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Analysing the effects of price changes on the cost of living of consumers using true indices

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In this paper we analyse the effects of price changes on consumers' cost of living, using true indices for Germany, France, the UK, Spain and Sweden. We define these indices for a PIGLOG cost function and a dynamic specification of the LAIDS allows us to estimate them using aggregated time-series from 1964 to 1993. The calculated index numbers show that: (i) Spain presents the highest values for all groups, whereas the lowest appear in Germany and the UK, (ii) the highest values were in both oil crisis years, 1973 and 1979, whereas the lowest were generally in 1966 and in 1993, and (iii) the mean values reveal that Spain and France display the highest true cost-of-living indices, whereas Germany and the UK show the lowest.

I. INTRODUCTION

The measurement of consumers' cost of living is a classic problem in the application of normative economics (see Hicks, 1940; Samuelson, 1950). In the last few decades a large number of empirical works have attempted to measure the impact of price changes on the standard of living of individuals (Allen, 1958; Brittain, 1960; Tipping, 1970; Hollister and Palmer, 1972; Williamson, 1997; Piachaud, 1978). This kind of research has flourished as a consequence of the conjunction of the increased availability of large datasets and the advances of econometric procedures. Thus, the theoretical and empirical literature has provided some measures of welfare changes that emerge from the comparison of alternative situations. That it to say, if we know the utility function, we could use the consumer surplus or, if we know the expenditure function, we could employ the compensating variation or the equivalent variation. However, from a strictly microeconomic point of view, the fundamental idea from which we start in this paper is that the expenditure function can be employed to assess the impact of changes in commodity prices on the standard of living of consumers by defining other measures, in particular, the true cost-of living indices. In this sense, it is important to note that the concept of the expenditure function first appeared in a recognizable form in the literature on cost-of-living index numbers in the pioneering contributions of Konüs in the 1920s and 1930s (Konüs, 1924, 1939; Konüs and Buscheguennce, 1925).

The purpose of this paper is to analyse the effects of price changes on the cost of living of consumers, using true indices for five representative European countries, that is to say, Germany, France, the United Kingdom, Spain and Sweden. To this end, we outline the standard methodology for the application of true cost-of-living index numbers, with the primary requisite being to define the cost or expenditure function. Thus, we define the indices for a particular preferences structure which is derived from the PIGLOG cost function. Thereafter, these numbers are estimated using a dynamic version of the Linear Almost Ideal Demand System (LAIDS) as system of demand equations proposed by Deaton and Muellbauer (1980a). We implement this econometric model for the above mentioned countries by statistical methods using aggregated time-series data covering the period from 1964 to 1993. We first confirm that each model has the suitable econometric properties and we then present the estimated parameters and the results of theoretical hypotheses tests. Finally, we outline the time evolution and the average of the true cost-of-living indices for each commodity group and for each sample European country.

In Section II we present the general definition of the true cost-of-living indices and we particularized these numbers for the LAIDS. The data and the estimation procedure are presented in Section III. In Section IV we outline the empirical results and, finally, the conclusions of the paper are summarized in Section V.

II. TRUE COST-OF-LIVING INDICES

True (i.e., constant utility) cost-of-living indices measure the relative costs of reaching a given standard of living under two

different situations (Deaton and Muellbauer, 1980b). These numbers are frequently applied to measure the welfare change associated with a change in prices over time and/or across countries. That is to say, if we assume that the initial consumer equilibrium is ($\mathbf{p}^0$, $\mathbf{q}^0$) and that the price of every good, for example, of Q_i, reduces ($p_i^0 > p_i^1$), giving rise to another, different, equilibrium ($\mathbf{p}^1$, $\mathbf{q}^1$) then cost-of-living index numbers are devices for reducing the comparison between two complete price vectors such as $\mathbf{p}^1$ and $\mathbf{p}^0$ to a single scalar. These indices use a specific indifference curve as the reference concept that is to be held constant. On this interpretation, the cost-of-living index is the ratio of two expenditure functions, that is to say, the minimum expenditure necessary to reach the reference indifference curve at the two sets of prices. Hence, if u is the label of the indifference curve taken as reference, the true cost-of-living index number is given by:

$$P(\mathbf{p}^1, \mathbf{p}^0, u^r) = \frac{c(u^r, \mathbf{p}1)}{c(u^r, \mathbf{p}^0)} \tag{1}$$

If the index number (1) is to be used in order to compare two different price situations, there are two sensible reference levels of utility: u^0 which is the maximum that can be reached under base period prices and income level, and u^1 which is the maximum under current prices with the current income level. It is well known that the Laspeyres index is an upper bound on the index number (1) for u^0, whereas the Paasche index is a lower bound for u^1. The former is sometimes called the Laspeyres-Konüs index and the latter is known as the Paasche-Konüs index.

If, in order to allow for graphic representation, we assume only two arguments in every price vector, the two resulting index numbers are illustrated in Fig. 1 for the case of a rise in p_1 with p_2 held constant. In this figure we observe that the original budget line AB rotates, with the rise in p_1, to AC. We can see that an identical standard of living for the initial situation can be obtained at F and the corresponding budget line cuts the vertical axis at E. Since p_2 is unchanged, distances along the vertical axis are proportional to total expenditures; hence, the base-weighted true price index is OD^0/OA. Similarly, the current-weighted true price index will be OA/OD^1.

True cost-of-living index numbers can be calculated straightforwardly if we know the cost function $c(\mathbf{p}, u)$. Therefore, we use the PIGLOG cost function, assuming the Stone index price for $\log a(\mathbf{p})$ and the usual form for $\log b(\mathbf{p})$, that is to say, $\log a(\mathbf{p}) + \beta_0 \Pi_k^n p_k^{\beta_k}$ (Stone, 1954):

$$\begin{aligned} \log c(\mathbf{p}, u) &= (1-u)\log a(\mathbf{p}) + u \log b(\mathbf{p}) \\ &= \sum_k^n w_k \log p_k + u\beta_0 \Pi_k^n p_k^{\beta_k} \end{aligned} \tag{2}$$

where w_k is the budget share of kth good and β_k are the parameters.

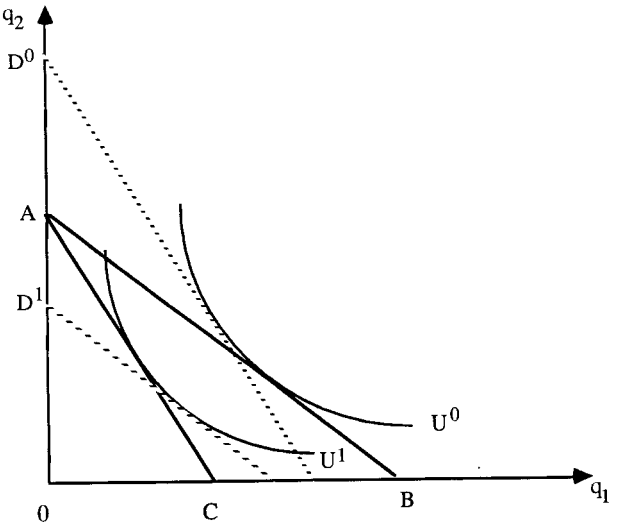

Fig. 1. *Base-weighted and current-weighted true price indices*

Considering definition 1 and the preferences structure 2, we can easily obtain the following particular true cost-of-living index numbers for the initial and final utility levels u^0 and u^1:

$$\begin{aligned} \log P(\mathbf{p}^1, \mathbf{p}^0, u^0) &= \sum_k^n w_k^1 \log p_k^1 - \log y^0 \\ &+ \left[\log y^0 - \sum_k^n w_k^0 \log p_k^0\right] \prod_k^n p_k^{1\beta_k} = \prod_k^n p_k^{0\beta_k} \end{aligned} \tag{3a}$$

$$\begin{aligned} \log P(\mathbf{p}^1, \mathbf{p}^0, u^1) &= -\sum_k^n w_k^0 + \log p_k^0 + \log y^1 \\ &- \left[\log y^1 - \sum_k^n w_k^1 \log p_k^1\right] \prod_k^n p_k^{0\beta_k} = \prod_k^n p_k^{1\beta_k} \end{aligned} \tag{3b}$$

The closest we are likely to approach this is through the estimation of a complete system of demand equations. The functional form used is a dynamic version of the Linear Almost Ideal Demand System:

$$\begin{aligned} w_{it} &= \alpha_i^* + \alpha w_{it-1} + \alpha_i^{**} t + \sum_j^n \gamma_{ij} \log p_{jt} \\ &+ \beta_i \left[\log y_t - \sum_k^n w_{kt} \log p_{kt}\right] \end{aligned} \tag{4}$$

where t is the time trend and α_i and γ_{ij} are parameters.

Economic theory places restrictions upon the value of parameters. Adding-up requires $\sum_i^n \alpha_i^* = 1 - \alpha$ and $\sum_i^n \alpha_i^{**} = \sum_i^n \gamma_{ij} = \sum_i^n \beta_i = 0$, homogeneity of degree zero of budget shares in prices and total expenditure requires $\sum_j^n \gamma_{ij} = 0$ and the symmetry of the Slutsky matrix requires $\gamma_{ij} = \gamma_{ji}$. Finally, the concavity of the cost function implies

that the Slutsky matrix is negative semidefinite. Consequently, its diagonal elements and, therefore, compensated own-price elasticities, must be nonpositive. The second and third conditions are restrictions that we can test by the usual procedures. The first is satisfied automatically and, hence, we cannot test it in the model; nor can the negativity be tested, because it does not take the form of restrictions solely on the parameters.

III. DATA AND ESTIMATION PROCEDURE

In the estimation of the model we use annual time-series covering the period 1964–93 for five European countries, that is to say, Germany, France, the United Kingdom, Spain and Sweden. The personal consumption expenditures and prices are obtained from several issues of the *National Accounts*, Vol. II (OECD). We have divided the total expenditure into the following six commodity categories: (i) food, beverages and tobacco; (ii) clothing and footwear; (iii) gross rent, fuel and powers; (iv) furniture, furnishings and household equipment; (v) medical care and health expenses and, finally, (vi) miscellaneous goods and services (transport and communication, recreational, entertainment, education and cultural services, personal care, expenditures in restaurants, cafes and hotels and other).

The stochastic specification of Equation 4 includes an error term, u_{it}, that captures taste shifts, measurement errors in the dependent variable and the effects of left out variables:

$$w_{it} = \alpha_i^* + \alpha w_{it-1} + \alpha_i^{**} t + \sum_j^n \gamma_{ij} \log p_{jt} + \beta_i \left[\log y_t - \sum_k^n w_{kt} \log p_{kt}\right] + u_{it} \quad (5)$$

Due to the adding-up restriction, the covariance matrix is singular and the likelihood function undefined. The usual procedure followed in this study has been to drop one of the equations, estimate the remaining system and calculate the parameters in the omitted equation via the adding-up condition. The dropped equation in our case is miscellaneous goods and services.

Model 5 has been estimated by using the SURE method employing the TSP version 4.3. We have tested joint autocorrelation by means of a diagnostic test which recognizes the adding-up restrictions and, hence, allows us to consider the system globally. We start from the initial model 5 expressed in a more general form, $w_{it} = X_{it}\beta_i + u_{it}$, and we assume that the error terms are specified as $u_{it} = r_{ii}u_{it-1} + e_{it}$, with r_{ii} being the first-order autocorrelation coefficient corresponding to the group i. If we now substitute this hypothesis in the initial model and, knowing that the adding-up conditions imply the equality of the coefficients r_{ii}, we obtain $w_{it} = X_{it}\beta_i + r(w_{it-1} - X_{it-1}\beta_i) + e_{it}$. Therefore, the rejection of the hypothesis $H_o : r = 0$, shows, on this specification, the existence of first-order autocorrelation problems. Furthermore, the theoretical restrictions of the system are tested by means of the Wald test.

IV. EMPIRICAL RESULTS

The results of the estimation are reported in Tables 1 to 5. First of all, we have tested the existence of first-order autocorrelation, obtaining different values of r, all of them with t-rates which are lower than the critical value at the 5% level of significance (asymptotic t-value at 5% of significance: 1.96). Therefore, these results, set out in Table 1, allow us to accept that our dynamic LAIDS model does not exhibit autocorrelation problems in any of the countries of the sample.

Table 2 shows the estimated parameters and the degree of fit. As regards the individual significance of coefficients, we can see that the majority of the parameters are significant at 5%. With respect to the dynamic coefficients which measure the effect of habits on consumption, we can observe that the parameter of the lagged variable, as well as several coefficients of the time trend, are individually significant in every country. These results allow us to confirm the suitability of the chosen dynamic specifications. As regards price and expenditure variables, we can note that the majority of coefficients are statistically significant at 5%. Finally, as is usually the case using time-series data, the models appear to fit very well, as illustrated by the very high coefficients; in particular, all values appear between 0.95 and 0.99.

The tests of the theoretical hypotheses are reported in Table 3. The values for homogeneity, and joint homogeneity and symmetry, are greater than their critical values at the 5% level of significance, $\chi^2(5)_{0.05} = 11.07, \chi^2(20)_{0.05} = 31.41$. Both hypotheses are, therefore, clearly rejected for every country. These results are in accordance with those reported in other papers that have estimated dynamic versions of the Linear Almost Ideal Demand System (Blanciforti and Green, 1983; Mergos and Donatos, 1989).

Tables 4a and 4b show the time evolution and the average of both true cost-of-living indices $P(\mathbf{p}^1, \mathbf{p}^0, u^0)$ and $P(\mathbf{p}^1, \mathbf{p}^0, u^1)$ for the six commodity groups. We have chosen five representative years of the last three decades, including both oil crises, 1973 and 1979, and, further, trying to obtain subperiods with a similar number of years. Both indices reveal

Table 1. *Autocorrelation tests*

	Parameter	t-value
Germany	0.6439	0.0079
France	0.8387	0.0174
UK	0.6805	0.0208
Spain	0.5428	0.0084
Sweden	0.6936	0.0125

Table 2. *Estimated parameters*

	α	α_i^{**}	γ_{ii}	β_i	R^2
Germany					
Food, beverages and tobacco	0.4744*	−0.0012*	0.0824*	−0.0035	0.99
Clothing and footwear	0.4744*	−0.0014*	0.0108	0.0223*	0.98
Gross rent, fuel and power	0.4744*	0.0028*	0.1472*	−0.0513*	0.98
Furniture, furnishings and hous. eq.	0.4744*	−0.0021*	0.1002*	0.0406*	0.99
Medical care and health expenses	0.4744*	0.0001	0.0048	0.0042	0.97
Miscellaneous goods and services	0.4744*	0.0018	0.1235*	−0.0122	–
France					
Food, beverages and tobacco	0.3232*	−0.0017*	0.0498*	−0.0133	0.99
Clothing and footwear	0.3232*	−0.0006*	−0.0066	0.0058	0.99
Gross rent, fuel and power	0.3232*	−0.0006	0.1685*	0.0208*	0.99
Furniture, furnishings and hous. eq.	0.3232*	−0.0006	−0.1007*	−0.0181*	0.97
Medical care and health expenses	0.3232*	0.0030*	0.0626*	−0.0062	0.98
Miscellaneous goods and services	0.3232*	0.0006	0.2928*	0.0111	–
UK					
Food, beverages and tobacco	0.3158*	−0.0045*	0.1679*	−0.009	0.96
Clothing and footwear	0.3158*	0.0003	0.0450*	−0.0078	0.98
Gross rent, fuel and power	0.3158*	0.0009	−0.0015	0.0048	0.88
Furniture, furnishings and hous. eq.	0.3158*	0.0003	−0.0320	−0.0070	0.95
Medical care and health expenses	0.3158	0.0009	0.0033	0.0019	0.98
Miscellaneous goods and services	0.3158*	0.0037	0.1628*	0.0179	–
Spain					
Food, beverages and tobacco	0.1461*	0.0019	0.1805	−0.1712*	0.99
Clothing and footwear	0.1461*	−0.0024*	0.0447*	0.0333*	0.98
Gross rent, fuel and power	0.1461*	0.0003	0.1187*	−0.0422*	0.99
Furniture, furnishings and hous. eq.	0.1461*	0.0001	0.0447*	0.0285*	0.98
Medical care and health expenses	0.1461*	0.0018*	0.0278*	0.0402*	0.97
Miscellaneous goods and services	0.1461*	−0.0018	0.1682*	0.1114*	–
Sweden					
Food, beverages and tobacco	0.6545*	0.0024	−0.0603*	−0.0385*	0.99
Clothing and footwear	0.6545*	−0.0032*	0.0176*	0.0333*	0.97
Gross rent, fuel and power	0.6545*	−0.0058*	0.1499*	0.0648*	0.97
Furniture, furnishings and hous. eq.	0.6545*	0.0004	−0.0032	−0.0064	0.97
Medical care and health expenses	0.6545*	0.0010*	0.0208*	−0.0104	0.94
Miscellaneous goods and services	0.6545*	0.0051	0.0085	−0.0427	–

Note: * indicates significant at the 5% level.

Table 3. *Hypotheses tests*

	Wald
Germany	
Homogeneity (5 d.f.)	15.33
Homogeneity and symmetry (20 d.f.)	146.55
France	
Homogeneity (5 d.f.)	26.31
Homogeneity and symmetry (20 d.f.)	148.54
UK	
Homogeneity (5 d.f.)	32.48
Homogeneity and symmetry (20 d.f.)	249.41
Spain	
Homogeneity (5 d.f.)	248.46
Homogeneity and symmetry (20 d.f.)	631.14
Sweden	
Homogeneity (5 d.f.)	54.47
Homogeneity and symmetry (20 d.f.)	116.82

that Spain presents the highest mean values for all categories, for example, $P(\mathbf{p}^1, \mathbf{p}^0, u^0)$ displays the following numbers: for food, beverages and tobacco, 2.15; for clothing and footwear, 1.92; for gross rent, fuel and power, 2.84; for furniture, furnishings and household equipment, 2.17; for medical care and health expenses, 1.41, and, finally, for miscellaneous goods and services, 2.59, with the values corresponding to $P(\mathbf{p}^1, \mathbf{p}^0, u^1)$ being very similar. By contrast, the lowest indices appear in Germany for food, beverages and tobacco, 1.17; for furniture, furnishings and household equipment, 1.07, and, thirdly, for miscellaneous goods and services, 1.24, for $P(\mathbf{p}^1, \mathbf{p}^0, u^0)$, whereas the UK shows the lowest values for clothing and footwear, 1.08; for gross rent, fuel and power, 1.18, and, finally, for medical care and health expenses, 0.98, also for $P(\mathbf{p}^1, \mathbf{p}^0, u^0)$.

With respect to the time evolution, we have detected that this is very similar for both indices $P(\mathbf{p}^1, \mathbf{p}^0, u^0)$ and $P(\mathbf{p}^1, \mathbf{p}^0, u^1)$, with the highest values, in general, appearing in 1973 and in 1979, that is to say, in both oil crisis years. By

Table 4. *True cost-of-living indices*

	1966	1973	1979	1986	1993	Mean
$P(\mathbf{p}^1, \mathbf{p}^0, u^0)$						
(A) Food, beverages and tobacco						
Germany	1.16	1.49	1.06	1.03	1.13	1.17
France	1.18	1.60	1.72	1.25	1.07	1.36
UK	1.08	1.29	1.54	1.20	1.13	1.24
Spain	1.76	2.53	2.69	2.61	1.20	2.15
Sweden	1.21	1.34	1.22	1.35	1.17	1.25
Clothing and footwear						
Germany	1.08	1.38	1.06	1.07	1.14	1.14
France	1.07	1.38	1.67	1.41	1.05	1.31
UK	1.02	1.14	1.21	1.05	1.02	1.08
Spain	1.51	2.44	1.42	2.79	1.45	1.92
Sweden	1.08	1.06	1.13	0.95	0.95	1.03
Gross rent, fuel and power						
Germany	1.28	1.56	1.60	0.84	1.35	1.32
France	1.23	1.39	2.01	1.06	1.32	1.40
UK	1.10	1.30	1.55	0.75	1.24	1.18
Spain	1.53	2.06	7.42	1.46	1.77	2.84
Sweden	1.27	1.39	1.58	1.31	1.54	1.41
Furniture, furnishings and hous. eq.						
Germany	1.08	0.93	1.14	1.05	1.15	1.07
France	1.06	1.22	1.66	1.25	1.09	1.25
UK	1.02	1.10	1.32	1.08	1.03	1.10
Spain	1.56	2.26	3.69	1.89	1.47	2.17
Sweden	1.08	1.12	1.20	1.17	1.07	1.12
Medical care and health expenses						
Germany	1.18	1.02	0.97	1.06	1.17	1.08
France	1.13	0.78	1.45	1.16	1.07	1.11
UK	0.92	0.92	0.97	1.05	1.08	0.98
Spain	1.38	1.82	1.00	1.56	1.30	1.41
Sweden	1.02	1.08	1.12	1.17	1.39	1.15
Miscellaneous goods and services						
Germany	1.20	1.60	1.20	0.93	1.30	1.24
France	1.15	1.40	2.18	1.29	1.18	1.44
UK	1.12	1.26	1.97	1.18	1.20	1.34
Spain	1.30	1.75	5.46	2.32	2.12	2.59
Sweden	1.28	1.30	1.45	1.28	1.35	1.33

	1966	1973	1979	1986	1993	Mean
$P(\mathbf{p}^1, \mathbf{p}^0, u^0)$						
(B) Food, beverages and tobacco						
Germany	1.16	1.46	1.06	1.03	1.12	1.16
France	1.17	1.56	1.66	1.24	1.07	1.34
UK	1.08	1.27	1.49	1.20	1.12	1.23
Spain	1.71	2.34	2.47	2.40	1.20	2.02
Sweden	1.20	1.32	1.21	1.33	1.17	1.24
Clothing and footwear						
Germany	1.08	1.35	1.06	1.07	1.14	1.14
France	1.07	1.36	1.61	1.39	1.05	1.29
UK	1.02	1.14	1.21	1.07	1.02	1.09
Spain	1.48	2.23	1.40	2.51	1.42	1.80
Sweden	1.08	1.06	1.13	0.95	0.95	1.03
Gross rent, fuel and power						
Germany	1.27	1.51	1.55	0.84	1.33	1.30
France	1.22	1.38	1.89	1.06	1.31	1.37
UK	1.10	1.29	1.49	0.68	1.23	1.15
Spain	1.50	1.95	5.05	1.44	1.71	2.33
Sweden	1.26	1.37	1.53	1.30	1.50	1.39
Furniture, furnishings and hous. eq.						
Germany	1.08	0.93	1.14	1.05	1.15	1.07
France	1.06	1.21	1.60	1.24	1.09	1.24
UK	1.02	1.10	1.30	1.08	1.03	1.10
Spain	1.52	2.08	3.06	1.81	1.45	1.98
Sweden	1.08	1.12	1.20	1.16	1.07	1.12
Medical care and health expenses						
Germany	1.17	1.02	0.97	1.06	1.16	1.07
France	1.13	0.76	1.43	1.16	1.06	1.10
UK	0.92	0.93	1.00	1.05	1.08	0.99
Spain	1.37	1.73	1.00	1.52	1.29	1.38
Sweden	1.03	1.09	1.12	1.17	1.37	1.15
Miscellaneous goods and services						
Germany	1.19	1.55	1.20	0.93	1.29	1.23
France	1.15	1.38	2.04	1.28	1.17	1.40
UK	1.12	1.25	1.83	1.17	1.19	1.31
Spain	1.29	1.71	4.27	2.20	2.02	2.29
Sweden	1.27	1.28	1.42	1.28	1.33	1.31

contrast, the lowest numbers, except for the gross rent, fuel and power group, generally appear at the beginning and end of the sample period, that is to say, in 1966 and 1993, respectively.

A more detailed analysis by categories reveals the following results. Food, beverages and tobacco present the highest values for $P(\mathbf{p}^1, \mathbf{p}^0, u^0)$ in Spain, France and the UK in 1979, 2.69, 1.72 and 1.54, respectively, whereas Germany displays the lowest index number in 1986, 1.03, with the lowest indices for the rest of the countries appearing in 1966 and 1993. The clothing and footwear group shows the highest index in Spain in 1986, 2.79, whereas for the other countries the highest values appear in 1973 and 1979; by contrast, we find the lowest indices for every country in 1966 and 1993, with the value corresponding to Sweden in 1993, 0.95, being the lowest index number. Gross rent, fuel and power displays the highest number for the five sample countries in 1979, 7.42 and 2.01 in Spain and France, respectively, whereas we find the lowest indices in 1986 for all countries, except for Sweden, with 0.75 and 0.84 appearing as the lowest values in the UK and Germany, respectively. Also in 1979 the furniture, furnishings and household equipment group present four of the five highest numbers, with that corresponding to Spain, 3.69, being the highest; by contrast, all the lowest values, except for Germany, 0.93, appear in the first and in the last sample years. Medical care and health expenses present the highest index numbers for Spain in 1973 and for France in 1979, whereas we find the lowest values in 1986 for the UK and Germany, 1.05 and 1.06, respectively. The miscellaneous goods and services group displays the highest index numbers for all sample countries in both oil crisis years, with that corresponding to Spain, 5.46, being the highest, whereas the four lowest values, except for Germany in 1986, 0.93, appear in the first sample year, 1966.

Finally, we present in Table 5 the mean true cost-of-living indices calculated from the specific indices for each of the six

Table 5. *True mean cost-of-living indices*

	$P(\mathbf{p}^1,\mathbf{p}^0,u^0$	$P(\mathbf{p}^1,\mathbf{p}^0,u^0$
Germany	1.20444	1.19457
France	1.35845	1.33168
UK	1.24422	1.22491
Spain	2.54113	2.10555
Sweden	1.28614	1.27219

categories, using the mean budget shares as ponderation factors. The results indicate that Spain and France display the highest values for $P(\mathbf{p}^1,\mathbf{p}^0,u^0)$ and $P(\mathbf{p}^1,\mathbf{p}^0,u^1)$, 2.54113 and 2.10555 for Spain, and 1.35845 and 1.33168 for France, respectively, whereas Germany and the UK show the lowest indices, also for both indices, with 1.20444 and 1.19457 for Germany, and 1.24422 and 1.22491 for the UK.

V. SUMMARY AND CONCLUSIONS

In this paper we have illustrated the use of true cost-of-living indices as indicators of the effects of changes in consumer goods' prices for five European countries, namely Germany, France, the United Kingdom, Spain and Sweden. These indices are derived from the PIGLOG cost function and are estimated using a dynamic specification of the linear Almost Ideal Demand System with annual time-series from 1964 to 1993.

After proving that all stochastic specifications do not present autocorrelation problems, we have shown that the majority of coefficients and, in particular, the dynamic parameters, are individually significant at the 5% level. Further, all the models appear to fit very well. With respect to the theoretical hypotheses, and as is usually the case, we have observed that homogeneity and symmetry are clearly rejected for every country.

The analysis of the true cost-of-living indices reveals some empirical results. First, Spain presents the highest mean values for all groups, with the highest corresponding to gross rent, fuel and power. By contrast, the lowest indices appear in Germany for food, beverages and tobacco, for furniture, furnishings and household equipment and for miscellaneous goods and services categories, whereas the UK show the lowest values for the clothing and footwear, gross rent, fuel and power and medical care and health expenses groups. Secondly, we have detected, as a generality, that the highest values appear in both oil crisis years, whereas the lowest numbers, except for the gross rent, fuel and power category, generally appear at the beginning and the end of the sample period. Thirdly, the mean values reveal that Spain and France display the highest true cost-of-living index numbers, whereas Germany and the UK show the lowest.

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