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SEPARABILITY AND AGGREGATE SHOCKS IN THE LIFE-CYCLE MODEL OF CONSUMPTION: EVIDENCE FROM SPAIN

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Abstract

The purpose of this paper is to test the life-cycle permanent income hypothesis using an unbalanced panel from the Spanish family expenditure survey. Our model accounts for aggregate shocks and non-separability in the Euler equation among consumption goods, contrary to most of the literature in this area. Our results do not indicate excess sensitivity of consumption growth to income.

Key Words
Life-cycle model; Separability; Aggregate Shocks, Panel Data.
JEL Classifications: C23, D12.

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1.- INTRODUCTION

Since 1978, when Hall published his paper on the life-cycle permanent income hypothesis, many authors have estimated revised versions of his model and have tested its implications using both aggregate and micro data.

At a macro level most of the empirical tests lead to the rejection of the permanent income hypothesis (e.g. Flavin (1981), Campbell and Mankiw (1991)). However, the fact that the life-cycle model of consumption is in general rejected using aggregate time series data does not necessarily invalidate the theory at the individual level. As pointed out by previous authors, the failure of the model with macro data can be due to the violation of the aggregation assumptions needed to justify the use of aggregate data (see Ch. 5 Deaton (1992), Attanasio and Weber (1993)).

At a micro level there is evidence in favour and against the permanent income hypothesis. Most of the research in this area (e.g. Hall and Mishkin (1982), Zeldes (1989) and Runkle (1991)) is based on the Panel Study of Income Dynamics (PSID). This data set only includes information on food consumption, and therefore, preferences have to be parameterized such that the Euler equation for food consumption does not depend on consumption of other goods[1]. As argued in Attanasio and Weber (1992), the violation of this assumption can be responsible for the rejection of the permanent income hypothesis when the data set used is the PSID. The reason why we can spuriously find evidence of excess sensitivity of consumption to income when the consumption measure used is food consumption is the following: if the utility function is not additive in food and non-food consumption, the Euler equation for food will depend on consumption of other goods.

[1] The normalization of the utility function has to be chosen such that the utility function is additively separable between food and non-food consumption. Notice that within-period allocation of expenditures is invariant to monotonic transformations of the utility function, but intertemporal allocation of consumption depends on the normalization of the utility function.

Hence, if no measure of non-food consumption is included, a spurious dependence of food consumption on income can be induced. This spurious dependence would lead to a rejection of the permanent income hypothesis. In this paper, we consider groups of composite commodities, and we estimate the Euler equations derived from a life-cycle model of consumer behaviour.

The main data set that we use is a rotating panel from the Spanish family expenditure survey (Encuesta Continua de Presupuestos Familiares, ECPF hereafter) corresponding to 1985-91. This data set has several advantages for estimating a life-cycle model of consumption compared with other data sets used in the literature. On the one hand, in the ECPF, very detailed information on expenditures is recorded. This fact makes this survey more appealing than the PSID. On the other hand, the structure of the ECPF is more convenient than the most widely used consumer surveys. In the Spanish survey households are interviewed along eight consecutive quarters, and they report a complete information on expenditure, income and family characteristics. The consumer surveys most widely used do not have this panel structure. The British Family Expenditure Survey has independent waves, and in the American Consumer Expenditure Survey, even though households are interviewed in four consecutive quarters, the information on income is only recorded in the 1st and 4th interview. The frequency of the data, quarterly as opposed to annual, is another advantage of the ECPF survey relative to the PSID for the purpose of studying consumption decisions.

Another important issue that has recently attracted attention in the literature is the presence of aggregate shocks that could invalidate the instruments and hence the identification of the model when the time series dimension of the data set is small (see Deaton (1992)). If the aggregate shocks affect all the individuals in the same way the problem can be easily solved by introducing time dummies in the model. However, if the effect of the shocks is not homogeneous across households, the introduction of time dummies will not solve the problem and we will need a long time series dimension to obtain valid estimates of the model. Therefore, if the effect of aggregate shocks varies over individuals, we may obtain different estimates for the parameters of the model for different periods of time, even if we include time dummies to pick up these effects. We have used a second unbalanced panel from a previous series of consumer surveys for Spain (Encuesta Permanente de Consumo, EPC hereafter) which were carried out between 1978 and 1983, at a very different part of the cycle, relative to the period 1985-91 when the economy was booming. On the basis of these two data sets we can check the stability of our results.

The paper is organized as follows. In section 2 we present the life-cycle model of consumer behaviour that will be used in the paper. In section 3 we describe the information contained in the Spanish family expenditure surveys and how the variables of the model have been constructed. In section 4 we analyze some econometric issues on the estimation of the model. The results are presented in section 5. Section 6 concludes.

2.- THE MODEL

The decision problem faced by the consumer is how to allocate consumption over time to maximize the expected intertemporal utility, i.e.

$$\max_{\{c_{t+k}\}_{k=0}^{T-t}} E_t\left[\sum_{k=0}^{T-t} \delta^k u(c_{t+k},\eta_{t+k})\right]$$

$$\text{subject to} \qquad (2.1)$$

$$A_{t+1+k}=(1+i_{t+k})(A_{t+k}+y_{t+k}-p'_{t+k}c_{t+k}) \qquad k=0,..,T-t$$

$$A_{T+1}\geq 0$$

Where, for period s, c_s is a vector of consumption of n groups of commodities, p_s is the corresponding vector of prices, y_s is income and i_s is the nominal interest rate. A_s denotes assets at the beginning of period s, η_s is a vector of family characteristics and δ is the discount rate. E_t is the conditional expectation operator, conditional on information known by the consumer in period t.

The set of Euler equations for this problem is

$$E_t\left[\frac{(1+r_{jt})\delta\, u_j(c_{t+1},\eta_{t+1})}{u_j(c_t,\eta_t)}\right]=1 \qquad j=1,..,n \tag{2.2}$$

Where r_{jt} is the commodity-specific real interest rate $(1+r_{jt}) = (1+i_t)p_{jt}/p_{jt+1}$ and u_j is the partial derivative of the utility function with respect to consumption of commodity j. We can write (2.2) in terms of the actual values as

$$\frac{(1+r_{jt})\delta\, u_j(c_{t+1},\eta_{t+1})}{u_j(c_t,\eta_t)}=1+\epsilon_{jt+1} \qquad E_t(\epsilon_{jt+1})=0 \qquad j=1,..,n \tag{2.3}$$

where ϵ_{jt+1} is an expectational error.

We consider the following instantaneous utility function, which is not additive (given the normalization we use) but simple to guarantee an approximate log-linear Euler equation

$$u(c_{1t},..,c_{nt},\eta_t)=c_{1t}^{\alpha_1}..c_{nt}^{\alpha_n}\phi(\eta_t) \tag{2.4}$$

Where ϕ is a function of the vector of family characteristics, which will be parameterized as an exponential[2]. We can write the set of Euler equations in (2.3) for the utility function (2.4). Taking logarithms and using a second order Taylor approximation for $\log(1+\epsilon_{jt+1})$, we obtain

[2] Notice that even though this utility function is weakly separable, the normalization we use implies non-separability in the Euler equations among consumption goods.

$$(\alpha_j-1)\Delta\log c_{jt+1}+\sum_{k\neq j}\alpha_k\Delta\log c_{kt+1}+\log\delta+\frac{1}{2}\sigma_j^2+\log(1+r_{jt})+\Delta\log\phi(\eta_t)=\epsilon_{jt+1} \tag{2.5}$$

where $E_t(\epsilon_{jt+1})=0$, $\sigma^2=E(\epsilon^2_{jt+1})$ and Δ is the first differences operator[3]. All the variables except the interest rate are household-specific, but we have omitted the household subscript to simplify notation.

We are implicitly assuming additive separability between consumption of durable and non-durable goods in the utility function. The reasons why we do not include expenditure in durables in our model are twofold. First, the treatment of durables would involve additional econometric problems (infrequency of purchases); and second, the fact that the inclusion of durables would complicate the specification of preferences (see Hayashi (1985)). Furthermore, we are mainly concerned in testing the life-cycle permanent income hypothesis, rather than in modelling consumption patterns for different goods.

There is no information on hours of work in the ECPF, and therefore, we have to assume separability between consumption and leisure. However, we have tried to overcome potential shortcomings by controlling for labour market status of the household head and the wife in our equations. Thus, we will pick up to some extent the potential differences in consumption behaviour among households with different labour force participation status.

3.- THE DATA

The main data set that we have used is the Spanish family expenditure survey

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[3] This approximation has been criticized by Altug and Miller (1990). They argue that $\log(1+\epsilon_{jt+1})$ is correlated with past information invalidating the instruments widely used to estimate this kind of models. The validity of the instruments can be tested empirically and we do not reject that the instruments we use in this paper are valid (see section 5).

(Encuesta Continua de Presupuestos Familiares (ECPF)). This survey is carried out by personal interview on a quarterly basis, from the 1st quarter 1985. The survey contains very detailed information on family expenditures, information on household characteristics and family income.

Every quarter, about 3000 families are interviewed. The data set is a rotating panel, since in principle 1/8 of the households are renewed every quarter. A family stays in the sample at most eight periods but there is quite an important percentage of attrition in earlier quarters, mainly during the first two years of the survey. In this application we have used 20 quarters of the survey from 1st quarter 1987 to 4th quarter 1991[4]. We have considered families that report full information for at least four consecutive periods. The reason why we have dropped households with less than four responses is that we need lagged information to instrument the endogenous variables of the model.

Consumption patterns can be very different for households with different characteristics (family members, age, etc.). To overcome this problem, we can either work with a small sample of "homogeneous" consumers, or else we can assume that we know how preferences depend on family characteristics. Using the first approach will mean a reduction on the sample size and hence a worse performance of the estimators[5]. The problem with the second procedure is to combine flexibility with parsimony. Our approach will be a compromise between these two approaches.

Taking into account the considerations above, we keep in our sample married couples with or without children, such that the husband is coded head of the household. We drop households whose head is either very young (younger than 25), or else quite old

[4] During the first two years of the survey the percentage of early exit is very high and no household entering the sample in these two years complete the eight interview. This is the reason why we have excluded 1985-86.

[5] Provided the sample selection is based on exogenous variables, otherwise we will have additional sample selection problems.

(older than 65). We also condition on some demographic and labour force variables as explained below.

For the purpose of this research we have used only expenditure in non-durables and services, which we have aggregated in three groups of commodities: the first one includes food, alcoholic and non-alcoholic drinks and tobacco; the second, clothing and footwear; and the third, energy and transport[6].

As we mentioned above, the data set includes information on labour market status but not on hours of work for any member of the household. We have included as regressors dummy variables on labour market status (full time employed, part time employed and unemployed) for the household head and the wife. There is also information on the sex and age for each member of the household. We have assumed that preferences can also depend on demographics, so that we have included age and age squared of the household head, the number of babies (between 0-2 years old), children (3-17 years old), elderly people (older than 65), and family size.

The second data set is an unbalanced panel from a previous series of consumer surveys for Spain (Encuesta Permanente de Consumo (EPC)). This survey was carried out from the first quarter 1978 to the fourth quarter 1983. Although we observe some households for 24 quarters, part of the sample is renewed on each period. Due to the estimation requirements explained above, we keep families reporting full information for at least four consecutive quarters. The subsample we have considered was obtained using the same criteria as that used for the ECPF. The EPC does not contain information on income, and therefore we can not use this data set to test excess sensitivity of consumption growth to anticipated income growth. Moreover, this survey does not provide any information on the labour market status of the wife. Therefore, this data set we can

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[6] Energy and transport is the group of non-durables whose definition is more homogeneous in the two data sets we use in this paper.

only allows to control for labour market status of the husband.

In the appendix we present descriptive statistics for demographic characteristics, expenditures and income, for both data sets. If we compare the means or the medians of real expenditure on energy and transport and real expenditure on clothing (table A1), we can see that the figures are higher for 1987-91 (ECPF data), than for 1978-83 (EPC data). We are aware of these differences which may cast some doubts on the comparison between the results obtained from the two surveys.

The price index for each group of commodities is derived from the disaggregated consumer retail price index for Spain published by the National Institute of Statistics (Instituto Nacional de Estadística), using the same weights that are used to construct the general index. The nominal interest rate is an interest rate on deposits provided by Cuenca (1991).

4.- ECONOMETRIC ISSUES

The set of Euler Equations in (2.5) is estimated using the Generalized Method of Moments (GMM). If the only component of the error terms in these equations were an expectational error, we could use as instruments for the model all the variables dated t-1 and earlier. However, if consumption is measured with error, additional terms are added to the disturbances, and even assuming that these measurement errors are serially uncorrelated, we can only use as instruments endogenous variables dated t-2 and earlier. Another potential source of stochastic variability in the model are random preferences, i.e. individual heterogeneity is not perfectly observed. We can model this fact by adding an error term to the vector η_t in (2.5). This would add an extra component to the disturbances, and as it happens in the presence of measurement errors in consumption, random preferences can also invalidate the use of endogenous variables dated at t-1 as valid instruments for the model. We have considered alternative instrument sets, and a detailed explanation is provided in the next section.

As discussed above, the presence of aggregate shocks will invalidate the econometric results based on cross-section averages. Therefore, we include time dummies in our regression equations, which will pick up the effect of the aggregate shocks provided that their influence is similar across households. Nevertheless, as we mention earlier, if the effect of aggregate shocks is different for different families, the estimated coefficients will be biased. The stability of the parameters can be tested comparing the estimated parameters for different time periods. Thus, we estimate the model using the ECPF (1987-91) and the EPC (1978-83) and we compare the results. In the presence of aggregate shocks we could expect to reject the stability of the coefficients, given that these shocks could bias the estimates in different ways for different periods.

The two data sets we have available are incomplete panels but they do not overlap. In order to have a longer time series dimension, we could join the information contained in the two samples by constructing cohorts of families according to the year of birth (see Browning, Deaton and Irish (1985), Blundell, Browning and Meghir (1994) amongst others). The population could be divided in groups with fixed membership over time (cohorts), and the sample means for each cohort on each time period can be treated as a panel subject to measurement errors. The classical estimators for panel data can be modified in a convenient way to obtain consistent estimators using the cohort means. We leave this approach for future research.

5.- RESULTS

We have estimated two equations, one for food consumption and another one for energy and transport. In both equations we condition on the growth rate of consumption of clothing and footwear. The food equation to be estimated is

$$\Delta \log c_{it}^{f} = \beta_1 \Delta \log c_{it}^{e} + \beta_2 \Delta \log c_{it}^{c} + \theta \log(1+r_t^{f}) + \gamma' \Delta \eta_{it} + seas + \epsilon_{it} \qquad (5.1)$$

where c_{it}^{f}, c_{it}^{e} and c_{it}^{c} are consumption by household i in period t of food, energy and transport, and clothing respectively; r_t^{f} is the commodity-specific real interest rate; η_{it} is a vector of family characteristics, which includes the number of babies, children, and household members older than 64, family size, husband age and age squared and dummies for the labour market status of the household head and the wife; seas denotes the set of seasonal dummies and ϵ_{it} is the disturbance term. The equation for energy and transport is analogous. As we mentioned earlier, we estimate the Euler equations by GMM[7].

We have to choose a set of instruments that are uncorrelated with the disturbance term. In our application the instrument set comprises lagged values of the endogenous and exogenous variables and contemporaneous values of the exogenous variables, as it is explained in detail below. The instruments will provide a set of moment restrictions, $E(Z_{it}^{j}\epsilon_{it})=0$, $j=1,..,J$, where Z_{it}^{j} is the j-th instrument for household i in period t and ϵ_{it} is the disturbance term. These restrictions can be seen as a system of equations relating the parameters of the model. In the overidentified case (when there are more restrictions than parameters to estimate), as in our application, the system will not have a solution once we replace the moment restrictions by their sample counterparts. The GMM estimator minimizes a quadratic form in these sample moments using any positive definite matrix as a weighting matrix. The GMM estimates reported in the tables below are two-step estimates, i.e. they are obtained in a second iteration using as weighting matrix the inverse of a consistent estimate of the variance-covariance matrix of the moment restrictions, and the reported standard errors are robust to general forms of heteroscedasticity and serial correlation.

[7] We use the DPD program written in Gauss by Arellano and Bond (1988).

As mentioned earlier, in the absence of measurement errors in consumption, we could use as instruments any endogenous variable dated t-1 or earlier. Since we consider demographic variables as exogenous[8], we only have to instrument consumption variables, the interest rate and the labour force dummies using past information. The results we obtained estimating these equations by GMM, and including: real income, the nominal interest rate, real consumption of food, clothing, and energy and transport, and the labour force dummies in t-1 and t-2 in the instrument set, clearly suggested the inadequacy of some instruments. We obtained very large values for the Sargan test of overidentifying restrictions. In order to see whether this rejection was due to the fact that endogenous variables dated t-1 were not valid instruments, or else that a particular instrument was not valid, we estimated the model excluding from the instrument set real income, real consumption of food (in the equation for food), or real consumption of energy and transport (in the equation for energy and transport), reaching very similar results. Furthermore, the negative first order serial correlation of the residuals also indicated that endogenous variables dated t-1 were not valid instruments for the model. These two issues are indicative of measurement errors in consumption.

The presence of measurement errors in consumption will add extra terms to the disturbance. These extra terms will have an MA(1) structure, provided that the measurement errors are serially uncorrelated. If this is the case, consumption variables dated at t-1 will not be valid instruments because measured consumption at t-1 will be correlated with the error term through its measurement error. However, if the measurement errors are serially uncorrelated, measured consumption at t-2 or earlier will be a valid instrument for the model. Something similar happens in the presence of random preferences. If the unobservable component of η_{it} in equation (5.1) is serially uncorrelated

[8] In principle, this assumption is not very convincing in the case of children. However, the exogeneity of children when we are modelling consumption does not seem to be such an important issue as it is in the context of female labour supply (see Browning (1992)).

an extra MA(1) term will be added to the disturbance, discarding endogenous variables dated at t-1 as valid instruments for the model. Alternative plausible assumptions are that this component is constant over time or that it has a random walk structure. In the first case the unobservable heterogeneity will vanish since it enters the equation as a change over time. In the random walk case, a white noise term will be added to the disturbance and variables dated t-1 will still be valid instruments. We consequently decided to exclude from the set of instruments consumption and income in t-1.

We have estimated the model including different lags of the endogenous and exogenous variables in the instrument set. The results obtained for the alternative instrument sets were quite similar. The results based on the ECPF are presented in tables 1 and 2. The instrument set used in both equations includes: income, consumption of food, consumption of clothing, consumption of energy and transport, the interest rate and the labour force dummies in t-2 and t-3; the number of babies, children, elder and family size in t, t-1 and t-2, husband age and the quarterly dummies. In columns (3) and (4) we have included time dummies to pick up the effect of aggregate shocks which are not explained by fluctuations on the interest rate. Although the set of time dummies is significant, the results are just slightly different to the results in columns (1) and (2). When we include contemporaneous income growth as an additional regressor (columns (2) and (4)), the estimated coefficient is not significant, providing evidence of no excess sensitivity of consumption growth to income.

The Sargan test of overidentifying restrictions does not reject the instrument set. This result indicates that endogenous variables dated t-2 and earlier are valid instruments as we could expect if measurement errors are white noise. Furthermore, the values of the m1 and m2 statistics for first and second order serial correlation of the residuals provide evidence of first order but not of second order correlation, reinforcing the evidence of white noise measurement errors and hence the validity of the instrument set[9].

None of the labour market dummies are significant at the 5 per cent level in any of the specifications. This can indicate that changes in labour force status do not influence consumption growth, but there is not enough evidence to guarantee that. The demographic variables do not seem to play an important role in explaining consumption growth. In the equation for energy and transport none of these variables is significant at the 5 per cent level, and in the food equation only the change in the family size is significant at this significance level. The reason why the demographic variables are not significant is probably because Family composition does not change over time for most of the households in our sample (the change in the demographic variables that we have considered is not zero only for about 1-4% of the observations).

The growth rate of consumption of energy and transport is significant in the food equation, and so is the growth rate of food consumption in the equation for energy and transport. This result, which provides evidence of non-separability in the Euler equations, is in agreement we the results for the US obtained by Attanasio and Weber (1992).

Given that we do not find evidence of excess sensitivity of consumption growth to income, we could think, as we mention earlier, that the evidence found in the studies which consider an additive separable utility function could be due to this sort of misspecification of the normalization of the utility function. However, when we do not include conditioning commodities in the Euler equations, we do not find evidence of excess sensitivity either.

As we commented earlier the robustness of our results will depend on the proper account of aggregate shocks. The presence of aggregate shocks that influence different families in different ways will invalidate the results relying in cross-section asymptotics.

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[9] These statistics are asymptotically distributed as standard normals, see Arellano and Bond (1991).

If this were the case, we would expect to obtain different values for the estimated parameters of the model when we use the second data set (the EPC). In order to test the stability of the parameters, we have estimated the Euler equations for food, and for energy and transport using the data from the EPC.

The EPC does not provide information on the labour market status of the wife. Furthermore, the husband is considered working if he was working for at least 13 hours during the reference week. This definition matches the definition of full time work in the ECPF. In order to test the stability of the parameters, we have to use the same set of regressors for the two samples. Accordingly, we have estimated the two Euler equations conditioning in just two labour market dummies (husband full time employed and husband unemployed).

In tables 3 and 4 we present these results for the ECPF (columns (1) and (3)) and the EPC (columns (2) and (4)). In columns (3) and (4) we have included time dummies. Some of the estimated parameters for the EPC look different that those for the ECPF. In the food equation (table 3), none of the variables are significant, when we use the EPC. In the equation for energy and transport (table 4), the only variables that are significant, when we use the EPC, are the number of children and the labour dummies. We have tested the null hypothesis that the vector of coefficients is the same in both periods, and the Wald statistic does not lead to a rejection of the null hypothesis (see tables 3 and 4). We have also tested the stability of the results, coefficient by coefficient, and we can only reject the null hypothesis for the labour force participation coefficients. However, the reason why we fail to reject the null hypothesis might be the low precision of our estimates.

6.- CONCLUSIONS

The results we have obtained for Spain add new evidence reinforcing the life-cycle permanent income hypothesis. We allow for non-separabilities among consumption goods in the Euler equations and we do not find evidence of excess sensitivity.

We estimate the Euler equations using two data sets corresponding to different periods of time. On the basis of a Wald test we do not reject the stability over time of our results. This fact suggests that the effect of aggregate shocks, which are not explained by fluctuations on the interest rate, can be properly captured by the time dummies. This precludes the use of a long time series dimension to obtain valid estimates of the model. However, we are aware that the low precision of our estimates weakens this result.

Measurement errors in consumption and non-separabilities seem to be an important issue, and they may be responsible for the failure of the model commonly found in the literature.

Table 1

Food, Alcohol and Tobacco

	(1)	(2)	(3)	(4)
Δln(clothing)	0.0351	0.0240	0.0321	0.0226
	(0.0299)	(0.0346)	(0.0300)	(0.0350
Δln(entr)	0.2151	0.2309	0.1946	0.2063
	(0.1029)	(0.1068)	(0.1043)	(0.1072
Δbabies	-0.0341	-0.0424	-0.0371	-0.0442
	(0.0348)	(0.0373)	(0.0344)	(0.0369
Δchildren	-0.0192	-0.0238	-0.0223	-0.0262
	(0.0253)	(0.0265)	(0.0250)	(0.0262
Δelder	-0.0273	-0.0252	-0.0301	-0.0284
	(0.0577)	(0.0588)	(0.0565)	(0.0572
Δfsize	0.0736	0.0877	0.0770	0.0890
	(0.0247)	(0.0330)	(0.0247)	(0.0334
hage	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Δhfullemp	-0.6258	-0.6589	-0.5916	-0.6130
	(0.3686)	(0.3762)	(0.3704)	(0.3749)
Δhpartemp	-0.7439	-0.7894	-0.7163	-0.7472
	(0.4352)	(0.4454)	(0.4360)	(0.4421)
Δhunemp	-0.5022	-0.5477	-0.4795	-0.5113
	(0.3304)	(0.3405)	(0.3310)	(0.3378)
Δwfullemp	-0.1774	-0.1747	-0.1834	-0.1807
	(0.1767)	(0.1785)	(0.1752)	(0.1763)
Δwpartemp	0.2479	0.2481	0.2539	0.2538
	(0.2293)	(0.2307)	(0.2267)	(0.2274)
Δwunemp	0.2911	0.2854	0.3039	0.3003
	(0.2753)	(0.2766)	(0.2710)	(0.2715)
ln(1 + r)	-0.4065	-0.5162	-	-
	(0.7787)	(0.8008)		
lnrinc	-	-0.0798	-	-0.0658
		(0.1276)		(0.1271)
time dummies	no	no	yes	yes
seasonal dum.	yes	yes	no	no
Sargan Test	22.368	21.671	22.333	21.897
df	21	20	20	19
m1	-10.884	-10.283	-11.012	-10.586
m2	-0.563	-0.623	-0.653	-0.715

The dependent variable is the growth rate of food consumption.
Numbers in parentheses are standard errors.
See notes to tables 1 to 4.

Table 2

Energy and transport Consumption

	(1)	(2)	(3)	(4)
Δln(clothing)	-0.0119	0.0122	-0.0083	0.0192
	(0.0528)	(0.0577)	(0.0535)	(0.0590)
Δln(food)	0.7140	0.7207	0.7586	0.7665
	(0.3303)	(0.3309)	(0.3364)	(0.3371)
Δbabies	-0.0258	0.0007	-0.0172	0.0134
	(0.0604)	(0.0668)	(0.0612)	(0.0681)
Δchildren	-0.0457	-0.0291	-0.0424	-0.0230
	(0.0431)	(0.0463)	(0.0437)	(0.0471)
Δelder	-0.0886	-0.0965	-0.0783	-0.0853
	(0.0992)	(0.1012)	(0.1005)	(0.1023)
Δfsize	0.0519	0.0118	0.0429	-0.0044
	(0.0492)	(0.0637)	(0.0500)	(0.0660)
hage	-0.0002	-0.0002	-0.0002	-0.0002
	(0.0006)	(0.0006)	(0.0006)	(0.0006)
Δhfullemp	0.5565	0.5652	0.4789	0.4698
	(0.6417)	(0.6480)	(0.6476)	(0.6534)
Δhpartemp	0.1429	0.2765	0.0643	0.1938
	(0.8194)	(0.8271)	(0.8324)	(0.8338)
Δhunemp	0.5638	0.6161	0.5207	0.5641
	(0.5517)	(0.5603)	(0.5571)	(0.5641)
Δwfullemp	0.1002	0.0931	0.0790	0.0557
	(0.3039)	(0.3056)	(0.3115)	(0.3139)
Δwpartemp	-0.0855	-0.1159	-0.0840	-0.1140
	(0.3723)	(0.3722)	(0.3778)	(0.3771)
Δwunemp	-0.1011	-0.1017	-0.1946	-0.2050
	(0.4978)	(0.4988)	(0.4938)	(0.4940)
ln(1+r)	-2.0979	-2.0508	-	-
	(1.3336)	(1.3341)		
lnrinc	-	0.2064	-	0.2367
		(0.2051)		(0.2144)
time dummies	no	no	yes	yes
seasonal dum.	yes	yes	no	no
Sargan Test	25.167	23.742	25.122	23.504
df	21	20	20	19
m1	-13.006	-13.086	-12.449	-12.575
m2	-0.260	-0.462	-0.244	-0.483

The dependent variable is the growth rate of consumption of energy and transport.
Numbers in parentheses are standard errors.
See notes to tables 1 to 4.

Table 3

Food, Alcohol and Tobacco

	(1) ECPF	(2) EPC	(3) ECPF	(4) EPC
Δln(clothing)	0.0197	0.0202	0.0162	0.0446
	(0.0376)	(0.0446)	(0.0376)	(0.0467)
Δln(entr)	0.2693	0.1093	0.2524	0.0752
	(0.1241)	(0.0855)	(0.1255)	(0.0867)
Δbabies	-0.0234	0.0310	-0.0264	0.0403
	(0.0357)	(0.0377)	(0.0354)	(0.0373)
Δchildren	-0.0132	0.0130	-0.0162	0.0139
	(0.0248)	(0.0220)	(0.0245)	(0.0218)
Δelder	-0.0381	0.0674	-0.0415	0.0732
	(0.0573)	(0.0503)	(0.0558)	(0.0501)
Δfsize	0.0709	0.0516	0.0742	0.0463
	(0.0258)	(0.0317)	(0.0256)	(0.0323)
hage	-0.0002	-0.0001	-0.0002	-0.0001
	(0.0004)	(0.0002)	(0.0004)	(0.0002)
Δhfullemp	-0.5484	0.9604	-0.5158	0.8074
	(0.4197)	(0.5682)	(0.4192)	(0.5573)
Δhunemp	-0.4597	1.1140	-0.4380	0.9120
	(0.3622)	(0.6808)	(0.3611)	(0.6719)
ln(1+r)	-0.6670	1.0118	-	-
	(0.7695)	(0.9323)		
time dummies	no	no	yes	yes
seasonal dum.	yes	yes	no	no
Sargan Test	18.252	19.363	18.474	13.171
df	15	15	14	14
m1	-9.076	-11.192	-9.145	-11.485
m2	-0.594	-1.027	-0.700	-0.877

Wald test for stability of the parameters (chi-square distribution)

H_0: column (1) = column (2), statistic = 13.19 df = 10 p-value = 0.2130.
H_0: column (3) = column (4), statistic = 10.64 df = 9 p-value = 0.3014.

The dependent variable is the growth rate of food consumption.
Numbers in parentheses are standard errors.
See notes to tables 1 to 4.

Table 4

Energy and transport

	(1) ECPF	(2) EPC	(3) ECPF	(4) EPC
Δln(clothing)	0.0546	0.0953	0.0626	0.0943
	(0.0647)	(0.0968)	(0.0651)	(0.0957)
Δln(food)	0.7121	0.7600	0.7545	0.7305
	(0.3481)	(0.5322)	(0.3584)	(0.5848)
Δbabies	-0.0160	-0.0616	-0.0068	-0.0524
	(0.0608)	(0.0708)	(0.0616)	(0.0713)
Δchildren	-0.0284	-0.0821	-0.0236	-0.0771
	(0.0416)	(0.0462)	(0.0422)	(0.0461)
Δelder	-0.0821	-0.0705	-0.0684	-0.0619
	(0.0986)	(0.0961)	(0.0997)	(0.0978)
Δfsize	0.0417	0.0343	0.0316	0.0313
	(0.0510)	(0.0620)	(0.0523)	(0.0645)
hage	-0.0001	-0.0008	-0.0002	-0.0008
	(0.0006)	(0.0005)	(0.0006)	(0.0005)
Δhfullemp	0.2170	-2.8925	0.1415	-2.9180
	(0.6756)	(1.3009)	(0.6793)	(1.2928)
Δhunemp	0.2766	-3.6034	0.2384	-3.6206
	(0.5774)	(1.5704)	(0.5816)	(1.5597)
ln(1+r)	-1.6870	0.0555	-	-
	(1.3315)	(0.3188)		
time dummies	no	no	yes	yes
seasonal dum.	yes	yes	no	no
Sargan Test	17.586	23.567	17.215	22.804
df	15	15	14	14
m1	-13.051	-7.388	-12.554	-6.773
m2	-0.139	-1.035	-0.146	-1.051

Wald test for stability of the parameters (chi-square distribution)

H_0: column (1) = column (2), statistic = 7.92 df = 10 p-value = 0.6368.
H_0: column (3) = column (4), statistic = 6.40 df = 9 p-value = 0.6998.

The dependent variable is the growth rate of consumption of energy and transport.
Numbers in parentheses are standard errors.
See notes to tables 1 to 4.

Notes to tables 1 to 4

- clothing, entr and food are real consumption of clothing, energy and transport,and food respectively.

- babies, children and elder are the number of babies (between 0 and 2 years old), the number of children (between 3 and 17), and the number of household members older than 64 respectively.

- fsize is family size.

- hage is the age of the household head.

- hfullemp (full-time employed), hpartemp (part-time employed) and hunempl (unemployed), are dummy variables for the labour market status of the household head. Analogously wpartemp, wfullemp and wunemp for the wife.

- r is the commodity specific real interest rate.

- income is real income.

- Sargan Test is the Sargan test of overidentifying restrictions. It is distributed as a chi-square with degrees of freedom (df) equal to the number of overidentifying restrictions.

- m1 and m2 are test statistics for first and second order serial correlation, their distribution is standard normal (see Arellano and Bond (1991) for a description of these tests).

Data Appendix

Table A1

Descriptive Statistics for Quarterly Expenditures and Income

Real Expenditures on Food, Alcohol and Tobacco (1983 pesetas)

year	Median	Mean	St. Dev.	Minimum	Maximum
1978	97865	106919	49757	18190	503645
1979	98231	109938	53879	11632	532677
1980	103128	113399	54145	18050	557679
1981	101627	112568	57713	9080	743292
1982	101777	113231	56632	13364	714264
1983	99833	109573	51223	19725	563461
1987	94375	103520	50281	12410	604881
1988	93099	101432	47222	8079	484540
1989	93932	102742	48765	10837	536265
1990	93812	103294	50074	6041	604995
1991	93436	102188	48937	10363	526147

Real Expenditures on Energy and Transport (1983 pesetas)

year	Median	Mean	St. Dev.	Minimum	Maximum
1978	24872	35540	35512	856	358485
1979	26713	37088	35202	561	300788
1980	24003	33250	31771	517	303398
1981	23763	33327	31574	435	396846
1982	25527	33354	29190	701	291459
1983	23110	32237	28286	773	211878
1987	36078	46928	41619	230	350431
1988	37438	48491	41852	547	513207
1989	38447	50897	46147	1537	725576
1990	35684	43681	33470	2326	400991
1991	35872	44229	33102	1561	357812

Real Expenditures on Clothing (1983 pesetas)

year	Median	Mean	St. Dev.	Minimum	Maximum
1978	22317	27849	22227	16	192953
1979	21068	27133	35982	59	1198863
1980	19235	24561	21754	36	282816
1981	17456	22775	20677	67	271292
1982	17270	22221	19719	40	204691
1983	16137	21360	20116	82	301717
1987	30051	42400	45077	42	530683
1988	28215	41728	44672	85	491009
1989	30213	44370	48045	213	639557
1990	30531	43500	44768	210	579698
1991	29633	42807	45178	41	648186

Real Income (1983 pesetas)

year	Median	Mean	St. Dev.	Minimum	Maximum
1987	235381	267720	142012	28637	1267436
1988	253730	286846	153614	10572	1678643
1989	266329	309217	170255	13185	1930884
1990	273372	314905	176224	32062	1994467
1991	281197	320464	177642	14651	2070534

Table A2

Descriptive Statistics for Demographic characteristics

year	babies	child	elder	famsize	hage	hemp	hunemp
1978	0.147	1.642	0.138	4.472	45.17	0.948	0.015
	(0.394)	(1.277)	(0.397)	(1.386)	(8.302)	(0.223)	(0.122)
1979	0.121	1.603	0.141	4.456	45.90	0.945	0.016
	(0.352)	(1.298)	(0.411)	(1.450)	(8.436)	(0.229)	(0.126)
1980	0.090	1.548	0.153	4.389	46.52	0.924	0.024
	(0.296)	(1.284)	(0.413)	(1.394)	(8.446)	(0.265)	(0.155)
1981	0.089	1.481	0.148	4.378	47.27	0.903	0.040
	(0.305)	(1.276)	(0.407)	(1.421)	(8.378)	(0.296)	(0.197)
1982	0.077	1.419	0.150	4.346	47.97	0.902	0.043
	(0.285)	(1.280)	(0.403)	(1.442)	(8.604)	(0.298)	(0.203)
1983	0.063	1.361	0.142	4.294	49.02	0.871	0.068
	(0.251)	(1.257)	(0.387)	(1.447)	(8.474)	(0.335)	(0.252)
1987	0.149	1.383	0.111	4.329	45.31	0.833	0.080
	(0.388)	(1.184)	(0.355)	(1.342)	(9.798)	(0.373)	(0.272)
1988	0.143	1.296	0.111	4.307	45.75	0.834	0.065
	(0.390)	(1.153)	(0.350)	(1.344)	(10.13)	(0.372)	(0.246)
1989	0.148	1.294	0.107	4.335	45.88	0.860	0.046
	(0.380)	(1.146)	(0.333)	(1.340)	(10.01)	(0.347)	(0.210)
1990	0.148	1.264	0.116	4.265	46.18	0.860	0.047
	(0.382)	(1.158)	(0.357)	(1.368)	(10.02)	(0.347)	(0.211)
1991	0.136	1.209	0.122	4.243	46.29	0.851	0.045
	(0.370)	(1.124)	(0.373)	(1.387)	(10.32)	(0.356)	(0.207)

Sample means. Sample Standard deviations in parenthesis.

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