budget Inquiry of 1965-1966 but with an adjustment to a 1968 base. They find that over the period November 1968 to February 1975,

Table 3: *Comparison of the true index, current year utility level T (C) with the Paasche index, P, 1968–1974*

Year	Expenditure in real (1970) £s													
	400		600		800		1,000		2,000		5,000		10,000	
	T (C)	P	T (C)	P	T (C)	P	T (C)	P	T (C)	P	T (C)	P	T (C)	P
1968	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
1969	1.0738	1.0736	1.0744	1.0742	1.0747	1.0744	1.0749	1.0746	1.0752	1.0749	1.0754	1.0751	1.0755	1.0752
1970	1.1600	1.1596	1.1617	1.1611	1.1625	1.1619	1.1630	1.1624	1.1641	1.1633	1.1647	1.1638	1.1649	1.1640
1971	1.2639	1.2630	1.2683	1.2670	1.2705	1.2690	1.2718	1.2702	1.2745	1.2726	1.2761	1.2741	1.2766	1.2746
1972	1.3797	1.3784	1.3836	1.3816	1.3856	1.3832	1.3867	1.3841	1.3891	1.3860	1.3905	1.3871	1.3910	1.3875
1973	1.5466	1.5450	1.5467	1.5438	1.5467	1.5431	1.5467	1.5428	1.5468	1.5420	1.5468	1.5416	1.5468	1.5415
1974	1.7821	1.7814	1.7916	1.7899	1.7964	1.7941	1.7993	1.7967	1.8050	1.8018	1.8085	1.8050	1.8097	1.8060

those in the lowest income class experienced a rate of price increase about one and a half per cent higher than those in the higher income classes. This is precisely the reverse of the pattern evident in Table 2 above, but as they remark, the differences are really quite small considering the approximate doubling of the general price level over the period in question. They used a 21-commodity classification in the calculation cited. With a 10-commodity classification, their estimate of the adverse impact on the lower income groups is somewhat higher.

There might appear to be a contradiction between our results and those of Kennedy and Bruton. However, given the extent of the change in the overall price level during the period, we feel it is not such a great disparity, bearing in mind that the data and methodologies employed are not the same and the data periods do not match precisely.

A recent study of British data (Muellbauer (1974)) used an approach very similar to that employed in the present paper. He concluded that, between 1964 and 1972, lower income groups experienced a rise in the true cost-of-living index over six per cent greater than that suffered by the higher income groups.

IV SUMMARY AND CONCLUSIONS

This paper has reviewed briefly the concept of the true, or constant utility, cost-of-living index and has implemented it using a nine-commodity Irish data sample and a popular neo-classical demand model, the Linear Expenditure System. The results suggest that the recent inflation has seen a slight worsening in the relative position of higher income groups as relative prices have altered.

It is worth noting again that the official Consumer Price Index, over the period in question, would not have been a misleading proxy for the true index for an average expenditure level. Of course, there is no guarantee that this holds generally.

The demand model employed is a special one and cost-of-living indices computed with its aid share the limitations of the underlying model. These are spelt out in the papers by O'Riordan and McCarthy referred to earlier. In addition, comparisons between income classes abstract from differences in expenditure patterns within those classes. The nine-commodity model we have employed seems to represent the most detailed disaggregation possible with the Irish National Accounts data. Clearly there will have been relative price movements within these commodity groups as well which are perforce ignored in our calculations.

Notwithstanding these difficulties, we would conclude by commending those engaged in attempts to measure the welfare effects of inflation in Ireland to take cognisance of the biases which may arise through ignoring the substitution possibilities open to consumers.

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APPENDIX
DATA, SOURCES AND METHODS

The data on prices and quantities of the nine commodities are precisely the same as those printed in the appendix to the paper by McCarthy (1977). The only difference is that the model employed here uses *per capita* figures. The annual population figures used are the mid-year population estimates published by the Central Statistics Office in the Reports on Vital Statistics. These figures are reproduced in Table A.1.

Table A.1.: *Mid-year population data, 1953-1974, millions*

Year	Population	Year	Population
1953	2.949	1964	2.864
1954	2.941	1965	2.876
1955	2.921	1966	2.884
1956	2.898	1967	2.900
1957	2.885	1968	2.913
1958	2.853	1969	2.926
1959	2.846	1970	2.950
1960	2.832	1971	2.978
1961	2.818	1972	3.014
1962	2.830	1973	3.051
1963	2.850	1974	3.091

The figures fo the Consumer Price Index given in Table 2 are simple averages, re-workcd to a 1968 base, of the (all items) index as published by the Central Statistics Office in the *Irish Statistical Bulletin*.