THE INTERTEMPORAL SUBSTITUTION
IN THE SPANISH ECONOMY
(PRELIMINARY VERSION)

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Abstract

We examine the intertemporal substitution in consumption and leisure in the Spanish economy through the estimation of the three first order conditions derived from a model of individual optimization, with data from two databases: regional data from the BDMORES and aggregate data from the BDREMS. While the first order conditions governing inter and intratemporal consumption behaviour show a good econometric fit, and we obtain a value of its intertemporal elasticity of substitution similar to previous available results, that of the intertemporal condition in leisure indicates that the behaviour of the Spanish labour supply along the cycle is more complex than the canonical intertemporal choice model can explain.

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JEL Code: C23, C26, C36, E21, E24, J22.

1. Introduction.

Macroeconomic cycle models often assume a response of labour supply to cyclical changes, very specifically to wage changes, much larger than what supports the available results of the empirical investigation. The debate on this issue has focused on the value of a parameter of individual utility function, the intertemporal elasticity of substitution of leisure, which has an essential role in this subject, since that it determines the response of this variable or, in other words, the supply of labour, to wage changes over the business cycle.

Empirical research on this issue, along the 80s and 90s, for the US and British economies, with models of representative agent, was very troublesome, since estimates of such elasticity with microeconomic data were too small in relation to those considered in standard macroeconomic models[1], while the results of the empirical studies with aggregate data were also very poorly compatible with the postulates of these models, to the point of questioning the basic features of the theoretical utility functions considered therein[2]. From then, little progress has been made on empirical ground and only recently there have been some attempts to reconcile these empirical findings with theoretical assumptions of standard macroeconomic models. Some of these attempts, that have shown a variable degree of success and acceptance, have been Chetty, Guren, Manoli and Weber (2011), Ljungqvist and Sargent (2011) and Keane and Rogerson (2012).

This paper is an attempt to measure this parameter for the Spanish economy from a sample of regional data processed as a panel, and their comparison with the results obtained by estimating the same model with the same econometric techniques on aggregate data. Itself considered, the exercise we propose here has the interest that involves the estimation of the intertemporal elasticity of substitution on leisure, one of the main parameters subject of the recent macroeconomic debate. But the characteristics of the data analyzed, aggregated by nature, but treated with appropriate econometric techniques for individual data, in our view, confer to this exercise a bigger interest, especially if we take into account the fundamentals of the debate on the value and the results of the empirical estimation of this parameter in other economies. To the extent that our database is composed of aggregate data with a micro

[1] You can see, for example, MaCurdy (1981), Browning, Deaton and Irish (1985) or Altonji (1986).
[2] The most oustanding example at this regard is Mankiw, Rotemberg and Summers (1985).

structure, it can be treated as a panel, or alternatively, as a set of time series of the different Spanish regions (although this is not carried out to term in this paper), which enables to compare the results obtained with different econometric techniques with a same regional database, as well as those obtained from conducting similar econometric exercises with an alternative aggregate database.

It should be noted that we abstract from the problems associated with the individual participation decision in the labor market, and from the consequences of corner solutions in the model (unemployment). In this sense, we note that our endogenous variable are leisure hours of employees, in some cases occupied, measured per capita, reason why we hope that the averaging of aggregate data could correct, or at least reduce, these problems, what is, on the other hand, the usual assumption in comparable studies for other economies.

As regards to the structure of the work, section 2 presents the theoretical model; section 3, presents the estimation method and the processing of data; then, in Section 4, the results obtained are presented and in section 5 we conclude, with special emphasis in further lines to extend our research.

2. The theoretical model.

Following MaCurdy (1981 and 1983), suppose an individual who chooses their levels of consumption and leisure at time t, respectively, C_t and L_t, maximizing their expected lifecycle utility function:

$$\underset{C_t L_t}{Max} U = E_t \sum_{i=0}^{T-t} \beta^i u(C_{t+i}, L_{t+i}) \qquad [1]$$

subject to the usual budget constraint that determines the evolution of individual financial wealth over time:

$$A_{t+i+1} = R_t \left[A_{t+i} + W_{t+i} N_{t+i} - P_{t+i} C_{t+i} \right] \qquad [2]$$

where U is the intertemporally separable utility function, *u(.)* is the uniperiod utility function, assumed increasing and concave in its two arguments. E_t is the mathematical expectations operator conditional on information set available in period t and β is the discount rate. A_t is the individual's financial non human wealth, R_t is the nominal interest rate, W_t is the wage per hour worked, N_t is the number of hours worked by the individual and

C_t his real consumption, all in period t. P_t, then, is the nominal price of a unit of C_t and L_t = L*-N is the number of hours of leisure enjoyed by the individual, where L* is the total number of hours available in period t.

As usual, both, wage per hour and nominal price of consumption are considered exogenous variables, independent of individual behaviour.

From previous budget constraint, we obtain the lifecycle budget constraint, that, if the individual does not make legacies (A_T=0), is given by:

$$\sum_{i=0}^{T-t} R_t^{-i} P_{t+i} C_{t+i} = A_t + \sum_{i=0}^{T-t} R_t^{-i} W_{t+i} N_{t+i} \qquad [3]$$

We are assuming that the individual operates in a perfect capital market, where she can lend or to borrow at the same nominal interest rate, R, in any moment.

From the definition of the value function, V, that represents maximum expected utility by the individual in $t+1$, from his choice of consumption and leisure:

$$V(A_{t+1}) = MáxE_{t+1}\left\{\sum_{i=1}^{T-t} \beta\, U(C_{t+i}, L_{t+i})\right\} \qquad [4]$$

and according to the Bellman's optimality principle, the previous optimization problem is equivalent to the following:

$$V(A_t) = \underset{C_t, L_t}{Máx}\left\{U(C_t, L_t) + \beta E_t V(A_{t+1})\right\} \qquad [5]$$

from where we obtain the expression:

$$V'(A_t) = R\beta\, E_t V'(A_{t+1}) \qquad [6]$$

that allows us derive the following first order conditions, result of individual optimization:

$$\frac{W_t}{P_t} \frac{\partial u / \partial C_t}{\partial u / \partial L_t} = 1 \qquad [7]$$

$$E_t \beta \frac{\partial u / \partial C_{t+1}}{\partial u / \partial C_t} \frac{P_t R_t}{P_{t+1}} = 1 \qquad [8]$$

$$E_t \beta \frac{\partial u / \partial L_{t+1}}{\partial u / \partial L_t} \frac{W_t R_t}{W_{t+1}} = 1 \qquad [9]$$

Along the individual optimization's path, these three conditions must be satisfied simultaneously. The fulfillment of [7] implies that, at the optimum, given the values of C_t and W_t, the individual can not improve altering marginally their consumption in return for changing their level of leisure, or vice versa. The satisfaction of the Euler condition of consumption [8] implies that, given R_t, P_t and P_{t+1} along the optimization path, the individual cannot increase their utility level between periods t and $t+1$ reallocating consumption between them. On the other hand, the satisfaction of the condition [9] implies that, along this path optimization, and given in this case R_t, W_t and W_{t+1}, the individual cannot increase their utility between periods t and $t+1$ reallocating their leisure between them[3].

From there, we need to specify a functional form for the utility to derive a testable expression of the model. In this field, although you can find many different uniperiod functional forms in literature, in fact all obey the same general pattern, with very slight modifications. Basically, this is a generalization of the CRRA utility function, widely applied in the analysis of aggregate consumption, to which is incorporated as an additional argument the level of leisure. In that sense, Mankiw, Rotemberg and Summers (1985) proposes the following expression:

$$u(C_t, L_t) = \frac{1}{1-\gamma}\left[\frac{C_t^{1-\alpha}-1}{1-\alpha} + d\,\frac{L_t^{1-\phi}-1}{1-\phi}\right]^{1-\gamma} \qquad [10]$$

where γ, α, ϕ and d are all non-negative parameters. Note that this utility function has, as a particular case, an additively separable function in consumption and leisure ($\gamma = 0$), in which case $1/\alpha$ is the elasticity of intertemporal substitution of consumption and $1/\phi$ is the elasticity of intertemporal substitution of leisure. As is well known, the first is the percentage change in consumption growth, C_{t+1}/C_t over the percentage change in the real interest rate, P_tR_t/P_{t+1}, while the second is the percentage change in the leisure growth, L_{t+1}/L_t on the percentage change in W_tRt/W_{t+1}[4].

[3] Analytically, as Mankiw, Rotemberg and Summers (1985) point out, one of these conditions is redundant, which is easily verifiable. However, given the unlikelihood that [7] was accurately satisfied in data, these same authors consider that it is convenient to estimate the three equations simultaneously, not being an efficient estimation procedure not to do it in this way.

[4] In what follows, only for a quick clear identification of the variables, we refer to the real interest rate, the first expression in the text, as the *real interest rate adjusted with prices*, and the second one as the *real interest rate adjusted with wages*.

From the above utility function [10], if the aim of our empirical analysis was to recover all its parameters, it would be inevitable to use nonlinear estimators, according to the proposal of Hansen and Singleton (1982), which is what Mankiw, Rotemberg and Summers (1985) made with aggregate data for the US economy. The rest of empirical approaches, whose objective was to estimate the same model with panel data, loglinearize the model, imposing intratemporal separability between consumption and leisure, to obtain a empirical expression testable with this kind of data. In that case, it is easy to check that the loglinearization of different alternative expressions of the utility function produce the following expressions:

$$\ln(C_t) = k_{os} + k_{1s}\ln(L_t) + k_{2s}\ln\left(\frac{W_t}{P_t}\right) \qquad [11]$$

$$E_t \ln\left(\frac{C_{t+1}}{C_t}\right) = k_{oc} + k_{1c}E_t \ln\left(\frac{P_t R_t}{P_{t+1}}\right) \qquad [12]$$

$$E_t \ln\left(\frac{L_{t+1}}{L_t}\right) = k_{ol} + k_{1l}\, E_t \ln\left(\frac{W_t R_t}{W_{t+1}}\right) \qquad [13]$$

where k_{ij}, i=0,1,2, j=$s,c,l,$ are coefficients to being estimated and dependent on parameters of the postulated utility function. Note, in particular, two important circumstances: first, k_{oc} and k_{ol} in [12] and [13] contain β, which should be treated as an individual fixed effect in estimation using panel data[5]; but it is not in k_{os} in [11]. Second, if the utility function is intratemporalmente separable in consumption and leisure, i.e., γ=0, k_{1c} in [12] is the intertemporal elasticity of substitution in consumption and k_{1l} in [13] is the elasticity of intertemporal substitution in leisure[6].

Therefore, subsequent empirical analysis, based on the above expressions [11], [12] and [13], is dependent on separability assumptionsd[7]. In that regard, it should be noted that much of the empirical analysis of aggregate consumption from the work of Hall (1978), based on

[5] Carrasco, Labeaga and López-Salido (2005) show, with Spanish data, the importance of a rigorous and suitable econometric treatment of these effects in the empirical analysis of consumption.

[6] The absence of intratemporal separability would change [12] and [13] but not [11]. In that case, those expressions would adopt a too complicated form for empirical analysis, given that our uniperiod utility is additive. In that sense, to obtain more appropriate expressions would require uniperiod multiplicative utility functions in consumption and leisure.

[7] In Collado (1998) you can find an example, with Spanish data, of the empirical consequences of noncompliance of intertemporal separability in the field of consumption.

the expression [12] taken alone, presents this same empirical weakness[8], aggravated, where appropriate, by ignoring the information provided by the expression [11] [9,10].

It is important to note that the empirical test of the model requires the fulfillment of the three above first order conditions. In that sense, we are assuming no violations of canonical model of intertemporal choice are produced, such as, for example, liquidity constraints, in the field of consumption, or involuntary unemployment, in that of the labor supply[11].

Finally, given that we use a representative agent model, variables C_t and L_t are measured in the empirical analysis in per capita terms, from the corresponding aggregate data, while W_t has the character of an average wage. As Alogoskoufis (1987) points out, the representative agent assumption applied to aggregate data circumvents some problems, at this respect, that would be more serious with individual data, such as the modeling of the individual participation decision in the labor market through a discrete choice model. Thus, according to this author, aggregation reduces these problems, on the assumption that participation decisions within each household, or between households, are not synchronized.

3. The empirical model and data.

Since, in a first phase, our objective is to estimate the equations [11], [12] and [13] using panel data techniques on data of regional Spanish regions, we rewrite these equations as follows, after adding an individual subscript and applying the rational expectations assumption:

$$\ln(C_{it}) = k_{ios} + k_{i1s}\ln(L_{it}) + k_{i2s}\ln\left(\frac{W_{it}}{P_{it}}\right) \qquad [11']$$

$$\Delta\ln(C_{it+1}) = k_{ioc} + k_{i1c}\ln\left(\frac{P_{it}R_t}{P_{it+1}}\right) + \varepsilon_{ict+1} \qquad [12']$$

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8 An application to the Spanish case can be found in Cutanda (2002).

9 See, in that regard, footnote 3.

10 The results of the estimation of the elasticity of intertemporal substitution of consumption with aggregate data compared with the results obtained with individual data point precisely in the opposite to that of the estimation of the elasticity of intertemporal substitution of leisure with both types of data mentioned. In the first case, microeconomic data allows to recover higher and more reasonable values of the elasticity; in the second reverse is true.

11 In Cutanda (2003), the consequences of the presence of liquidity constraints in Spanish consumption are analyzed with data from the Encuesta Continua de Presupuestos Familiares (ECPF) from 1985 to 1993.

$$\Delta \ln(L_{it+1}) = k_{iol} + k_{i1l} \ln\left(\frac{W_{it} R_t}{W_{it+1}}\right) + \varepsilon_{ilt+1} \qquad [13']$$

being ε_{ict+1} and ε_{ilt+1} two error terms independent of all variables dated at t or before. Note that, in the above equations, the nominal interest rate has not individual variability, which is likely to affect the outcome of an analysis like ours with panel techniques, although this is not the case of the real interest rate, whose individual variability is provided by the price series[12].

Our sample consists, therefore, of 17 Spanish regions, named autonomous communities[13], i=1, ..., 17 of which we have available information about consumer spending, hours of leisure, obtained from worked hours, wages and prices.

As we have mentioned before, since k_{ioc} and k_{iol} have the character of fixed individual effects[14], potentially correlated with the regressors, robust estimation techniques to this circumstance are needed. Specifically, we present the results of the estimation of the model with the within groups estimator and with the generalized method of moments in two cases, depending on the fixed effects are removed subtracting the average of the variables or differentiating the model. In tables we refer these three procedures as WG, MGM1 and MGM2, respectively[15]. The MGM estimators we use are robust to heteroskedasticity and first order autocorrelation of the error term.

Joint to the problems of endogeneity of regressors, a further reason for using instrumental variables in estimating the model is the possible presence of measurement error, especially in all the variables related to the labor supply. Since our measure of hours of leisure is obtained from the number of hours worked, and the wage used in the empirical

[12] The variability in the interest rate is usually generated, by constructing an individualized Stone price index, either through the introduction of an individual tax rate, as does MaCurdy (1983). In our case, since our individuals are the Spanish regions, we have taken the CPIs of each of them, directly.

[13] Our principal database is the BDMORES, which aggregate data from the autonomous cities of Ceuta and Melilla in Andalucía, which gives the total number of regions in the text.

[14] Specifically, taking into account individual variability of β, $k_{ioc} = \frac{1}{\alpha}\beta_i$; $k_{iol} = \frac{1}{\phi}\beta_i$

[15]We also tried to apply the Arellano and Bond (1991) estimator, for which the expressions [12'] and [13'] were rewritten as dynamic models, dependent on the lagged endogenous variable. However, the results for the parameter of the lagged dependent variable were too close to the unit, for that they might be relevant. See Blundell and Bond (1998). Moreover, of all works consulted, only Alogoskoufis (1987) contrasts a dynamic expression of the model in these terms, although he express labour supply depending on its forward expression, which is unusual.

implementation of the model is also obtained from that measure of hours worked and the measure of salary income, the measurement errors in both variables could be negatively correlated, as Altonji (1986) has pointed out, and it could produce negative estimates of the elasticity of intertemporal substitution of leisure, as are the values obtained by Mankiw, Rotemberg and Summers (1985). Moreover, also the measures of consumer spending might be affected by this problem, as Altonji and Siow (1987) report. On the other hand, if all these measurement errors are supposed white noise, instruments dated in *t-2*, or before, would be robust to it, which is the solution adopted in this work, and common in the literature.

In any case, the estimation results are verified by the Sargan test of overidentifying restrictions, for checking the absence of correlation between the instruments and the error term. Also, a test of Wald of joint significance applies. Finally, a LM test of orthogonality of the residuals is also performed, from the regression of these on the instruments set used in each case.

In the second phase, we estimate the same equations using the data from the BDREMS, for comparative purposes, as already noted. As is well known, the BDREMS is an aggregate database of the Spanish economy, with quarterly data since 1980. The interest of this exercise lies in the fact that both databases, the BDMORES and BDREMS, are supported by the same public agency, dedicating a great effort to increase the coherence between them and with the aggregates of Spanish national accounting; moreover, they are developed, largely, by the same group of researchers[16,17].

Entering in details about the data used and the construction of variables, in the first phase the database used was the BDMORES, base year 2008, although we have also used data from the Regional Accounting of Spain, CRE, with the same base year, which, at this moment, are not included in that database, and we have added more variables from other statistical

[16] The goal of this exercise is, therefore, checking whether there exist differences in the results of the same estimation procedure with two different data structures, purely aggregated in one case, the BDREMS, and with individual variability in the other, the BDMORES, even though their primary data be aggregated. To some extent, this exercise is directly related to Cutanda, Labeaga and Sanchis-Llopis (2001), where the biases of different levels of aggregation of data are checked in the context of the analysis of the Spanish aggregate consumption, although they have available pure individual data.

[17] These databases are available in http://www.sepg.pap.minhap.gob.es/sitios/sepg/es-ES/Presupuestos/Documentacion/Paginas/Documentacion.aspx. The interested reader in their content and elaboration can consult Daban, Díaz, Escribá and Murgui (2008), Bosca, De Bustos, Díaz, Doménech, Ferri, Pérez and Puch (2007) and De Bustos, Díaz, Cutanda, Escribá, Murgui and Sanz (2008).

sources. Currently, the BDMORES, base year 2008, provides information of the Spanish regions, autonomous communities, for variables, both nominal and real, both from the supply side and the demand side of the economy for different time periods, that, in the best of cases, extend from 1955 to 2010 or 2011, and even beyond.

Concretely, for our purposes, the BDMORES provides data on consumer spending, both nominal and real, between 1967 and 2010. Moreover, it also presents data for total nominal employee compensation between 1955 and 2011[18]. Unfortunately, does not report the hours worked, as does the CRE since 2000, both for employees and for the total occupied. Despite the broad time period of the spending and revenue variables obtained from the BDMORES, the fact that working hours of the CRE are only offered since 2000 is a major handicap, which we attempt to solve extending backwards the series of hours worked by different procedures. Thus, we obtained an increase in the number of available observations until 1996 applying to the two available series of hours worked the rate of growth in hours worked for each region of the Wage Survey for Industry and Services (2nd quarter), from the Instituto Nacional de Estadística, INE, the Spanish public organism at charge of official data and statistics. We get two series of hours worked for the autonomous communities, for employees and total occupied between 1996 and 2012.

Since our dependent variable is hours of leisure, following Mankiw, Rotemberg and Summers (1985) they are estimated by discounting the hours worked to the "annual endowment of available total hours". This variable was obtained by multiplying the number of available days per year[19] for 16 and for the number of individuals (which are given by the numbers of employees and occupied, as appropriate, provided by the BDMORES). Two sets of annual hours of leisure by autonomous communities, employees and total occupied between 1996 and 2011 are thus obtained[20]. As Mankiw, Rotemberg and Summers (1985) point out, this specification is subject to criticism, since it does not distinguish between

[18] Employee compensation, or any other variable that BDMORES or CRE provided only in nominal terms, were expressed in real terms by using the corresponding CPI, base year 2008.
[19] Which took into account whether or not it was a leap year.
[20] The data available in the BDMORES, base year 2008, for the number of employees and occupied for 2012 was a preliminary estimate and was not credible, so it was discarded from the analysis.

changes due to the variation of the number of workers and due to the modification of the number of hours worked[21].

It should be noted that, in order to exploit the most the available sample, the number of temporal observations of hours worked by employees expanded backwards as discussed above, was additionally enlarged backwards, by two procedures, using the data of the annual hours worked by employees from the BDREMS, available since 1980. At first, the total hours worked for Spain in the CRE was extended backwards with the growth rate of the number of hours worked from the BDREMS for the same aggregate, and after this total was distributed for regions assuming that the ratio of their hours worked over the total is the same as the ratio of the employees compensation over its total. In the second method, the same procedure was applied, but imposing now the ratio of employees in each region over the total. In this case, we were imposing equality in the percentage distributions of employees and hours worked between regions. Thus, we obtained two series of hours worked from 1980, and not from 1996, of which we extract the corresponding series of hours of leisure since 1980 by the same mechanism explained above. In this case, our goal was to check what occurred with previous results obtained with short series, estimating the same model with these longer, but more controversial series[22,23].

Alogoskoufis (1987) uses measures of the labor supply, not leisure, obtained from the volume of employment and from the rate of unemployment[24]. In our case, we chose not to follow this strategy, given the particular behavior of the unemployment rate in Spain, which

[21] As noted earlier, since the fulfillment of some of the conditions of the first order model is incompatible with involuntary unemployment, this is a serious problem. Empirical work with individual data try to avoid it restricting the sample, in some cases to such an extent that one wonders for its representativeness. See, in this sense, MaCurdy (1983) and Altonji (1986), already mentioned.

[22] Since the asymptotic of the estimators for panel data, both with cross-sectional data or with pseudo-panels data, depends on the product *NxT* (see Collado (1997) and Alvarez and Arellano (2003)), it is important to note that even the samples of shorter hours considered are beyond the usual standards in this field: in our case, *NxT* = 187, while in Browning, Deaton and Irish (1985), *NxT* = 112. This is not surprising, if you consider that both, the worsening problems of attrition in the pure panels and the increasing age of the components of the cohorts in the pseudo-panels with the increase in *T*, advise does not extend this variable too much. Thus, only Cutanda, Labeaga and Sanchis-Llopis (2001) and/or Cutanda (2002) present higher *NxT*, 440 and 282, respectively, but their observations are quarterly.

[23] In Tables, the series of leisure hours of employees and occupied do not temporarily extended until 1980 are called asav1 and ocuv1, respectively, while the extended versions of them appear, respectively, as asav2 and asav3.

[24] As is well known, the model can be rearranged very easily in terms of labour supply, which has no more significance that affect the constant and change the expected sign of the influence of the variable of hours considered.

has reached values higher than 25% in the three crises experienced since the 70s. Additionally, the change in definition of unemployment by Eurostat in 2001 introduced a break in the official rate of unemployment series, complicating matters further. In any case, since some of the measures of labor supply of Alogoskoufis (1987) were normalized based to the labor force, and not to the total population, we checked that this does not affect the results.

Regarding to wages, as usual in the works cited, the wage per hour is obtained by dividing the compensation of employees, nominal and real, between hours worked estimated by the second method discussed above. On the other hand, we have reviewed the results obtained using the annual wage instead of wage per hour (in Tables, the annual salary is referred to as W^y, in front of the wage per hour, W). This annual wage is obtained by dividing the aforementioned compensation of employees, nominal and real, between the number of employees. The rationale for this test resides in the fact that the remuneration of employees can be decomposed, in fact, in the product of the number of employees for the average number of hours worked per employee and for the wage per hour, so that the annual salary is actually the product of the last two aforementioned variables. Thus, if the average number of hours worked by each employee does not change, the result of estimation with both wages, per hour and per year, should be the same, which is a simple procedure to check the importance of variation of average hours worked in the labour supply, one of the classic and recurring problems in these contrasts.

Regarding the data from BDREMS, only be noted that we took as a price index the deflator of final consumption expenditure provided by the database itself, from which we obtain the nominal expenditure in final consumption, which it is not provided by the database. Consequently, nominal compensation of employees provided by this database was deflated with that price index, discarding the real wage compensation provided in the BDREMS, which is obtained with a different deflator, whose numbers were too different from the real wage compensation obtained from nominal compensation of employees in the BDMORES deflated with CPIs, especially when the nominal values of this variable in both databases were very similar. The remaining variables were taken directly from the said database[25,26].

[25] Since BDREMS data are quarterly, a sample with annualized data was generated from the available quarterly original data, but the results did not differ from those presented here.

Moreover, although is not present in the BDMORES, the CRE presents spending on food, beverages and tobacco, which has traditionally been considered a more appropriate expenditure category than total spending for the empirical analysis of consumption, given that it is supposed not contaminated by durability. In any case, and in principle, it is not obvious which of the two categories of consumer spending is more suitable for estimating the elasticity of intertemporal substitution of leisure, given the nature of consumption on food[27,28], so they have been used both in the empirical analysis to see if it produces differences in outcomes. In that sense, we use the appropriate CPI for each category of expenditure considered[29,30,31].

Finally, we have also taken the population from the BDMORES, base year 2008, to use it for calculating the variables in per capita terms. The price series considered have been the CPIs of each region, also in base year 2008, as already noted. On the other hand, they were considered different interest rates, given its importance in the analysis: we have taken, first, two interest rates considered in Cutanda, Labeaga and Sanchis-Llopis (2001) and Cutanda (2013) and, finally, the second quarter interest rate from BDREMS. In Cutanda (2013) was considered the interest rate on 12-month treasury bills from the Statistical Bulletin of the Bank of Spain, with data from 1987, extended back with the growth rate of the interest rate of deposits from one to two years of banks, from the same source (in Tables, this interest rate is referred to as R_1). It was considered also the interest rate on new deposit operations of credit institutions to households and non-financial institutions, also from the same source, with data from 2003, extended back through the same procedure (in Tables, R_2), that was

[26] In obtaining the endowment of hours, the number of days available is allocated quarterly, increasing the number of days in the first quarter of leap years correspondingly.

[27] In fact, Mankiw, Rotemberg and Summers (1985) used both a category of non-durable spending, as this same augmented with services. An analogue to this latter is the expenditure considered in McCurdy (1983), while Altonji (1986) tests spending in food, given that he uses the PSID.

[28] An empirical fact of the evolution of such spending, which is often not considered, is that it has recently shown a persistent downward trend. For example, the official data of the weights used in the elaboration of Spanish CPI between 1992 and 2013, show that the percentage of spending on this item has fallen from 29.4% to 21.1% of the total.

[29] Since there is no strict correspondence between the aggregate final consumption expenditure from BDMORES and from the CRE, the figures for spending on food, beverages and tobacco have been adjusted in proportion to these totals by the usual procedure.

[30] The CRE decompose from 2000 the spending on food, beverages and tobacco in expenditure in food and non-alcoholic beverages and in alcoholic beverages and tobacco. In this paper, these figures are added from that year, and its price index is obtained by the usual procedure, using the appropriate weights for each subcategory provided by the INE.

[31] In Tables, a superscript *a* over *C* or *P* indicates expenditure or price index of food, beverages and tobacco, respectively.

also applied to the interest rate from the BDREMS (in Tables, R_3). With regard to interest rates R_1 and R_2, we have generated quarterly series for them to be used with the BDREMS data, from the original monthly data available.

4. Empirical Results.

Table 1 shows the results of estimating equation [11'], the equation of intertemporal substitution between consumption and leisure. In this Table, as in the rest, we show the results of the different estimators considered to eliminate individual effects: the within-groups estimate (WG) and two estimates of the Generalized Method of Moments in which the effects are eliminated by substracting the mean of the variables, that we call MGM1, or differentiating the model, that we call MGM2, considering the latter more robust. Results are presented for the four measures of leisure considered by the three estimation procedures referred, showing a good overall fit as measured by the Sargan test. Also the Wald tests provide broadly good results, despite the reduced specification considered, as well as the residual orthogonality test, being the former slightly worse in the case of shorter series of leisure. On one hand, this variable has a positive sign in all the estimates, which is interpreted as indicative of complementarity between consumption and leisure activities, although it is not statistically significant, except in some cases. On the other hand, with respect to the logarithm of the real hourly wage, their sign is always positive, presenting both statistically significant and non-significant MGM estimated parameters, although it is not in any case of MGM2 estimates. Nonetheless, as we have already mentioned, we believe that these results support the hypothesis of a positive relationship between wages per hour and total real spending consumption in Spain. As regards the results of the estimation with the BDREMS data, which in Tables always appear at the column/s labeled BDR, they are very similar to those mentioned, although its overall econometric fit is worse than any of the estimates with BDMORES data, no matter the test performed. The only relevant difference is that the logarithm of real hourly wage is shown almost statistically significant in the exercise with BDREMS data, but the opposite happens in MGM2 estimates with BDMORES data.

These results surprisingly contrast with those of Mankiw, Rotemberg and Summers (1985) for the United States economy, although they use nonlinear estimates for time series data.

Their results, as themselves acknowledge, are largely disappointing, as they find a negative relationship between consumption and leisure in the US economy, which can only be compatible with optimizing behavior of the agents, if the real wage is constant, when one of the two variables is an inferior good[32].

Table 2 presents the results of estimating equation [12'], the intertemporal Euler condition of consumption, that has already been checked on multiple occasions for the Spanish economy, both by different estimation procedures, as with different statistical sources. In our case, the estimation is made for the three interest rates considered, already discussed above, respectively on each of the three columns, and for each of the estimators. The estimation results with BDMORES data are very acceptable, considering the flat specification of the empirical model and the traditional problems in estimating this equation from its loglinearized expression[33]. This is indicated by the relatively worst outcome of the Sargan test in the exercises performed with respect to Table 1. For its part, the results of the test of orthogonality of the residuals are also very good, and some less good are the results of the Wald test, especially on two occasions, which we relate to the low specification considered. Addressing already the parameter estimate for the logarithm of the real interest rate, it is positive in all cases and, except in one, less than unity, being, besides, also significant in all MGM2 estimation results. These figures are around an intermediate value within the range of estimated values for this parameter in previous studies for the Spanish economy, implying a value of intertemporal elasticity of substitution of consumption between 0.30 and 1.15, approximately, if we do not take into account the within-groups results, being their average value 0.69[34].

With regard to the results of the estimation of this equation with BDREMS data, it should be noted that the goodness of fit is similar to that obtained with the BDMORES data if measured by Sargan and residuals orthogonality tests, although the Wald test does not offer

[32] Barañano and Paz Moral (2013) show, using simulation techniques, that Lucas's human capital model adequately reproduces the empirical facts of the US economy where consumption and leisure are complementaries.
[33] See, for example, López-Salido (1993), in an empirical study using data from the ECPF. On the other hand, even though they are applications of the CCAP model with aggregate data for the Spanish economy, Marquez de la Cruz (2005 and 2006) both summarize and illustrate the difficulties of empirically observed relationship between Spanish aggregate consumption and interest rate.
[34] Note that this average value considers all the MGM estimates. When only MGM2 estimates are used, the average value amounts to 0.93.

good statistic values. However, the results with the BDREMS data are similar to those found in the estimation of the elasticity of intertemporal substitution of consumption for other economies with aggregate data, from the work of Hall (1988). It should be noted that the average value of estimated parameter with BDREMS data is less than that obtained with the MGM2 estimates with BDMORES data (0.32 vs. 0.93)[35], being also not statistically significant in either case. In addition, the instability of the results with the BDREMS data is greater than with the BDMORES data, as proves that the standard deviation of the former is 0.40 against 0.25 of the BDMORES MGM2 estimates[36].

The results of estimating equation [13'], the intertemporal Euler condition of leisure, are presented in Table 3, where we have adopted as interest rate that we have called R_1, given that it provided, in all cases in our previous results, an estimated intermediate value of the elasticity of intertemporal substitution of consumption. Overall, the fit is not bad, being the Wald test that shows worse results. Taken together all these MGM estimates, its interpretation may not be favorable to the paradigm of intertemporal substitution of leisure in the Spanish economy: the estimated parameter of the *real interest rate adjusted for wages*, in other words, the elasticity of intertemporal substitution of leisure, presents a negative sign in all estimates with BDMORES data, whatever the estimator considered, and besides a significant dispersion of the values obtained, replying to the Spanish economy, although with our regional data, the results of Mankiw, Rotemberg and Summers (1985) for the aggregate data of the US economy. In addition, the estimated parameter is statistically significant in many cases, so the only possible conclusion in this Table would be that the *real interest rate adjusted for wages* is negatively related to leisure in the Spanish economy, with all the bad implications that we have previously noted. On the other hand, the estimation of the BDREMS data now shows a positive value of the parameter, but not statistically significant, and then, in this case, we have a clear discrepancy in the results of the estimation of the model with data from both statistical sources. In any case, the value of this estimate, 0.47, is far below of that assumed by standard macroeconomic cycle models.

[35] Note that the BDREMS data are estimated by MGM on the model in differences.

[36] Given the coherence between the two databases, and the fact that aggregation of BDREMS data to annual length did not change the results, and the equivalence in the estimator, these differences in results can only be explained by the different nature of data, or the different time period available for the samples (the BDMORES provides data from 1967). In connection with this, it should be noted that the estimation of BDMORES data allows individualize the interest rate, which is impossible with the BDREMS data, for obvious reasons. In any case, the explanation of this disparity in results must be addressed elsewhere.

As we have seen, this result is consistent with that obtained by Mankiw, Rotemberg and Summers (1985) for the US economy, and that leads them to conclude, in particularly negative terms, moreover, against the intertemporal choice model, given that it would imply a convex utility function. In this case, as well these authors say, or maximization of utility produce a corner solution, or either do not exist. Thus, Mankiw, Rotemberg and Summers (1985) use this result to doubt of the realism of income-leisure choice models in which agents optimize with absolute flexibility in all variables, without any additional restriction besides the intertemporal[37].

Given the problems associated to a estimated negative sign of the elasticity of intertemporal substitution of leisure, we proceeded to perform a very simple exercise to analyze deeply these results. Since the *real interest rate adjusted for wages* involved enters in logarithms in the model, we can decompose it into the sum of the logarithm of the ratio of real wages and the logarithm of the *real interest rate adjusted for prices* and we can then verify by this decomposition whether the negative sign obtained for the parameter of the whole logarithm is produced in response to one, to the other, or to both of the two mentioned logarithms[38,39]. This is undertaken in Table 4. Estimated parameters resulting from this exercise does not have an accurate theoretical interpretation, as happens with those in Table 3, but may help clarify our previous results. Although not particularly good, the results are more favorable for the model that those in Table 3, while the decomposition of the logarithm of the *real interest rate adjusted for wages* does not produces a positive sign for the logarithm of real wages, either for within-groups estimates or for MGM1 estimates, it does in all MGM2 estimates; at the same time, the parameter estimate for the logarithm of the ratio of real wage is not, in any case, statistically significant. Interestingly, even now BDMORES data give better results than the BDREMS data, unlike what happened in Table 3: the estimated

[37] By using nonlinear estimators, these authors can verify the responsibility of assumptions of separability in the result they obtain, concluding against such responsibility. Contrary, Hotz, Kydland and Sedlacek (1988), with a sample from the PSID, found evidence of separabilities between consumption and leisure in the utility function, although their conclusions are derived from the estimation of the Euler equation of consumption, not leisure, so they could not estimate its elasticity of intertemporal substitution.

[38] This type of exercise is similar to that performed by Alogoskoufis (1987), already cited, with aggregate data for the US economy, which also tests the constraint of equality of two estimated alluded log parameters, which he calls Hall's constraint.

[39] A similar decomposition between the logarithm of the ratio of nominal wages and the logarithm of the nominal interest rate, with similar results although more diffuse to that commented in the text, was also carried out, although it was more problematic because the lacking of individual variability of the nominal interest rate, in an analysis like this with panel data.

parameter of the real wage ratio has now a negative sign and is not statistically significant, being positive that of the logarithm of the *real interest rate adjusted for prices*.

So, it appears that the decomposition of the *real interest rate adjusted for wages* is moderately relevant, as it generates a positive sign of the ratio of real wage per hour in the case of MGM2 estimates, but not in the case of other estimators. However, as already mentioned, the two logarithms resulting from the breakdown appear as no statistically significant, which, on the other hand, was to be expected, given the nature of the exercise.

Given the importance given to the characteristics of expenditure checked in the analysis of intertemporal adjustment of consumption, in Table 5 we presents the results of the same exercise as in Table 1 for expenditure on food, beverages and tobacco, C^a in Tables, in searching of the better alleged fit of a non-durable expenditure to the theoretical model. First, we find a strong positive relationship between this spending with leisure, as with the total expenditure in Table 1, although it continues showing as not statistically significant; second, real wage appears unequivocally positively related with expenditure of food, which was also the case with the total expenditure, given support to the hypothesis of complementarity also for this type of expense. Few differences, then, in the results of econometric fit of the intertemporal Euler condition between consumption and leisure in changing the expenditure considered.

Finally, Table 6 shows the results of testing the intertemporal Euler equation made in Table 2 for total expenditure, but now for spending on food, beverages and tobacco. The parameter estimates of *real interest rates adjusted for prices* are similar to those obtained in Table 2, although the average intertemporal elasticity of substitution estimated in MGM results is lower than in this Table, in the environment of 0.25. This result is intuitive, so it seems reasonable that this is one of the items of expenditure in what less intertemporal changes occur, at least in relative terms in response to changes in the interest rate, the more is subject to the influence of habits. Otherwise, the econometric fit is some worse than in Table 2, mainly in terms of Sargan and orthogonality of residuals tests, although reinforce, to some extent, the conclusions we obtained of the analysis of those results.

In the remainder, summarized in Tables 7 to 10, we replicate the same exercises with the same data but done with the estimated annual salary, W^y, and not with the hourly wage, as until now. Thus, Table 7 replicates Table 1, but using the estimate of annual wage. In general, it can be seen that the fit is very similar in both tables, which supports the use of either wages for testing the model. As in that case, both variables, logarithms of leisure and real wages, are shown with positive influence on consumption evolution, although in this case both variables reach, on average, higher ratios of statistical significance. Notably, in this case, shorter series of hours of leisure present far worse Wald test results. With regard to results with BDREMS data, they are also similar, with a worse differential fit than those with BDMORES data, also reversing the relationship of statistical significance/non-significance of the two variables considered, logarithms of leisure and of real annual wage.

Table 8 performs the same exercise as Table 3, but with W^y instead of W, and relevant differences occur here. While in Table 3 the *real interest rate adjusted for wages* showed a clear negative sign when estimated with BDMORES data, and appeared indistinctly statistically significant and no significant, now both signs are observed, although the negative only appears in three cases, and in only one of the MGM2 estimates[40]. Moreover, although the MGM1 results are not statistically significant, all MGM2 results are. Thus, if we take only these latter estimates, their average value is 1.6. This value is notably higher than that obtained for the corresponding parameter for consumption, and consistent with the usual postulates of cycle models[41].

Moreover, Table 9 replicates Table 4 using now the real hourly wage, and again there are differences with respect to the case where the annual salary is used: as can be seen, in general, the results of the econometric fit are slightly worse with respect to those presented in Table 8, especially in terms of Sargan and Wald tests. The results are revealing: first, none of the estimates obtained with BDMORES data gets now a negative sign for the logarithm of the ratio of real wage, although this variable is displayed, usually as no statistically significant; second, the log of *real interest rate adjusted for prices* showing either positive and negative sign, but this is the case in three of the four MGM2 estimates,

[40] Additionally, it should be noted that this negative sign appears in the estimation of the hours of leisure of the occupied, which, of all series of hours of leisure considered, it is the most questionable from a conceptual point of view, given the group that it considers.

[41] If not considered in calculating the average the negative value obtained with ocuv1, based on the considerations made in the previous footnote, that average would be higher than 2.

appearing also not statistically significant. So it appears that the decomposition of the logarithm of the *real interest rate adjusted for wages* is relevant in the case where the annual wage is used in the estimation, to the extent that it generates a positive sign of the logarithm of the ratio of real wages in all cases. However, as already mentioned, both variables are shown as not statistically significant, as expected, given the nature of the exercise. Finally, we note that these results are similar to those obtained by Alogoskoufis (1987), although in his case their exogenous variable is the hourly wage and not the annual wage, which he interpreted as favorable evidence to a static elasticity of substitution between consumption and leisure, bigger than the intertemporal elasticity of substitution. In regard to the exercise with BDREMS data, decomposition does not prevent a negative sign for the logarithm of the ratio of real wages, in what is an additional element of disparity of the results obtained with both databases.

Although that change in the results as mentioned above, depending on which is used in estimating a wage or another, cannot be taken as favorable to the hypothesis of a high intertemporal substitution of leisure in the Spanish economy, it may be reflecting other type of behavior of Spanish workers: from these results, it is plausible to hypothesize that Spanish workers, intentionally or unintentionally, react to changes in the hourly wage with opposite changes in the number of hours worked, what as result produces a negative relationship of leisure with the wage per hour, which is also compatible with a positive relationship of annual wage with leisure. Thus, these results suggest, as hypothesis, a myopic behavior of Spanish workers[42], in the sense that, in response to changes in the wage hour, their goal would be to keep their current income, for which they necessary alter the number of hours worked in each period, without it having to be incompatible with the increase of leisure observed when the annual wage increases[43,44]. On the other hand, since the annual salary is the product of the average number of hours worked for the hourly wage, its positive relationship with leisure would be picking both myopic behavior of certain

[42] By analogy with myopic behaviour in consumption’s literature, referring individuals that consume systematically their current income.

[43] This type of behaviour could explain, then, some of the phenomena observed along the crisis in the Spanish economy, when falling wages have been accompanied by increases in hours worked of individuals who kept their jobs.

[44] It should be noted that this hypothesis, although contrary to the paradigm of intertemporal substitution of leisure, not necessarily implies rigidities in labor market, for both firms and individuals are changing both the number of hours worked and the hourly wage. In our view, it is simply a different kind of flexibility to that considered in the said paradigm.

individuals, in the above sense, as other individuals behave according to the classical paradigm of intertemporal substitution. This last group should be, in principle, a minority within the overall labor supply, and their empirical identification would require, in this case, yes, pure microeconomic data. In our opinion, this is what suggest these results, unless the estimated negative sign of the real wage per hour was reflecting a reaction of leisure to changes in the nominal interest rate, which does not seem acceptable, if only for the size of changes in the nominal interest rate that would be required for it.

At last, Table 10 shows the same exercise that Table 5 for spending on food, beverages and tobacco, but using the real annual wage. It should be noted that the results in the Table qualify some conclusions that we obtained by examining Table 5, obtained with the real hourly wage. First, we confirm the positive relationship of this expenditure with leisure, while still revealing mostly not statistically significant, showing the estimates accuracy problems in some cases; and, secondly, real wages does not show an unequivocally positive relation to expenditure on food, beverages and tobacco, as in Table 5. In addition, all MGM2 estimates show a negative sign of this variable. Whatever be the interpretation of these results, it seems obvious that these differences in model fit with either wage advise further investigation on its causes.

Comparison of the results with both wages, annual and per hour, allows us to consolidate some partial conclusions: first, it seems unquestionable that there is a relationship of complementarity between consumption and leisure, observed both with total spending and with spending in food, beverages and tobacco, albeit the latter only when the model is tested with the hourly wage; second, in relation to the above, it seems unquestionable a good adjustment of the intratemporal equation between consumption and leisure in the Spanish economy, although for spending on food, beverages and tobacco only occurs with the hourly wage; third and last, the disparity of results with one or other estimators, and with one or other database, make it impossible to obtain a solid worth value of the intertemporal elasticity of substitution of leisure for the Spanish economy, which contrasts with the results we have obtained for the elasticity of intertemporal substitution of consumption with the same data. Thus, at least in this area, we see that there are clear differences in the behavior of both types of expenditure in terms of its relationship with the variables of the labor supply, which, moreover, does not seem counterintuitive, especially when taking into account their different historical behavior. These results suggest that, although non-durable expenditure is often considered the most appropriate spending to test the model of intertemporal choice, assuming that it avoids the problems associated with the presence of phenomena of not intertemporal separabilities in the utility function, the expenditure on food has particular features that call into question their suitability for this purpose, at least in samples of large temporal length, especially given the presumed incidence of habits in it. Finally, the fact that replacing the hourly wage by annual wage place such notable changes in the estimates for the two items of expenditure considered advises explore this question in future research.

5. Conclusions.

This work has exploited the information of BDMORES, CRE and BDREMS databases in an attempt to estimate the value of the intertemporal elasticity of substitution in consumption and leisure in Spain. Given the controversy from the evidence on this issue to other economies, particularly for the United States and Britain, from the contrast of life-cycle models of representative agent, with both microeconomic and macroeconomic data, our principal database used, the BDMORES, consisting of regional aggregate data that can be alternatively be treated econometrically as a panel or as a set of time series, presents some characteristics that make it particularly suitable to address this issue, although the processing of these data as time series is left for further work, as we have already noted. At the same time, and moreover, always it has been possible, we have compared the results with those obtained from the fit of the model with another pure aggregated database for the Spanish economy, the BDREMS.

However, we must make some important considerations that must be taken into account in assessing our results. First, we cannot ignore the fact that individual levels of leisure and /or labor supply are conditioned by an initial decision of participation in the labor market, which requires individual data for proper econometric treatment. This problem can be mitigated to some extent by the mechanisms of aggregation used in obtaining our data, as Alogoskoufis (1987) notes. In that sense, the very poor results obtained for other economies with individual data on works with an empirical similar goal support that aggregate data may have something to say on this issue.

Furthermore, an additional problem, and especially relevant in the case of the Spanish economy, is the high level of unemployment, since the compliance of first order conditions of the optimization program requires no corner solutions. In this area, and although they have been used longer estimated series in an effort to check the results, it should be noted that our raw data of hours of leisure extend from 1996 to 2011, which corresponds to the estimation period of our short series, one of the most dynamic period in the history of Spanish labor market, except for the last three years, and that we consider one of the less problematic in this regard that could have been considered in an empirical study of these characteristics .

As regards concrete results, these would be:

a) first, the intratemporal Euler equation for consumption and leisure presents a good general econometric adjustment, revealing a complementarity relationship between the two in the Spanish economy, both for the total expenditure as for spending on food, beverages and tobacco, although the latter not in a so sharp form. The good fit of this equation for our economy is striking, when compared with the poor results obtained by Mankiw, Rotemberg and Summers (1985) for the US economy, the more taking into account the differences between the two labor markets involved.

b) secondly, the intertemporal condition for consumption also shows a good fit for total consumer spending, with estimated values of the intertemporal elasticity of substitution of consumption very reasonable, at around 0.70, which could reach 0.90 environment depending on the exercise. It notes that the results with BDREMS data confirm the greater difficulties of estimating this parameter with time series data, a well known empirical fact in other economies. This result is revealing in that the reasonable values of our estimates are not obtained with pure microeconomic data, but with a panel of aggregate regional data.

c) on the contrary, the econometric adjustment of intertemporal condition of leisure shows very similar problems to that evidenced to other economies. The intertemporal elasticity of substitution of leisure estimated displays high instability, and an opposite sign to the postulates of the theoretical model, both with the real annual wage and, especially, with the real hourly wage. So, unfortunately, unlike the case of consumption, the disparity of results in the different exercises does not allow a reasonable guess of the average elasticity of intertemporal substitution of leisure in the Spanish economy. Moreover, the decomposition of the logarithm of the *real interest rate adjusted for wages* on the logarithms of the ratio of real wages and of the *real interest rate adjusted for prices*, it does not allow for firm conclusions, given that disparity.

d) related to differences in the results when the model is estimated with both wages, we consider that those obtained with the wage per hour guarantee that the Spanish workers, voluntarily or involuntarily, substitute hours of leisure for hours of work intratemporally to maintain their current income, in response to changes in the hourly wage; at the same time, the results obtained with the annual wage generates the theoretical expected positive sign. In this sense, note that the annual wage can increase when wage per hour reduces, if movement in hours worked more than compensates its reduction. Additionally, in the economy could coexist workers substituting hours of work for hours of leisure within each period, in response to changes in wage per hour, and workers behaving according to model, substituting leisure intertemporally. However, the verification of the importance of the strength of this effect on total Spanish labor supply and accurate identification of the groups involved in it, requires pure microeconomic data.

e) finally, the consideration of expenditure on food, beverages and tobacco instead of total consumer spending allows to retrieve lower values of intertemporal elasticity of substitution of consumption, by over 50% lower than in the case of total expenditure, with an average value around 0.25, although there are clear differences in the adjustment of intertemporal Euler equation of consumption and leisure in this case.

In later phases of this research, given the aggregate nature of our data, it is intended to use non-linear estimators to get results for each region, similarly to Cutanda (2013), where they are applied to the consumption Euler equation alone, obtaining higher values of intertemporal elasticity of substitution of consumption than those obtained here, and that would be directly comparable to those obtained for the US economy by Mankiw, Rotemberg and Summers (1985) and Alogoskoufis (1987). These estimators are particularly suitable in this case, since that they would allow directly retrieve the parameters of the utility function postulated, while enabling to estimate jointly as a system of equations the three first order conditions of our model, estimated here separately.

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Table 1

$$\ln(C_{it}) = k_{ios} + k_{i1s}\ln(L_{it}) + k_{i2s}\ln\left(\frac{W_{it}}{P_{it}}\right)$$

	WG				MGM1				MGM2				BDR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
k_{ios}					0.128	-0.019	0.063	0.098	0.018	0.016	-0.016	0.021	-0.038
					(0.072)	(0.172)	(0.056)	(0.018)	(0.004)	(0.004)	(0.030)	(0.016)	(0.125)
$\ln(L_{it})$	0.573	0.575	0.332	0.341	1.095	0.916	0.106	0.158	0.236	0.237	0.038	0.214	0.196
	(0.029)	(0.032)	(0.015)	(0.023)	(0.534)	(1.068)	(0.454)	(0.187)	(0.178)	(0.134)	(0.444)	(0.243)	(0.231)
$\ln\left(\frac{W_{it}}{P_{it}}\right)$	0.098	0.257	0.339	0.267	0.462	0.966	0.474	0.405	0.366	0.263	0.361	0.176	0.935
	(0.042)	(0.038)	(0.012)	(0.022)	(0.230)	(0.542)	(0.274)	(0.139)	(0.352)	(0.266)	(0.323)	(0.329)	(0.555)
$\overline{R}^2$	0.968	0.964	0.969	0.958									
Sargan					0.087	0.105	0.694	0.201	0.716	0.747	0.663	1.538	1.287
					0.993	0.948	0.874	0.977	0.869	0.861	0.881	0.819	0.732
Ortog.					0.150	0.093	0.586	0.103	0.443	0.488	1.328	1.231	3.034
					0.999	0.999	0.996	0.999	0.998	0.997	0.987	0.990	0.804
Wald	908.255	791.726	4617.889	3378.506	5.361	3.205	30.772	110.083	14.722	7.968	28.971	67.913	3.483
	0.000	0.000	0.000	0.000	0.068	0.201	0.000	0.000	0.000	0.018	0.000	0.000	0.175

Notes to Table 1: Cols. (1) to (12) show the results obtained with the BDMORES, while col. (13) presents the results obtained with the BDREMS. Cols. (1) to (4) present the within-groups estimation for the four measures of leisure considered: respectively, asav1, ocuv1, asav2 and asav3. Cols. (5) to (8) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables; and cols. (9) to (12) present the results of the GMM estimation where we have discounted fixed effects by differentiating the variables. The instruments are lags 2nd to 4th of $\Delta^2\ln(C_{it})$ and $\Delta^2\ln(L_t)$ for cols. (5) and (8); these same less 4th lag of $\Delta^2\ln(L_t)$ for col. (6); lags 2nd and 3rd of $\Delta^2\ln(C_{it})$ and 2nd to 5th of $\Delta^2\ln(L_t)$ for col. (7); lags 2nd to 4th of $\Delta^2\ln(C_{it})$ and 2nd, 4th and 6th of $\Delta^2\ln(L_t)$ for cols. (9), (10) y (11) and 2nd and 4th to 6th of $\Delta^2\ln(C_{it})$ and 2nd, 3rd and 6th of $\Delta^2\ln(L_t)$ for col. (12). The instruments for the BDREMS are the same that for cols (5) and (8).

Table 2

$$\Delta \ln(C_{it+1}) = k_{ioc} + k_{i1c} \ln\left(\frac{P_{it}R_t}{P_{it+1}}\right) + \varepsilon_{ict+1}$$

	WG			MGM1			MGM2			BDR		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
k_{ioc}				0.079	0.033	0.156	0.089	0.082	-0.062	-0.001	0.004	0.001
				(0.069)	(0.061)	(0.265)	(0.070)	(0.057)	(0.042)	(0.003)	(0.005)	(0.003)
$\ln\left(\frac{P_{it}R_t}{P_{it+1}}\right)$	0.115	0.067	0.076	0.515	0.337	0.512	0.970	0.659	1.162	0.192	0.780	0.011
	(0.026)	(0.025)	(0.025)	(0.212)	(0.207)	(0.658)	(0.446)	(0.343)	(0.328)	(1.541)	(2.682)	(0.026)
$\overline{R}^2$	0.008	-0.006	-0.004									
Sargan				0.980	1.168	0.413	1.189	0.987	1.927	0.329	0.616	0.021
				0.805	0.760	0.813	0.755	0.911	0.749	0.847	0.734	0.884
Ortog.				0.909	0.823	0.109	1.300	1.578	1.198	0.308	0.612	0.026
				0.969	0.935	0.998	0.934	0.954	0.976	0.958	0.961	0.998
Wald	18.324	7.261	8.639	5.876	2.633	0.604	4.723	3.686	12.521	0.015	0.084	0.205
	0.000	0.007	0.003	0.015	0.102	0.436	0.029	0.054	0.000	0.900	0.771	0.650

Notes to Table 2: Cols. (1) to (9) present the results obtained with the BDMORES, while al (10) to (12) show the results obtained with the BDREMS. Cols. (1) to (3) present the results of within-groups estimation, for the three considered interest rates: respectively, R_1, R_2 and R_3. Cols. (4) to (6) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables for the same interest rates in this same order; and cols. (7) to (9) present the results of the GMM estimation where we have discounted fixed effects by differentiating the variables, for the same interest rates in this same order. The instruments for BDMORES data are lags 3rd to 7th of $\Delta\ln(P_{it}R_t/P_{it+1})$ for cols. (4), (7) and (8), lags 3rd to 6th of the same variable for cols. (5) and (6), while for BDREMS data are lags 3rd to 5th of the same variable for col. (10), 2nd, 3rd, 5th and 7th of the same variable for col. (11) and 2nd and 7th, plus a constant for col (12). In the case of equation (9), the instruments are lags 3rd,4th,6th and 7th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and $\Delta^2\ln(C_{it-3})$ and $\Delta^2\ln(C_{it-4})$.

Table 3

$$\Delta \ln(L_{it+1}) = k_{iol} + k_{i1l} \ln\left(\frac{W_{it}R_t}{W_{it+1}}\right) + \varepsilon_{ilt+1}$$

	WG				MGM1				MGM2				BDR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
k_{iol}					0.029	0.024	-0.203	-0.106	-0.107	-0.013	0.001	0.029	-0.423
					(0.011)	(0.011)	(0.350)	(0.198)	(0.107)	(0.010)	(0.024)	(0.045)	(0.741)
$\ln\left(\frac{W_{it}R_t}{W_{it+1}}\right)$	-1.370	-1.159	-0.448	-1.038	-1.493	-0.338	-0.900	-1.313	-0.091	-0.647	-0.625	-0.903	0.474
	(0.093)	(0.088)	(0.036)	(0.036)	(0.485)	(0.306)	(0.759)	(0.433)	(0.810)	(0.244)	(0.465)	(0.487)	(3.190)
$\overline{R}^2$	0.440	0.386	0.211	0.595									
Sargan					0.039	0.164	0.075	0.000	0.008	0.073	0.016	0.022	1.350
					0.841	0.921	0.963	0.979	0.926	0.786	0.896	0.881	0.929
Ortog.					0.015	0.047	0.049	0.000	0.005	0.774	0.017	0.026	0.451
					0.999	0.999	0.999	0.999	0.999	0.855	0.999	0.998	0.999
Wald	213.069	172.246	149.999	789.432	9.452	1.216	1.405	9.165	0.012	7.023	1.806	3.428	0.022
	0.000	0.000	0.000	0.000	0.002	0.269	0.235	0.002	0.910	0.008	0.178	0.064	0.881

Notes to Table 3: Cols. (1) to (12) show the results obtained with the BDMORES, while col. (13) presents the results obtained with the BDREMS. Cols. (1) to (4) present the results of within-groups estimation, for the four measures of leisure considered: respectively, asav1, ocuv1, asav2 and asav3. Cols. (5) to (8) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables; and cols. (9) to (12) present the results of the GMM estimation where we have discounted fixed effects differentiating the variables. The instruments are lags 3rd, 4th and 7th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ for cols. (5) and (9); 2nd to 5th of the same variable for col. (6); 2nd, 3rd, 4th and 7th of the same variable for col. (7); 2nd, 3rd y 7th of the same variable for col. (8); 4th, 6th and 7th of $\Delta\ln(P_{it}R_t/P_{it+1})$ for col. (10) and 2nd, 3rd and 5th of the same variable for col. (11); finally, lags 2nd, 3rd and 5th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ for col.(12).

Table 4

$$\Delta \ln(L_{it+1}) = k_{iol} + k_{i1l} \ln\left(\frac{W_{it} / P_{it}}{W_{it+1} / P_{it+1}}\right) + k_{i2l} \ln\left(\frac{P_{it} R_t}{P_{t+1}}\right) + \varepsilon_{ilt+1}$$

	WG				MGM1				MGM2				BDR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
k_{iol}					0.083	0.088	0.000	-0.089	-0.017	-0.180	0.003	0.273	0.086
					(0.033)	(0.082)	(0.020)	(0.125)	(0.015)	(0.262)	(0.009)	(1.276)	(0.208)
$\ln\left(\frac{W_{it} / P_{it}}{W_{it+1} / P_{it+1}}\right)$	-0.943	-0.674	-0.329	-0.858	-1.550	-1.157	-0.432	-1.466	0.768	4.093	0.546	0.034	-0.137
	(0.083)	(0.081)	(0.034)	(0.034)	(0.315)	(0.602)	(0.144)	(0.363)	(0.786)	(4.765)	(1.282)	(6.005)	(0.860)
$\ln\left(\frac{P_{it} R_t}{P_{it+1}}\right)$	1.317	1.155	0.034	-0.053	1.647	1.921	0.452	1.223	1.376	-0.228	2.665	3.266	0.716
	(0.155)	(0.152)	(0.030)	(0.030)	(0.498)	(1.413)	(0.244)	(1.192)	(1.114)	(3.221)	(2.590)	(9.418)	(1.070)
$\overline{R}^2$	0.394	0.279	0.136	0.568									
Sargan					0.986	0.224	0.231	0.007	0.025	0.124	0.008	0.037	0.634
					0.911	0.893	0.890	0.932	0.872	0.939	0.927	0.846	0.888
Ortog.					0.644	0.178	0.258	0.003	0.055	0.105	0.009	0.021	0.355
					0.998	0.999	0.998	0.999	0.999	0.999	0.999	0.999	0.999
Wald	89.809	56.275	46.916	354.628	27.477	3.696	14.366	21.504	2.287	0.985	1.791	1.458	0.631
	0.000	0.000	0.000	0.000	0.000	0.157	0.003	0.000	0.318	0.610	0.408	0.482	0.729

Notes to Table 4: Cols. (1) to (12) show the results obtained with the BDMORES, while col. (13) presents the results obtained with the BDREMS. Cols. (1) to (4) present the results of within-groups estimation, for the four measures of leisure considered: respectively, asav1, ocuv1, asav2 and asav3. Cols. (5) to (8) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables; and cols. (9) to (12) show the results of the GMM estimation where we have discounted fixed effects differentiating the variables. The instruments are lags 3rd to 5th and 7th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 2nd to 3rd and 7th of $\Delta^2\ln[(W_{it}/P_{it})/(W_{it+1}/P_{it+1})]$ for col. (5); lags 3rd and 7th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 2nd and 3rd and 7th of $\Delta^2\ln[(W_{it}/P_{it})/(W_{it+1}/P_{it+1})]$ for col. (6); lags 2nd to 6th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ for col. (7) and the same less 2nd of the same variable for col. (8); lag 2nd of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 2nd al 4th of $\Delta^2\ln[(W_{it}/P_{it})/(W_{it+1}/P_{it+1})]$ for col. (9); 4th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 2nd to 4th and 6th of $\Delta^2\ln[(W_{it}/P_{it})/(W_{it+1}/P_{it+1})]$ for col. (10); 2nd, 4th and 6th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 5th of $\Delta\ln(L_t)$ for col. (11); and lags 2nd to 4th and 6th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ for col. (12).

Table 5

$$\ln(C^a_{it}) = k_{ios} + k_{i1s}\ln(L_{it}) + k_{i2s}\ln\left(\frac{W_{it}}{P^a_{it}}\right)$$

	WG				MGM1				MGM2			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
k_{ios}					0.078	0.079	-0.054	-0.140	0.025	0.035	0.065	0.101
					(0.015)	(0.013)	(0.030)	(0.112)	(0.013)	(0.007)	(0.107)	(0.155)
$\ln(L_{it})$	0.421	0.501	0.312	0.262	0.315	0.304	0.441	0.121	0.070	0.689	0.147	-0.056
	(0.025)	(0.029)	(0.010)	(0.009)	(0.278)	(0.269)	(0.099)	(0.174)	(0.355)	(0.177)	(0.380)	(0.549)
$\ln\left(\frac{W_{it}}{P^a_{it}}\right)$	0.464	0.423	0.184	0.054	0.604	0.467	0.153	0.274	1.503	2.372	0.341	0.137
	(0.052)	(0.050)	(0.025)	(0.027)	(0.238)	(0.207)	(0.163)	(0.594)	(0.992)	(0.481)	(0.742)	(1.049)
$\bar{R}^2$	0.891	0.893	0.858	0.837								
Sargan					0.438	0.128	2.371	0.180	0.001	0.148	0.745	0.384
					0.932	0.988	0.882	0.980	0.973	0.928	0.862	0.824
Ortog.					0.369	0.072	3.129	0.085	0.001	0.101	0.430	0.181
					0.999	0.999	0.958	0.999	0.999	0.999	0.998	0.999
Wald	135.043	140.619	468.451	375.641	6.820	5.173	20.202	1.815	2.981	35.082	0.694	0.018
	0.000	0.000	0.000	0.000	0.033	0.075	0.000	0.403	0.225	0.000	0.706	0.990

Notes to Table 5. Table 5 is in all similar to Table 1, except for the fact that the variable considered for consumer expenditure is spending on food, beverages and tobacco, instead of total expenditure. The instruments are lags 2nd to 4th of $\Delta^2\ln(C^a_{it})$ and of $\Delta^2\ln(L_t)$ for cols. (5) and (6)); from 2nd to 5th lag of $\Delta^2\ln(C^a_{it})$ and from 2nd to 6th lag of $\Delta^2\ln(L_t)$ for col. (7); from 3rd to 5th lag of $\Delta^2\ln(C^a_{it})$ and from 2nd to 4th of $\Delta^2\ln(L_t)$ for col. (8); 3rd and 4th of $\Delta^2\ln(C^a_{it})$ and 2nd and 4th of $\Delta^2\ln(L_t)$ for col. (9); 3rd, 4th and 6th of $\Delta^2\ln(C^a_{it})$ and 2nd and 3rd of $\Delta^2\ln(L_t)$ for col. (10); 3rd to 5th of $\Delta^2\ln(C^a_{it})$ and of $\Delta^2\ln(L_t)$ for col. (11); and 3rd to 5th of $\Delta^2\ln(C^a_{it})$ and 3rd to 4th of $\Delta^2\ln(L_t)$ for col. (12).

Table 6

$$\Delta\ln(C^{a}_{it+1}) = k_{ioc} + k_{i1c}\ln\left(\frac{P^{a}_{it}R_t}{P^{a}_{it+1}}\right) + \varepsilon_{ict+1}$$

	WG			MGM1			MGM2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
k_{ioc}				0.011	-0.000	0.019	0.006	0.000	-0.008
				(0.006)	(0.001)	(0.018)	(0.032)	(0.001)	(0.022)
$\ln\left(\frac{P^{a}_{it}R_t}{P^{a}_{it+1}}\right)$	0.739	0.648	0.561	0.466	0.186	0.138	0.259	0.162	0.208
	(0.029)	(0.028)	(0.028)	(0.198)	(0.272)	(0.220)	(0.428)	(0.328)	(0.355)
$\overline{R}^2$	0.555	0.491	0.430						
Sargan				1.142	0.540	0.646	0.419	0.690	0.173
				0.887	0.909	0.723	0.810	0.875	0.917
Ortog.				0.906	0.437	0.364	1.058	0.926	0.603
				0.988	0.979	0.985	0.900	0.920	0.962
Wald	643.677	501.321	394.360	5.524	0.470	0.392	0.366	0.243	0.343
	0.000	0.000	0.000	0.018	0.492	0.530	0.544	0.621	0.557

Notes to Table 6. Table 6 is in all similar to Table 2, except for the fact that the variable considered for consumer expenditure is spending on food, beverages and tobacco, instead of total expenditure. Instruments for equations (4) to (9) are the 3rd to 7th lags of $\Delta\ln(P_{it}R_t/P_{it+1})$ and a constant.

Table 7

$$\ln(C_{it}) = k_{ios} + k_{i1s}\ln(L_{it}) + k_{i2s}\ln\left(\frac{W_{it}^{y}}{P_{it}}\right)$$

	WG				MGM1				MGM2				BDR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
k_{ios}					0.128	-0.013	0.073	0.059	0.034	0.020	0.006	-0.011	0.006
					(0.082)	(0.281)	(0.028)	(0.017)	(0.055)	(0.038)	(0.002)	(0.014)	(0.013)
$\ln(L_{it})$	0.625	0.746	0.526	0.494	1.263	1.155	0.584	0.483	0.461	1.671	0.323	0.306	0.696
	(0.013)	(0.018)	(0.009)	(0.009)	(0.671)	(1.202)	(0.134)	(0.076)	(0.816)	(1.336)	(0.103)	(0.087)	(0.138)
$\ln\left(\frac{W_{it}^{y}}{P_{it}}\right)$	0.376	0.492	0.627	0.426	0.658	1.397	0.360	0.416	1.523	2.659	0.462	0.583	$1.1\ 10^{-6}$
	(0.051)	(0.056)	(0.022)	(0.028)	(0.361)	(1.287)	(0.153)	(0.118)	(2.466)	(4.107)	(0.249)	(0.439)	$(8.0\ 10^{-6})$
$\bar{R}^2$	0.973	0.967	0.970	0.963									
Sargan					0.080	0.681	0.576	0.421	0.211	0.128	0.007	0.029	2.855
					0.994	0.877	0.901	0.937	0.899	0.937	0.929	0.985	0.722
Ortog.					0.065	0.549	0.197	0.355	0.112	0.133	0.019	0.033	2.168
					0.999	0.997	0.999	0.999	0.999	0.999	0.997	0.999	0.975
Wald	1114.778	897.643	4837.667	3840.472	4.115	1.185	85.82	150.069	1.112	2.767	23.909	51.702	82.290
	0.000	0.000	0.000	0.000	0.127	0.552	0.000	0.000	0.573	0.250	0.000	0.000	0.000

Notes to Table 7: Cols. (1) to (12) show the results obtained with the BDMORES, while col. (13) presents the results obtained with the BDREMS. Cols. (1) to (4) present the results of within-groups estimation, for the four measures of leisure considered: respectively, asav1, ocuv1, asav2 and asav3. Cols. (5) to (8) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables; and cols. (9) to (12) present the results of the GMM estimation where we have discounted fixed effects by differentiating the variables. The instruments for BDMORES data are $\Delta\ln(C_{t-2})$, $\Delta\ln(C_{t-3})$, $\Delta\ln(C_{t-4})$, $\Delta\ln(L_{t-2})$, $\Delta\ln(L_{t-3})$ y $\Delta\ln(L_{t-4})$ for cols. (5) to (8), and $\Delta\ln(C_{t-3})$, $\Delta\ln(C_{t-4})$, $\Delta\ln(L_{t-3})$, $\Delta\ln(L_{t-4})$ y $\Delta\ln(L_{t-5})$ for cols. (9) and (10); $\Delta\ln(C_{t-4})$, $\Delta\ln(C_{t-6})$, $\Delta\ln(L_{t-2})$ and a constant for col. (11) and $\Delta\ln(C_{t-2})$, $\Delta\ln(C_{t-3})$, $\Delta\ln(C_{t-4})$, $\Delta\ln(L_{t-2})$ and $\Delta\ln(L_{t-4})$ for col. (12), while for BDREMS data are $\Delta^2\ln(C_{t-2})$, $\Delta^2\ln(C_{t-3})$, $\Delta^2\ln(C_{t-4})$, $\Delta^2\ln(L_{t-2})$, $\Delta^2\ln(L_{t-3})$, $\Delta^2\ln(L_{t-4})$, $\Delta^2\ln(RA_{t-2}/P_{t-2})$ y $\Delta^2\ln(RA_{t-3}/P_{t-3})$.

Table 8

$$\Delta \ln(L_{it+1}) = k_{iol} + k_{i1l} \ln\left(\frac{W_{it}^{y} R_t}{W_{it+1}^{y}}\right) + \varepsilon_{ilt+1}$$

	WG				MGM1				MGM2				BDR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
k_{iol}					-0.216	-0.037	-0.077	0.037	-0.017	0.001	-0.075	0.037	-0.389
					(0.144)	(0.032)	(0.113)	(0.175)	(0.005)	(0.002)	(0.073)	(0.043)	(0.590)
$\ln\left(\frac{W_{it}^{y} R_t}{W_{it+1}^{y}}\right)$	0.827	0.385	0.487	0.775	2.475	0.119	-2.904	-0.124	2.672	-1.031	2.558	2.099	-1.467
	(0.152)	(0.142)	(0.073)	(0.103)	(2.254)	(0.790)	(2.376)	(0.981)	(0.679)	(0.420)	(1.063)	(1.125)	(5.404)
$\overline{R}^2$	0.055	-0.027	0.059	0.070									
Sargan					0.714	0.299	0.422	1.090	0.932	0.950	0.477	0.381	0.463
					0.869	0.860	0.980	0.895	0.817	0.917	0.923	0.944	0.993
Ortog.					0.853	0.294	0.711	11.635	0.794	1.316	0.510	0.276	0.312
					0.973	0.990	0.994	0.040	0.977	0.970	0.991	0.998	0.999
Wald	29.609	7.308	43.371	55.950	1.205	0.022	1.493	0.391	15.482	6.025	5.789	3.479	0.073
	0.000	0.007	0.000	0.000	0.272	0.879	0.221	0.942	0.000	0.014	0.016	0.062	0.785

Notes to Table 8: Cols. (1) to (12) show the results obtained with the BDMORES, while col. (13) presents the results obtained with the BDREMS. Cols. (1) to (4) present the results of within-groups estimation for the four measures of leisure considered: respectively, asav1, ocuv1, asav2 and asav3. Cols. (5) to (8) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables; and cols. (9) to (12) present the results of the GMM estimation where we have discounted fixed effects by differentiating the variables. The instruments are lags 2nd, 3rd and 5th of $\Delta^2\ln(L_t)$ and 3rd and 4th of $\Delta^2\ln(W_{it}^yR_t/W_{it+1}^y)$ for col (5); 3rd of $\Delta^2\ln(L_t)$ and 3rd, 4th and 6th of $\Delta^2\ln(C_{it})$ for col. (6); 2nd to 4th of $\Delta^2\ln(L_t)$ and of $\Delta^2\ln(C_{it})$ for col. (7); 2nd to 4th of $\Delta^2\ln(W_{it}^yR_t/W_{it+1}^y)$ and 2nd and 3rd of $\Delta^2\ln(C_{it})$ for col. (8); 2nd to 5th of $\Delta\ln(W_{it}^yR_t/W_{it+1}^y)$ and 2nd and 5th of $\Delta^2\ln(C_{it})$ for col. (9); 2nd to 4th of $\Delta\ln(W_{it}^yR_t/W_{it+1}^y)$ and 3rd to 5th of $\Delta\ln(L_{it})$ for col. (10); 2nd, 4th and 5th of $\Delta^2\ln(L_t)$ and 2nd and 5th of $\Delta^2\ln(W_{it}^yR_t/W_{it+1}^y)$ for col. (11); and 3rd to 4th of $\Delta^2\ln(L_t)$ and 2nd to 4th of $\Delta^2\ln(W_{it}^yR_t/W_{it+1}^y)$ for col. (12). The instruments for the BDREMS are lags 3rd to 5th of $\Delta^2\ln(L_t)$, and 2nd to 5th of $\Delta^2\ln(W_{it}^yR_t/W_{it+1}^y)$.

Table 9

$$\Delta \ln(L_{it+1}) = k_{iol} + k_{i1l} \ln\left(\frac{W_{it}^{y} / P_{it}}{W_{it+1}^{y} / P_{it+1}}\right) + k_{i2l} \ln\left(\frac{P_{it} R_t}{P_{t+1}}\right) + \varepsilon_{ilt+1}$$

	WG				MGM1				MGM2				BDR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
k_{iol}					-0.086	-0.102	-0.016	-0.226	-0.011	-0.006	-0.078	0.204	-0.004
					(0.139)	(0.112)	(0.016)	(0.122)	(0.004)	(0.001)	(0.042)	(0.105)	(0.011)
$\ln\left(\frac{W_{it}^{y} / P_{it}}{W_{it+1}^{y} / P_{it+1}}\right)$	1.060	0.827	0.571	0.284	2.116	2.388	0.058	5.348	2.470	1.217	0.405	1.317	-1.264
	(0.152)	(0.139)	(0.073)	(0.106)	(2.308)	(1.909)	(0.418)	(3.544)	(0.920)	(0.306)	(0.591)	(1.181)	(1.179)
$\ln\left(\frac{P_{it} R_t}{P_{it+1}}\right)$	0.757	0.732	-0.036	-0.263	0.611	0.158	0.125	-1.774	3.185	-0.318	-0.488	-1.414	2.027
	(0.182)	(0.167)	(0.030)	(0.043)	(1.366)	(1.055)	(0.219)	(1.537)	(2.171)	(0.376)	(0.582)	(2.677)	(1.411)
$\overline{R}^2$	0.225	0.191	0.089	0.052									
Sargan					0.050	0.331	0.785	0.269	0.113	1.539	1.642	0.407	0.919
					0.975	0.847	0.675	0.874	0.944	0.819	0.801	0.938	0.820
Ortog.					0.030	0.210	0.758	0.234	0.074	3.001	3.267	0.278	0.904
					0.000	0.998	0.979	0.998	0.999	0.884	0.859	0.999	0.988
Wald	44.566	37.348	31.260	23.068	2.156	2.602	0.527	2.286	7.204	15.863	1.474	1.333	2.467
	0.000	0.000	0.000	0.000	0.340	0.272	0.768	0.318	0.027	0.000	0.478	0.513	0.291

Notes to Table 9: Cols. (1) to (12) show the results obtained with the BDMORES, while col. (13) presents the results obtained with the BDREMS. Cols. (1) to (4) present the results of within-groups estimation for the four measures of leisure considered: respectively, asav1, ocuv1, asav2 and asav3. Cols. (5) to (8) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables; and cols. (9) to (12) present the results of the GMM estimation where we have discounted fixed effects by differentiating the variables. The instruments for equations (5) and (6) are lags 3rd to 5th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 4th and 5th of $\Delta^2\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$; lags 3rd and 5th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 2nd, 3rd and 5th of $\Delta^2\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$ for col. (7); 2nd to 4th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 3rd to 6th of $\Delta^2\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$ for col. (8); lags 3rd of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 3rd, 4th and 6th of $\Delta^2\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$ plus a constant for col. (9); lags 2nd and 3rd of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 2nd to 5th of $\Delta^2\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$ plus a constant for col. (10); lags 2nd to 6th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$, and 4th and 5th of $\Delta^2\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$ for col. (11); and lags 2nd to 5th of $\Delta^2\ln(P_{it}R_t/P_{it+1})$ and 4th and 5th of $\Delta^2\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$ for col. (12). The instruments for BDREMS are lags 3rd to 5th of $\Delta\ln(P_{it}R_t/P_{it+1})$ and of $\Delta\ln[(W_{it}^{y}/P_{it})/(W_{it+1}^{y}/P_{it+1})]$.

Table 10

$$\ln(C_{it}^{a}) = k_{ios} + k_{i1s}\ln(L_{it}) + k_{i2s}\ln\left(\frac{W_{it}^{y}}{P_{it}^{a}}\right)$$

	WG				MGM1				MGM2			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
k_{ios}					0.093	-0.094	0.042	0.047	-0.031	0.018	0.105	0.037
					(0.484)	(1.099)	(0.101)	(0.048)	(0.005)	(0.009)	(0.191)	(0.061)
$\ln(L_{it})$	0.293	0.373	0.222	0.187	3.282	4.308	0.111	0.030	0.500	0.394	0.104	0.095
	(0.023)	(0.027)	(0.013)	(0.013)	(10.660)	(49.466)	(0.176)	(0.118)	(0.236)	(0.241)	(0.600)	(0.175)
$\ln\left(\frac{W_{it}^{y}}{P_{it}^{a}}\right)$	0.300	0.379	0.268	0.248	-1.789	0.368	0.415	0.494	-0.147	-0.835	-0.055	-0.074
	(0.121)	(0.118)	(0.028)	(0.032)	(7.014)	(4.790)	(0.247)	(0.244)	(0.617)	(0.836)	(1.476)	(0.694)
$\bar{R}^2$	0.856	0.865	0.866	0.852								
Sargan					0.000	0.038	0.775	0.103	0.451	0.501	0.012	0.002
					0.976	0.844	0.855	0.991	0.929	0.778	0.994	0.959
Ortog.					0.001	0.029	0.495	0.109	0.289	0.670	0.005	0.000
					0.999	0.999	0.997	0.999	0.999	0.984	0.999	0.999
Wald	82.249	96.035	561.430	483.205	0.95	0.029	10.549	13.414	20.633	8.244	0.102	1.900
	0.000	0.000	0.000	0.000	0.953	0.985	0.005	0.001	0.000	0.016	0.949	0.386

Notes to Table 10: Cols. (1) to (4) present the results of within-groups estimation for the four measures of leisure considered: respectively, asav1, ocuv1, asav2 and asav3. Cols. (5) to (8) present the results of the GMM estimation where we have discounted fixed effects by subtracting the average of the variables; and cols. (9) to (12) present the results of the GMM estimation where we have discounted fixed effects by differentiating the variables. The instruments are lags 2nd, 3rd, 5th and 7th of $\Delta^2\ln(C^a_{it})$ for col. (5); lags 2nd to 5th of $\Delta^2\ln(C^a_{it})$ for col. (6); lags 2nd to 4th of $\Delta^2\ln(C^a_{it})$ and 2nd to 4th of $\Delta^2\ln(L_t)$ for cols. (7) and (8); lags 3rd, 4th and 6th of $\Delta^2\ln(C^a_{it})$ and of $\Delta^2\ln(L_t)$ for col. (9); lags 2nd, 3rd, 5th and 6th of $\Delta^2\ln(C^a_{it})$ and 2nd of $\Delta^2\ln(L_t)$ for col. (10); lags 4th and 5th of $\Delta^2\ln(C^a_{it})$ and 3rd, 4th and 6th of $\Delta^2\ln(L_t)$ for col. (11) and these same less 4th of $\Delta^2\ln(L_t)$ for col. (12).