Intertemporal Behavior and Household Structure*

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Abstract

In this paper the traditional household Euler equations are estimated for singles and separately for couples. Using the Consumer Expenditure Survey, I reject the Euler equations of couples, but I cannot reject the Euler equations of singles. To rationalize this result, I develop an intertemporal model with two features. First, household members are represented using individual preferences. Second, household members cannot commit to future allocations of resources. It is shown that an excess sensitivity test should generally reject the household Euler equations of couples, but not of singles. A test is then derived to evaluate the explanation given in this paper against alternative hypotheses using a proportionality condition which is specific to the intertemporal model introduced here. I cannot reject the explanation provided in this paper.

1 Introduction

Many areas of public economics require a good understanding of household intertemporal decisions. The adequacy of household saving, fertility choices, investment in human capital are only few of the examples in which policy makers and economists need some knowledge of the intertemporal behavior of the household. There are two main categories of households: married couples and singles. Most of the research on intertemporal decisions has been performed under the assumption that these two types of households have identical intertemporal behavior. In particular, it is assumed that each household can be represented using a unique utility function independently of the number of decision-makers. Under this assumption, life-cycle models of household behavior have been developed, tested, and estimated. As documented in Browning and Lusardi (1996), the majority of the tests and estimations have been performed using household Euler equations. Unfortunately, household

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Euler equations are usually rejected since they exhibit excess sensitivity to information known to the household at the time of the decision.

This paper makes three main contributions to the literature on household intertemporal decisions. First, traditional household Euler equations are estimated for singles and separately for couples using the Consumer Expenditure Survey (CEX). Employing standard excess sensitivity tests, I find that household Euler equations are not rejected for singles, but they are for couples. This finding is robust to the addition of labor supply variables to take into account the potential non-separability between consumption and leisure, and to the introduction of selection terms to capture the endogeneity of the marriage decision. This result suggests that the rejections of the household Euler equations obtained in the past should be attributed to the subsample of couples.

As a second contribution, an explanation of this finding is provided by developing a model with the following features. First, household members are characterized by individual preferences and make efficient decisions. Second, household members cannot commit to future allocations of resources. It is shown that an excess sensitivity test should reject the household Euler equations of couples, but not of singles. To provide the intuition underlying this result note that, even if family members are represented by means of individual preferences, household Euler equations can be derived using the representative agent corresponding to the household. The main difference between the standard and the representative agent Euler equation is that the latter depends on the decision power of individual members and on all the variables having an effect on it. Consequently, any excess sensitivity test based on one of these variables will reject the household Euler equations of couples.

As a third contribution, a test is derived to evaluate the explanation provided in this paper against alternative hypotheses. The test is based on the following idea. Let the set of distribution factors be the set of variables affecting the individual decision power. If the rationalization provided in this paper is correct, the distribution factors should enter the Euler equations of couples only through the decision power of the two spouses. The main implication of this feature is that a subset of the Euler equation coefficients capturing the effect of the distribution factors should satisfy a proportionality condition. Using this test, I cannot reject the explanation provided in this paper.

The estimation of Euler equations is standard in the consumption literature, which is surveyed in the comprehensive paper by Browning and Lusardi (1996). To the best of my knowledge, however, this paper is the first attempt to estimate the traditional household Euler equations separately for singles and couples. The literature on intertemporal decisions has advanced alternative explanations for the violation of the household Euler equations. The two main rationalizations are the existence of liquidity constraints and the non-separability between consumption and leisure. Zeldes (1989) argues that if liquidity constraints are binding, Euler equations should be replaced by inequalities and should exhibit excess sensitivity to income. Attanasio and Weber (1995) and Meghir and Weber (1996) find that if labor supply variables are added to the traditional Euler equations, these intertemporal optimality conditions are not violated. The present paper suggests an alternative and more basic explanation for the rejections of the traditional household Euler equations, which is supported by the empirical evidence provided here. The results also clarify that labor supply and income variables affect household decisions in three different ways: (i) through preferences if leisure is non-separable from other consumption goods, (ii) through the budget constraints and (iii) through the individual decision power. This paper develops a model that allows to disentangle these three effects and finds that the impact of income variables through the individual decision power is significant.

This paper is also related to the literature on the collective representation of household behavior. Manser and Brown (1980) and McElroy and Horney (1981) are the first papers to characterize the household as a group of agents making joint decisions. In those papers the household decision process is modeled as a Nash bargaining problem. Chiappori (1988; 1992) extends their analysis to allow for any type of efficient decision process. The theoretical model developed here generalizes Chiappori's static collective model in two directions. First, the collective representation is generalized to a dynamic framework. Second, the assumption of intra-household commitment is analyzed. The static collective model has been extensively tested and estimated. Thomas (1990) is one of the first papers to test the static unitary model against the static collective model. Browning et al. (1994) perform a similar test and estimate the intra-household allocation of resources. Chiappori et al. (2002) analyze theoretically and empirically the impact of the marriage market and divorce legislations on household labor supply using a static collective model. Blundell et al. (2001) develop and estimate a static collective labor supply framework which allows for censoring and nonparticipation in employment. The present paper, however, contributes to a new literature which attempts to model and test the intertemporal aspects of household decisions using a collective formulation.[1]

The paper is organized as follows. In section 2, the traditional household Euler equations are estimated for singles and separately for couples. Section 3 introduces the no-commitment intertemporal collective model. Section 4 sets up a test of this model. Section 5 discusses the implementation of the test and reports the outcome. Some concluding remarks are presented in the final section.

2 Euler Equations of Singles and Couples

In the estimation of Euler equations, singles are generally pooled with couples. This approach is adopted, for example, by Attanasio and Weber (1995) and Zeldes (1989). In few instances, singles are dropped from the sample used in the estimation of Euler equations. Attanasio and Browning (1995) and Meghir and Weber (1996) are two examples in which households with only one decision maker are excluded. With this selection of the sample, Euler equations are usually rejected unless a large number of demographics and labor supply variables are added to the intertemporal optimality

[1] The following papers also use the collective representation to describe intertemporal decisions. Lundberg et al. (2003) use a collective model with no commitment to explain the consumption-retirement puzzle. Mazzocco (2004a) analyzes the effect of risk sharing on household decisions employing a full-efficiency framework. Duflo and Udry (2004) test whether household decisions are Pareto efficient using data from Côte D'Ivore. Ligon (2004) uses a model with no-commitment to explain household decisions in Bangladesh. Aura (2004) discusses the impact of different divorce laws on consumption and saving choices of married couples with no commitment. Lich-Tyler (2004) uses a repeated static collective model, a model with full commitment and a model with no commitment to determine the fraction of couples in the PSID which make decisions according to the three different models.

conditions.

In this section, Euler equations are estimated for singles and separately for couples. To make the results comparable with the previous literature, the estimation is performed as follows. First, Euler equations are estimated using the CEX.[2] Second, the estimation is performed using standard log-linearized Euler equations. Third, different sets of demographic and labor supply variables are included. Fourth, Euler equations are tested by performing a standard excess sensitivity test, using lagged household income. For couples, I also estimate a specification which includes wife's and husband's lagged income. Finally, since the division of the sample between singles and couples may be endogenous, Euler equations are estimated with and without selection correction terms.

2.1 The Consumer Expenditure Survey

Since 1980, the CEX survey has been collecting data on household consumption, income, and different types of demographics. The survey is a rotating panel organized by the Bureau of Labor Statistics (BLS). Each quarter about 4500 households representative of the US population are interviewed. 80% are reinterviewed the following quarter, while the remaining 20% are replaced by a new randomly selected group. Each household is interviewed at most for four quarters and detailed information is elicited in regard to expenditures for each of the three months preceding the interview, and in regard to income and demographics for the quarter preceding the interview. The data used in the estimation cover the period 1982-1995. The first two years are excluded because the data were collected with a slightly different methodology.

Following Attanasio and Weber (1995) total consumption is computed as the sum of food at home, food out, tobacco, alcohol, public and private transportation, personal care, maintenance, heating fuel, utilities, housekeeping services, repairs and clothing. Total consumption is deflated using a weighted average of individual price indices, with weights equal to the expenditure share for the particular consumption good. Household income is computed as total household income plus transfers for the year preceding the interview. Individual income is the sum of the components that can be imputed to each member, i.e. income received from non-farm business, income received from farm business, wage and salary income, social security checks, and supplemental security income checks for the year preceding the interview. As in Attanasio and Weber (1995), the real interest rate is the quarterly average of the 20-year Municipal bond rate deflated using the household specific price index.

Rather than employing the short panel dimension of the CEX, I follow Attanasio and Weber (1995) and use synthetic panels. These are constructed using two variables: the year of birth of the head of the household and a dummy equal to 1 if the head is married and 0 otherwise.[3] All households are assigned to one of these cells which are constructed using a 7-year interval for the

[2] I also estimated the Euler equations using the Panel Study of Income Dynamics (PSID). The results are similar to the ones presented here and are available at http://www.ssc.wisc.edu/∼mmazzocc/AdditionalTables.pdf.

[3] The husband is considered to be the head of the household in a married or cohabiting couple.

head's year of birth. The variables of interest are then averaged over all the households belonging to a given cohort observed in a given quarter. To avoid the complicated error structure that the timing of the interviews implies, I follow Attanasio and Weber (1996) and for each household in each quarter I use only the consumption data for the month preceding the interview and drop the data for the previous two months.

To construct the synthetic cohorts I exclude from the sample rural households, households with incomplete income responses, and households experiencing a change in marital status. Only cohorts for which the head's age is between 21 and 60 are included in the estimation. Cohorts with size smaller than 150 are dropped. Table 1 contains a description of the cohorts. Table 2 reports the summary statistics for the CEX sample.

2.2 Derivation of Euler Equations.

The Euler equations typically estimated in the empirical literature can be written in the following form:

$$\Delta \log (C_{i,t+1}) = \alpha + \gamma \log R_{t+1} + \epsilon_{i,t+1} \tag{1}$$

where $C_{i,t+1}$ represents non-durable consumption of household i, R_{t+1} is the gross real interest rate, $-\gamma$ represents the intertemporal elasticity of substitution, $\epsilon_{i,t+1}$ is a residual uncorrelated with the information known to the household at time t and the constant is a function of the discount factor and of the second and higher moments corresponding to the distribution of ϵ_{t+1}. Using standard arguments, this equation can be derived by log-linearizing the first order conditions of a dynamic model in which preferences are intertemporally separable and non-durable consumption is strongly separable from durable goods and leisure.[4]

One of the main challenges faced by the empirical literature on Euler equations is that equation (1) is derived for an individual consumer, whereas consumption data are only available at the household level. The traditional solution to this problem is to assume that the instantaneous utility function depends on a set of demographic variables, z, which approximate variations in household composition. Following Attanasio and Weber (1995) and Zeldes (1989), it is assumed that the demographic variables enter the instantaneous utility function multiplicatively through an exponential function, which implies,

$$U_{i,t} = U(C_{i,t})\, exp\left(\phi' z_{i,t}\right)$$

In the estimation the vector of demographics will be composed of family size, number of children and number of children younger than 2. Since in the CEX consumption data are collected quarterly, the vector z will be augmented to include a set of seasonal dummies.

[4] There is mixed evidence on the effect of the log-linearization on the parameter estimates. Carroll (2001) and Ludvigson and Paxson (2001) find that the approximation may introduce a substantial bias in the estimation of the preference parameters. On the other hand, Attanasio and Low (2004) show that using long panels it is possible to estimate consistently log-linearized Euler equations.

A controversial assumption often made in papers estimating Euler equations is that household consumption is strongly separable from leisure. In this paper the non-separability between consumption and leisure will not be formally modeled. Following Browning and Meghir (1991), Attanasio and Weber (1995), and Meghir and Weber (1996), however, the effect of leisure on consumption decisions will be captured by modeling the leisure variables as conditioning variables. These are variables that may affect preferences over the good of interest, but are not of primary interest. Specifically, following Attanasio and Weber (1995), Euler equations will be first estimated by including the wife's leisure and a dummy equal to 1 if the wife works. Subsequently, following Meghir and Weber (1996), the estimation will be performed including two dummies measuring the wife's and husband's labor supply status.

To summarize, the following Euler equations are estimated:

$$\Delta \log \left(C_{i,t+1}\right) = \alpha + \gamma \log R_{t+1} + \phi' \Delta z_{i,t+1} + \epsilon_{i,t+1}, \tag{2}$$

where $z_{i,t+1}$ includes the demographic and labor supply variables.

2.3 Econometric Issues

The error term of equation (2), $\epsilon_{i,t+1}$, contains the expectation error implicit in the Euler equations. Since part of the expectation error is generated by aggregate shocks, $\epsilon_{i,t+1}$ should be correlated across households. This implies that Euler equations can be consistently estimated only if households are observed over a long period of time as suggested by Chamberlain (1984). In the CEX, one of the main advantages of using synthetic panels is that cohorts are followed for the whole sample period. This should reduce the effect of aggregate errors on the estimation results.

The Euler equations are estimated using the Generalized Method of Moments (GMM). Under the assumption of rational expectations, any variable known at time t should be a valid instrument for GMM. However, measurement errors may introduce dependence between variables known at time t and concurrent and future variables, even under rational expectations. To address this problem I only use variables known at $t-1$.

Given the longitudinal nature of the dataset employed in the estimation, it is important to allow each household to have a different and unrestricted covariance structure. To that end, the covariance matrix is computed using the efficient weighting matrix in the GMM procedure. Denote with $E\left[g_i\left(\theta\right)\right]$ the set of moment conditions, where θ is the vector of parameters to be estimated. Let $\Omega = E\left[g_i g_i'\right]$ and $G = E\left[\frac{\partial}{\partial \theta'} g_i\left(\theta\right)\right]$. By Hansen (1982), under general regularity conditions, $\sqrt{n}\left(\hat{\theta} - \theta\right)$ converges in distribution to a normal with mean zero and covariance $\left(G'\Omega^{-1}G\right)^{-1}$. The covariance matrix is then estimated replacing Ω with $\hat{\Omega} = \frac{1}{n}\sum_i \hat{g}_i \hat{g}_i'$ and G with $\hat{G} = \frac{1}{n}\sum_i \frac{\partial}{\partial \theta'}\hat{g}_i$, where $\hat{g}_i = g_i\left(\hat{\theta}\right)$. As shown by Wooldridge (2002), this covariance matrix is general enough to allow for heteroskedasticity and arbitrary dependence in the residuals.

2.4 Selection Correction

In the estimation, the sample is divided into two groups. The first is composed of married and cohabiting couples. The second includes widows, divorcees, never married, and separated respondents. In both groups, households with changes in marital status are excluded from the sample. If household Euler equations are estimated separately for the two groups by GMM, the results may be affected by selection biases. While it is beyond the scope of this paper to model household formation, from an econometric viewpoint it is important to take it into consideration.[5]

To address this problem, correction terms are included following Heckman (1976; 1979), Tunali (1986), and Newey and McFadden (1994). The correction terms can be used to control for two types of selection: selection into households with more than one decision maker and selection into households experiencing no change in marital status. Denote with m and s, respectively, a household composed of a married couple and a household composed of a single adult. Let $D_{i,t}$ be a dummy equal to 1 if agent i is married or cohabiting in period t. Consider the households that are not changing marital status during the sample period and denote with i the household containing agent i. Under the assumption that the error terms of the Euler equations and selection equations are normally distributed, in the appendix it is shown that the Euler equations of household i can be written in the form,

$$\Delta \log \left(C_{i,t+1}^{m}\right) = \alpha^{m} + \gamma^{m} \log R_{t+1} + \phi^{m'} \Delta z_{i,t+1} + \sum_{\tau=t,t+1} \sigma_{\epsilon,m} \rho_{\epsilon,m}^{\tau} \xi_{i,\tau}^{m} + \eta_{i,t+1}^{m} \quad \text{if } D_{i,\tau}=1,\ \tau=t,t+1,$$

$$\Delta \log \left(C_{i,t+1}^{s}\right) = \alpha^{s} + \gamma^{s} \log R_{t+1} + \phi^{s'} \Delta z_{i,t+1} + \sum_{\tau=t,t+1} \sigma_{\epsilon,s} \rho_{\epsilon,s}^{\tau} \xi_{i,\tau}^{s} + \eta_{i,t+1}^{s} \quad \text{if } D_{i,\tau}=0,\ \tau=t,t+1,$$

where $\eta_{i,t+1}^{h}$ are the new residuals with zero conditional mean, and $\xi_{i,\tau}^{m}$ and $\xi_{i,\tau}^{s}$ are the selection terms in period τ for married and single individuals.

Following Newey and McFadden (1994), the Euler equations adjusted for selection are estimated using GMM in one step by adding as moment conditions the first order conditions of the bivariate probit, which determines the probability of being in one of the four possible marital states defined by $D_{i,j,t}$ and $D_{i,j,t+1}$. The following variables in period t and $t+1$ are included in the bivariate probit estimation: the age of the head of the household, the number of children, a race dummy equal to one if the head is white, and the log of the head's income. As an exclusion restriction, it is assumed that the race of the head is correlated with the marriage decision, but not with consumption growth.

2.5 Results

Following the insight of Hall (1978), Sargent (1978), and Flavin (1981), several papers have investigated the relationship between realized consumption growth and either lagged income or predicted changes in income. The idea is that the expectation errors of the Euler equations should be orthogonal to any variable contained in the consumer's information set at the time of the decision.

[5] Household formation is analyzed in Davis, Mazzocco, and Yamaguchi (2004).

Consequently, lagged income or predicted income growth should not enter the household Euler equations. Hall and Mishkin (1982), Zeldes (1989), and Attanasio and Weber (1995) are some examples of papers performing this excess sensitivity test.

In the present paper a similar excess sensitivity test is performed by adding household income at $t-1$ to the Euler equations and testing whether the coefficient is significantly different from zero. The test proposed in this paper differs from the previous literature because it is performed on the sample of single households and, separately, on the sample of couples. Tables 3 reports the results of the excess sensitivity test without correction for selection, for different sets of demographics and labor supply variables.

Household Euler equations of singles are not rejected since the coefficient on the logarithm of lagged household income is never significantly different from zero. Household Euler equations of couples, however, are always violated. More important, the size of the coefficient on the logarithm of lagged household income for couples is always at least twice the coefficient for singles. The addition of labor supply variables does not change the outcome of the excess sensitivity test, which suggests that the findings of this section cannot be only a consequence of non-separability between consumption and leisure.

The Euler equations of singles are also estimated separately for women and men.[6] The results without correction for selection are reported in table 4. In both cases the excess sensitivity test does not reject the Euler equations. It is worth noting that the coefficient on the interest rate, which describes the intertemporal elasticity of substitution, is larger for single men. But for both groups, it is not statistically different from zero. This difference in intertemporal preferences is consistent with the findings in Mazzocco (2005) where individual preferences are estimated for single men, single women, married men, and married women.

Tables 5 and 6 present the results of the excess sensitivity test with correction for selection. The selection terms are statistically different from zero only for the sample of single women and only marginally. But even for this group the outcome of the test does not change. This finding can be interpreted in two different ways. Either I am not able to precisely estimate the marriage decision, or the unobservable heterogeneity in the marriage decision is independent of the Euler equation error term. The results for single women suggest that the second interpretation is plausible.

One possible rationalization for the outcome of the excess sensitivity test is that couples are liquidity constrained and therefore Euler equations are not satisfied. However, since the household budget constraints depend only on household total income, if the rejection for couples is only a consequence of liquidity constraints, the wife's and husband's income should not enter the Euler equations after controlling for household total income. The last two columns of Tables 3 and 5 report the coefficient estimates for couples obtained by adding individual incomes to the Euler equations. The coefficients on both household income and wife's income are significantly different from zero and

[6] In this case the minimum cohort size has been decreased to 65, because at 150 the number of observations for single men was too low.

have opposite sign. This finding suggests that liquidity constraints cannot be the only explanation for the violation of Euler equations for couples.

One additional result is worth discussing. The estimates of the coefficient on the change in the labor supply dummies suggest that the non-separability of preferences between consumption and leisure is particularly important for singles. The coefficient estimates have a positive sign which is consistent with the common intuition that total consumption expenditure should increase if a household member decides to supply labor to account for a number of job-related expenses. The sign of the coefficient estimates for couples is also positive but the magnitude of the coefficient is smaller for both the head and the spouse. There are at least three possible interpretations of this finding. First, separability between consumption and leisure is a better approximation of the behavior of couples relative to singles. This is consistent with the intuition that the wife and the husband can adjust the amount of labor they supply to the market and to household production if one of two decides to work. Second, the coefficient on the labor force participation dummies may capture the effect of unexpected changes in employment on consumption growth. This effect should be larger for singles since they do not have access to the insurance provided by the spouse, which may explain the difference in coefficients. An alternative interpretation is that household Euler equations contain joint information on the head's preferences, on the wife's preferences, and on their decision power within the household. Since labor supply variables can affect preferences as well as decision power, it may be difficult to evaluate the significance of non-separability for couples using household Euler equations.

The previous discussion assumes that the coefficient estimates are consistent. There is increasing evidence that the efficient weighting matrix in GMM can lead to biased inference due to small sample biases.[7] To address this issue, tables 7 and 8 report the results when the efficient weighting matrix is replaced by the identity matrix. The results are similar to the ones obtained with efficient weighting. The only significant difference is that the standard errors are larger. Biased inference may also be generated by the problem of "weak instruments", i.e. instruments that are only weakly correlated with the endogenous variables. To determine the relevance of the instruments, the partial R^2 introduced by Shea (1997) is computed for each endogenous variable. The smallest partial R^2 is 0.16 which suggests that the correlation between the instruments and the endogenous variables is not negligible.[8]

The remainder of the paper is devoted to providing an explanation for the rejection of Euler equations for couples and to deriving a test to evaluate the empirical significance of this explanation.

[7] See for instance Altonji and Segal (1996).

[8] A more formal approach to determine whether instruments are "weak" should use a test that is based on the definition of "weak instruments" given for instance in Stock and Yogo (2004). However, as noted in Stock, Wright, and Yogo (2002), a formal test of "weak instruments" has not been developed yet for GMM with efficient weighting if the errors are heteroscedastic and serially correlated as it is the case in this paper.

3 Household Intertemporal Behavior

To characterize the intertemporal behavior of couples, consider a household composed of two adults living for T periods in an environment with uncertainty. In each period t and state of nature ω, member i is endowed with an exogenous income $y^i(t,\omega)$, consumes a private composite good in quantity $c^i(t,\omega)$, and a public composite good in quantity $Q(t,\omega)$. Household members can save jointly using a risk-free asset. Denote with $s(t,\omega)$ and $R(t)$, respectively, the amount of wealth invested in the risk-free asset and its gross return.[9] Each agent is characterized by an individual discount factor, β_i, and by individual preferences which are assumed to be separable over time and across states of nature. The corresponding utility function, u_i, is assumed to be increasing, concave and three times continuously differentiable. The two agents are assumed to have identical beliefs.

The introduction of a public good in the model is important for two reasons. First, some of the goods traditionally included in the composite consumption good are unambiguously public consumption within the household. Second, to understand household intertemporal behavior it is essential to take into consideration children. With few exceptions, children do not participate directly in the household decision process. They affect household decisions indirectly through the utility of their parents. Hence, they should be modeled as a public good.

The next two subsections discuss the traditional and an alternative approach to modeling intertemporal decisions and to deriving the household Euler equations.

3.1 The Unitary Model

The approach traditionally used to model household intertemporal decisions assumes that each household behaves as a single agent. This is equivalent to the restriction that the individual utility functions can be collapsed into a unique utility function $U(C,Q)$ which fully describes the preferences of the entire household.[10] Denote with β the household discount factor. Then the intertemporal allocation can be determined as the solution of the following problem:[11]

$$\max_{\{C_t,Q_t,s_t\}_{t\in\mathbf{T},\omega\in\Omega}} E_0\left[\sum_{t=0}^{T}\beta^t U(C_t,Q_t)\right] \tag{3}$$

$$s.t.\ C_t + P_t Q_t + s_t \le \sum_{i=1}^{2} y_t^i + R_t s_{t-1} \quad \forall t,\omega$$

$$s_T \ge 0 \quad \forall\omega.$$

[9] The results of the paper are still valid if a risky asset is introduced in the model.

[10] Mazzocco (2004b) finds necessary and sufficient conditions for the aggregation of individual preferences in a unique utility function.

[11] The dependence on the states of nature will be suppressed to simplify the notation.

The first order conditions of the unitary model (3) can be used to derive the following household Euler equation for private consumption:

$$U_C\left(C_t, Q_t\right) = \beta E_t\left[U_C\left(C_{t+1}, Q_{t+1}\right) R_{t+1}\right]. \tag{4}$$

This intertemporal optimality condition corresponds to the Euler equation estimated in section 2 and in most of the empirical literature on intertemporal decisions.

3.2 The No-commitment Intertemporal Collective Model

This subsection relaxes the assumption that individual utility functions can be collapsed into a unique utility function. In a companion paper, Mazzocco (2004b) considers two alternatives. The first model assumes that household decisions are efficient. The assumption of efficiency requires that individual members can commit to an allocation of resources at the time of household formation and stick to it for the next T periods. This assumption may be restrictive in economies in which separation and divorce are available at low cost. To take into account this possibility, the second alternative considers an environment in which household members cannot commit to future plans. In Mazzocco (2004b) a test is derived to determine the empirical significance of the two models. Since using the CEX as well as the PSID the efficiency model is rejected in favor of the no-commitment framework, in this paper only the no-commitment model is considered.

If the two spouses cooperate but cannot commit to future plans, an allocation is feasible only if the two agents are better off within the household in any period and state of nature relative to the available outside options. In this environment, household decisions are the solution of a Pareto problem which contains a set of participation constraints for each spouse in addition to the standard budget constraints:

$$\max_{\left\{c_t^1, c_t^2, Q_t, s_t\right\}_{t\in\mathbf{T},\omega\in\Omega}} \mu_1\left(Z\right) E_0\left[\sum_{t=0}^{T}\beta_1^t u^1(c_t^1, Q_t)\right] + \mu_2\left(Z\right) E_0\left[\sum_{t=0}^{T}\beta_2^t u^2(c_t^2, Q_t)\right] \tag{5}$$

$$s.t.\ \hat{\lambda}_{i,\tau,\omega}: \quad E_\tau\left[\sum_{t=0}^{T-\tau}\beta_i^t u^i(c_{t+\tau}^i, Q_{t+\tau}^i)\right] \geq \underline{u}_{i,\tau,\omega}\left(Z\right) \quad \forall\ \omega, \tau > 0, i = 1, 2$$

$$\sum_{i=1}^{2} c_t^i + P_t Q_t + s_t \leq \sum_{i=1}^{2} y_t^i + R_t s_{t-1} \quad \forall t, \omega$$

$$s_T \geq 0 \quad \forall \omega,$$

where μ_i is member i's Pareto weight, $\underline{u}_{i,t,\omega}$ represents the value of the best outside option available to agent i in period t and state ω, and Z denotes the set of variables that affect the Pareto weights and the reservation utilities $\underline{u}_{i,t,\omega}$. It is important to remark that the Pareto weights are generally not observed, but the distribution factors Z are. Consequently, to test household intertemporal decisions the dependence of the Pareto weights on Z has to be explicitly modeled.

Some remarks are in order. First, the literature on household behavior has generally defined the individual outside options as the value of divorce.[12] The same definition will be used in this paper. Second, in the unitary model the assumption that household members can only save jointly is not restrictive since individual saving is suboptimal. In the no-commitment model, if the reservation utility is the value of divorce it may be optimal for household members to have individual accounts to improve their outside options. Note, however, that the only accounts that may have an effect on the reservation utilities are the ones that are considered as individual property during a divorce procedure. In the US the fraction of wealth that is considered individual property during a divorce procedure depends on the type of law adopted by the state. There are three different property laws in the US: the common property law, the community property law, and the equitable property law. The common property law establishes that marital property is divided at divorce according to who has legal title to the property. Only the state of Mississippi adopts the common property law. In the remaining 49 states, all earnings during marriage and all property acquired with those earnings are community property and they are divided at divorce equally between the spouses in community property states and equitably in equitable property states. Consequently, the assumption that household members can only save jointly should not be too restrictive. As a third remark, it should be noted that household saving may affect the reservation utilities of household members.

To determine the household Euler equations with no commitment, it is useful to rewrite the household decision process using a more intuitive formulation. Following the approach developed in Marcet and Marimon (1992, 1998), the no-commitment intertemporal collective model can be written in the following form:

$$\max_{\left\{c_t^1, c_t^2, Q_t, s_t\right\}_{t\in\mathbf{T},\omega\in\Omega}} \sum_{t=0}^{T}\sum_{i=1}^{2} E_0\left[\beta_i^t M_{i,t}\left(Z\right) u^i(c_t^i, Q_t) - \lambda_{i,t}\left(Z\right) \underline{u}_{i,t}\left(Z\right)\right] \tag{6}$$

$$\sum_{i=1}^{2} c_t^i + P_t Q_t + s_t \leq \sum_{i=1}^{2} y_t^i + R_t s_{t-1} \quad \forall t, \omega$$

$$s_T \geq 0 \ \forall \omega,$$

where $M_{i,0} = \mu_i$, $M_{i,t,\omega} = M_{i,t-1,\omega} + \lambda_{i,t,\omega}$ and $\lambda_{i,t,\omega}$ is the Lagrange multiplier corresponding to the participation constraint of member i, at time t, in state ω, adjusted for the discount factor and the probability distribution.[13]

This alternative formulation clarifies how individual preferences are aggregated within the household to determine consumption and saving decisions. In the first period, the household determines the optimal allocation of resources for each future period and state of nature by weighing the individual preferences using the Pareto weights, which can be interpreted as the decision power of the

[12] An important exception is the paper by Lundberg and Pollak (1993) in which the outside options are defined as the value of non-cooperation within the household.

[13] Household intertemporal behavior with no commitment could also be characterized using the setting developed by Kocherlakota (1996) and Ligon, Thomas and Worrall (2002). The approach adopted by Marcet and Marimon (1992, 1998) is, however, better suited to the derivation of the test described in section 4.

household members at the time of household formation. In any subsequent period, the two spouses consume and save according to the chosen allocation until, at this allocation, for one of the two agents it is optimal to choose the alternative of divorce. In the first period in which divorce is optimal, the allocation is renegotiated to make the spouse with a binding participation constraint just indifferent between the outside option and staying in the household. This goal is achieved by increasing the weight assigned to the preferences of the spouse with a binding participation constraint or equivalently her decision power.[14] The couple then consumes and saves according to the new allocation until one of the participation constraints binds once again and the process is repeated. All this implies that changes in variables like income, earnings, interest rate, and inflation affect consumption dynamics not only because they change the budget constraints, but also because they modify the outside options and therefore the individual decision power.

The derivation of household Euler equations requires the determination of household preferences. Even if the two agents are characterized by individual utility functions, household preferences can be computed by solving the representative agent problem. Specifically, under the assumption that individual preferences are separable over time and across states of nature, given an arbitrary amount of public consumption, household preferences are the solution of the following problem:

$$\hat{V}\left(C,Q,M(Z)\right)=\max_{c^1,c^2}\beta_1 M_1\left(Z\right)u^1\left(c^1,Q\right)+\beta_2 M_2\left(Z\right)u^2\left(c^2,Q\right)$$

$$s.t.\ \sum_{i=1}^{2}c^i=C,$$

where $M(Z)=[M_1(Z),M_2(Z)]$ describes the individual decision power. The intertemporal problem can then be written using the household preferences in the following form:

$$\max_{\left\{c_t^1,c_t^2,Q_t,s_t\right\}_{t\in\mathbf{T},\omega\in\Omega}}\sum_{t=0}^{T}E_0^i\left[\beta^t V\left(C_t,Q_t,M_t(Z)\right)-\sum_{i=1}^{2}\lambda_{i,t}\left(Z\right)\underline{u}_{i,t}\left(Z\right)\right] \quad (7)$$

$$C_t+P_tQ_t+s_t\leq Y_t+R_ts_{t-1}\ \ \forall t,\omega$$

$$s_T\geq 0\ \forall\omega,$$

where $V\left(C_t,Q_t,M_t(Z)\right)=\hat{V}\left(C_t,Q_t,M_t(Z)\right)/\beta^t$.

To be able to formulate the household Euler equations for the no-commitment model in the standard form, it is crucial to maintain one of the main assumptions of the traditional approach, namely intertemporal separability of household preferences. With no commitment, household preferences are intertemporally separable if and only if household saving does not belong to the set of distribution factors Z. It is important to remark that the main effect of this assumption is that a test may reject the no-commitment model in favor of the unitary framework only because this restriction is not satisfied.[15]

[14] Ligon, Thomas and Worrall (2002) show that if an agent is constrained the optimal group allocation is such that the constrained agent is just indifferent between the best outside option and staying in the group.

[15] The empirical validity of this assumption will be tested by checking whether the outcome of the test proposed in this paper is robust to the addition of household saving to the Euler equations.

Under the assumption that saving is not a distribution factor, the no-commitment household Euler equations can be written in the following form:

$$V_C\left(C_t, Q_t, M_t(Z)\right) = \beta E_t\left[V_C\left(C_{t+1}, Q_{t+1}, M_{t+1}(Z)\right) R_{t+1}\right]. \tag{8}$$

Equation (8) indicates that the household Euler equations of couples depend not only on consumption in two consecutive periods, but also on the individual decision power in period t and $t+1$, and through it on the set of distribution factors Z. This result represents a potential explanation for the rejection of the traditional Euler equations for couples but not for singles. To see this, consider a couple in which the wife is more risk averse and prudent than the husband. Suppose that in period t the wife's income varies in such a way to increase her decision power in period $t+1$. Then from period $t+1$ the household as a whole will be more risk averse and prudent, which implies that consumption will generally be smoother. If the variation in individual decision power is not properly modeled, this change in household behavior will be interpreted as excess sensitivity to variables known at the time of the decision, as non-separability between consumption and leisure, or as binding liquidity constraints.

Equation (8) may also be used to interpret the results of section 2. According to those results, an increase in the wife's income reduces consumption growth, whereas an increase in household income has the opposite effect. Since wives are generally more risk averse and prudent than husbands, these findings are consistent with equation (8) if a rise in wife's income has a positive effect on her decision power and the changes in household income are dominated by variations in husband's income.[16]

The next section derives a test to further investigate the empirical relevance of this explanation. The strength of the test is that the null hypothesis is represented by the collective model analyzed in this section.

4 Testing the Intertemporal Collective Model

The intertemporal collective model predicts that the set of distribution factors Z should affect the household Euler equations only through the individual decision power. This section exploits this feature to derive a test of the intertemporal collective model.

To construct the test, I follow the empirical literature on consumption dynamics and log-linearize the no-commitment household Euler equations. The derivation of the test requires two modifications of the standard approach. First, since the test requires the Euler equations for two different goods, the private consumption household Euler equations (8) will be used jointly with the corresponding public consumption household Euler equations. Second, to increase the number of testable restrictions, a second order Taylor expansion will be employed instead of the traditional first order expansion.[17]

[16] Barsky et al. (1997) and Mazzocco (2005) find that wives are more risk averse and prudent than husbands.

[17] If a first order expansion is used the test is characterized by one restriction instead of the five that can be tested using a second order expansion.

Since this paper focuses on the sample of couples that do not experience a change in marital status, it will be assumed that there exists at least one feasible allocation at which both spouses are better off relative to their best outside option. Under this assumption, Kocherlakota (1996) and Ligon, Thomas and Worrall (2002) show that in a no-commitment model with two agents, at most one agent can be constrained. This implies that in each period and state of nature the decision power of at most one spouse can vary. As a result, for any given household, the change in decision power between two consecutive periods can be summarized by $\lambda_{1,t,\omega}(Z)$ if spouse 1 is constrained or $\lambda_{2,t,\omega}(Z)$ if spouse 2 is constrained.[18]

One last assumption is needed to derive the log-linearized no-commitment household Euler equations. It is assumed that if the state of nature in period t is such that all distribution factors are equal to their expected value, the participation constraints in period t do not bind. This assumption states that household members do not expect to be constrained in future periods and it is required to guarantee that in this state of nature the household preferences do not vary between t and $t+1$. Intuitively, in the sample of married and cohabiting couples, the household with the average realization of Z should not be constrained.

Denote with $\bar{C}$, $\bar{Q}$ and $\bar{Z}$, respectively, the expected value of private consumption, of public consumption, and of the distribution factors. Moreover, let $\hat{C} = \ln\left(C/\bar{C}\right)$, $\hat{Q} = \ln\left(Q/\bar{Q}\right)$ and $\hat{Z} = Z - \bar{Z}$. Finally, assume that $V_C(C,Q,M(Z))$ and $V_Q(C,Q,M(Z))$ are twice continuously differentiable. The log-linearized no-commitment household Euler equations can then be derived.

Proposition 1 *The private consumption household Euler equation for the no-commitment intertemporal collective model can be written as follows:*

$$\ln\frac{C_{t+1}}{C_t} = \alpha_0 + \alpha_1 \ln R_{t+1} + \alpha_2 \ln\frac{Q_{t+1}}{Q_t} + \sum_{i=1}^{m}\alpha_{i,3}\hat{z}_i \ln\frac{C_{t+1}}{C_t} + \sum_{i=1}^{m}\alpha_{i,4}\hat{z}_i \ln\frac{Q_{t+1}}{Q_t}$$
$$+\alpha_5\left[\left(\ln\frac{C_{t+1}}{\bar{C}}\right)^2 - \left(\ln\frac{C_t}{\bar{C}}\right)^2\right] + \alpha_6\left[\left(\ln\frac{Q_{t+1}}{\bar{Q}}\right)^2 - \left(\ln\frac{Q_t}{\bar{Q}}\right)^2\right] + \alpha_7\left[\ln\frac{C_{t+1}}{\bar{C}}\ln\frac{Q_{t+1}}{\bar{Q}} - \ln\frac{C_t}{\bar{C}}\ln\frac{Q_t}{\bar{Q}}\right]$$
$$+\sum_{i=1}^{m}\alpha_{i,8}\hat{z}_i + \sum_{i=1}^{m}\alpha_{i,9}\hat{z}_i\ln\frac{C_{t+1}}{\bar{C}} + \sum_{i=1}^{m}\alpha_{i,10}\hat{z}_i\ln\frac{Q_{t+1}}{\bar{Q}} + \sum_i\sum_j \alpha_{i,j,11}\ \hat{z}_i\hat{z}_j + R_C\left(\hat{C},\hat{Q},\hat{Z}\right) + \ln\left(1+e_{t+1,C}\right),$$

The public consumption household Euler equation can be written in the following form:

$$\ln\frac{Q_{t+1}}{Q_t} = \delta_0 + \delta_1 \ln\frac{R_{t+1}P_t}{P_{t+1}} + \delta_2 \ln\frac{C_{t+1}}{C_t} + \sum_{i=1}^{m}\delta_{i,3}\hat{z}_i \ln\frac{C_{t+1}}{C_t} + \sum_{i=1}^{m}\delta_{i,4}\hat{z}_i \ln\frac{Q_{t+1}}{Q_t}$$
$$+\delta_5\left[\left(\ln\frac{C_{t+1}}{\bar{C}}\right)^2 - \left(\ln\frac{C_t}{\bar{C}}\right)^2\right] + \delta_6\left[\left(\ln\frac{Q_{t+1}}{\bar{Q}}\right)^2 - \left(\ln\frac{Q_t}{\bar{Q}}\right)^2\right] + \delta_7\left[\ln\frac{C_{t+1}}{\bar{C}}\ln\frac{Q_{t+1}}{\bar{Q}} - \ln\frac{C_t}{\bar{C}}\ln\frac{Q_t}{\bar{Q}}\right]$$
$$+\sum_{i=1}^{m}\delta_{i,8}\hat{z}_i + \sum_{i=1}^{m}\delta_{i,9}\hat{z}_i\ln\frac{C_{t+1}}{\bar{C}} + \sum_{i=1}^{m}\delta_{i,10}\hat{z}_i\ln\frac{Q_{t+1}}{\bar{Q}} + \sum_i\sum_j \delta_{i,j,11}\ \hat{z}_i\hat{z}_j + R_Q\left(\hat{C},\hat{Q},\hat{Z}\right) + \ln\left(1+e_{t+1,Q}\right),$$

[18] In the household problem (7) the individual decision power $M_{i,t}$ varies with time, which implies that it cannot be normalized as it is standard in static models or in intertemporal models with full-commitment. This explains why at most one $M_{i,t}$ can change in each period.

where R_C and R_Q are Taylor series remainders and e_C and e_Q are the expectation errors.

Proof. In the appendix. ■

Proposition 1 shows that the distribution factors enter the no-commitment household Euler equations in three different ways: (i) interacted with consumption growth, (ii) directly and (iii) interacted with the log of consumption at $t+1$. To illustrate the idea behind this result, consider a change in one of the distribution factors that modifies the individual outside options at $t+1$. Suppose that with this variation in the outside options, at the current intra-household allocation of resources, the wife is better off as single. If the marriage still generates some surplus, it is optimal for the couple to renegotiate the allocation of resources to keep the wife from leaving the household. The optimal renegotiation requires an increase in the wife's decision power from $M_{1,t}$ to $M_{1,t+1} = M_{1,t} + \lambda_{1,t+1}$, to raise her expected welfare to the level of her best outside option. This renegotiation will modify C_{t+1} and Q_{t+1} relative to the consumption plan that was optimal before the changes in the outside options.[19] This component of consumption dynamics is captured in the no-commitment Euler equations by the terms that depend on the distribution factors and it is ignored by the standard unitary model.

To understand the meaning of each term in the Euler equations that depends on the distribution factors observe that, under the assumption of separable utilities across states and over time, household intertemporal decisions can be analyzed by considering a given period and state of nature at a time. Consider period t and state ω'. Given the optimal allocation of household resources to (t, ω'), it is possible to compute the (t, ω')-Pareto frontier. The optimal distribution of household resources between the two agents is then determined by the line with slope $m_{t,\omega'} = -M_{1,t,\omega'}(Z)/M_{2,t,\omega'}(Z)$ that is tangent to the (t, ω')-Pareto frontier. Consider period $t+1$ and state ω''. The optimal allocation of resources will generally be different from the allocation to (t, ω'), which implies that the $(t+1, \omega'')$-Pareto frontier will differ from the (t, ω')-Pareto frontier. The distribution of household resources between the two agents can then be determined using a new tangency line with slope $m_{t+1,\omega''} = -M_{1,t+1,\omega''}(Z)/M_{2,t+1,\omega''}(Z)$. Consider a variation in one of the distribution factors. This has a direct and an indirect effect. The direct effect is to change $M_t(Z)$ and $M_{t+1}(Z)$. Since $M_{t+1}(Z) = M_t(Z) + \lambda_{t+1}(Z)$, the change in the distribution factor generates the same variation in $M_t(Z)$ in period t and $t+1$ and a change in $\lambda_{t+1}(Z)$ that is specific to period $t+1$. As a result, only the latter component of the direct change enters the Euler equations. This component, which changes the slope of the tangency line at $t+1$, is captured by the Euler equation terms that depend only on the distribution factors. The indirect effect can be divided into two parts. First, the change in $M_t(Z)$ modifies the allocation of resources to the two periods and with it the Pareto frontiers. Since the changes at (t, ω') generally differ from the changes at $(t+1, \omega'')$, this part of the indirect effect enters the household Euler equations and it is summarized by the interaction between

[19] Mazzocco (2004b) shows that a change in the individual decision power always changes household decisions unless the individual utilities belong to the harmonic absolute risk aversion class with identical curvature parameter. This implies that a modification in M_{t+1} changes consumption decisions even if the two spouses have identical preferences that do not belong to the previous class.

consumption growth and the distribution factors. Second, the change in $\lambda_{t+1}(Z)$ generates a change in the Pareto frontier in period $t+1$ in addition to the change that is common to periods t and $t+1$. This produces an additional variation in the tangency point that is captured by the interaction term between the log of consumption at $t+1$ and the distribution factors. This intuition is depicted in figure 2 for a household in which $\lambda_{1,t+1}(Z) = \lambda_{2,t+1}(Z) = 0$, but $\lambda_{1,t+1}(Z') > 0$, where Z' is the set of distribution factors after the change. It suggests that cross sectional as well as longitudinal variation may explain the presence of the distribution factors in the no-commitment Euler equations.

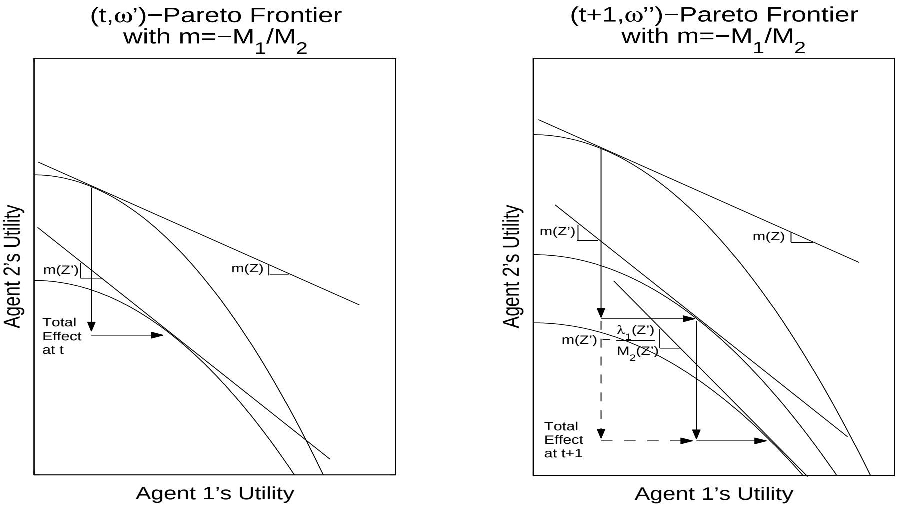

Figure 2: Changes in Z and the intra−household allocation with no commitment.

The next corollary to proposition 1 provides the ingredients to derive a test of the explanation proposed in this paper for the rejection of the Euler equations for couples documented in section 2. It contains a proportionality condition that is generally violated if the intertemporal collective model is not a correct characterization of household behavior.

Corollary 1 *The no-commitment intertemporal collective model implies,*

$$\frac{\alpha_{i,8}}{\alpha_{j,8}} = \frac{\delta_{i,8}}{\delta_{j,8}} = \frac{\alpha_{i,9}}{\alpha_{j,9}} = \frac{\delta_{i,9}}{\delta_{j,9}} = \frac{\alpha_{i,10}}{\alpha_{j,10}} = \frac{\delta_{i,10}}{\delta_{j,10}},$$

for any pair of distribution factors z_i and z_j, where $\alpha_{k,l}$ and $\delta_{k,l}$ are, respectively, the coefficients of the private and public no-commitment Euler equations.

Since locally each household Euler equation is equal to its n-th order Taylor expansion with n tending to infinity, this result applies locally to the general model. To explain the intuition underlying the proportionality condition, note that in the no-commitment model the distribution factors enter the private and public Euler equations in two ways: (i) through $M_t = [M_{1,t}, M_{2,t}]$ and, since at most one spouse can be constrained, (ii) through $\lambda_{i,t+1}$ where i is equal to 1 or 2. A change in the distribution factors z_i and z_j has therefore the same effect on the private and public Euler equations, except that the effect depends on the marginal utility of private consumption in the first case and public consumption in the second case. Consequently, if the dependence on the marginal utility of private and public consumption can be removed, the effect of a change in the distribution factors must be identical across Euler equations. This dependence can be removed for the portion of the change in z_i and z_j that enters the Euler equations through $\lambda_{i,t+1}$ by computing α_i / α_j in the private Euler equations and δ_i / δ_j in the public Euler equations. The dependence on the marginal utilities cannot be removed, however, for the portion of the variation in the distribution factors that enters the Euler equations through M_t, since a change in each distribution factor modifies $M_{1,t}$ and at the same time $M_{2,t}$. This explains why the coefficients on the interaction terms between the distribution factors and consumption growth do not satisfy the proportionality condition. A test to determine the empirical validity of the intertemporal collective model can now be constructed.

TEST. *If the intertemporal collective model is a correct specification of intertemporal decisions, the private and public consumption Euler equations should satisfy the proportionality condition of corollary 1.*

This test can be performed by simultaneously estimating the household Euler equations if at least two consumption goods and two factors are observed.

5 Implementation of the Test

The implementation of the test derived in the previous section requires a set of distribution factors. Using a recursive formulation of the no-commitment model it can be shown that the change in individual decision power between t and $t+1$ depends on the individual income realizations in period $t+1$. The set of distribution factors should therefore include the wife's and the husband's realizations of individual income at $t+1$ and the test can be performed using these two variables. Note that the definition of individual income required to test the no-commitment Euler equations differs from the one used in section 2 to test for excess sensitivity, where individual income was defined as the spouse's income in period $t-1$.[20]

The test is performed using the distance statistic approach developed by Newey and West (1987) in three steps. The private and public consumption Euler equations are first simultaneously estimated by GMM. Subsequently, the private and public Euler equations are estimated imposing the proportionality condition provided by corollary 1. The distance statistic is then calculated. In the first as well as in the second step, the efficient weighting matrix of the unconstrained model is used.

All the variables used in the implementation of the test have already been defined in section 2, except public and private consumption. Total private consumption is computed as the sum of food at home, food out, tobacco, alcohol, public and private transportation, personal care and clothing of wife and husband. Total public consumption is defined as the sum of maintenance, heating fuel, utilities, housekeeping services, repairs and children clothing.[21] Private and public consumption are

[20] Since household saving at t may also enter the set of distribution factors, the test was also implemented controlling for household saving. The results are similar and they are available at http://www.ssc.wisc.edu/~mmazzocc/AdditionalTables.pdf.

[21] It is likely that food out and private transportation contain a public component. Moreover, food consumed by

deflated using the household specific price indices described in section 2. The numeraire is defined to be private consumption.

In the estimation of the private and public Euler equations, the set of demographic variables used in section 2 are always included. Moreover, to control for a potential non-separability between consumption and leisure, the test is performed by adding the change in a dummy equal to 1 if the wife works and the change in a similar dummy for the husband. The results of the test do not change if the dummy for a working husband is replaced by the wife's leisure growth. Finally, since in the results reported in section 2 there is no evidence of selection biases, the model is tested without controlling for selection into marriage.

The test is first performed using the wife's and husband's income at $t+1$ as distribution factors and then using the wife's income at $t+1$ and the ratio of individual incomes. Tables 9 and 10 report the results. These tables have a similar structure. The first two columns report the estimates of the private and public Euler equation coefficients for the no-commitment model. The third and fourth columns contain the estimation results when the coefficients are constrained to satisfy the proportionality condition of corollary 1. The last two columns report some additional evidence on the performance of the no-commitment model relative to the unitary framework. They contain the estimates when the coefficients on all the distribution factor terms are constrained to be equal to zero.

The standard unitary framework is always rejected. Its rejection should be attributed to the husband's as well as the wife's income, since both distribution factors have a statistically significant effect on private and public consumption dynamics. More important, the proportionality condition and therefore the no-commitment Euler equations are not rejected at any standard significance level. This result indicates that labor supply and income variables affect the intertemporal behavior of the household not only through preferences and the budget constraints, but also through the individual decision power.

Additional findings presented in this paper support this conclusion. First, in tables 9 and 10 the distribution factors have a significant effect on consumption dynamics even if the labor supply dummies are added to the Euler equations and even if these dummies have a significant effect on consumption dynamics. This indicates that labor supply affects intertemporal decisions not only through the individual preferences, but also through the individual decision power. Second, according to the results reported in section 2 the coefficient on the wife's income in the standard household Euler equations is statistically significant even after controlling for total income. Since in the standard unitary model with borrowing constraints only total income should affect consumption dynamics, the existence of households that are liquidity constrained cannot be the only explanation for the rejection of intertemporal models of the household.

All this suggests that a realistic model of intertemporal decisions should take into consideration

children is included in food at home. Since for these goods it is not possible to distinguish between their private and public components and these items are mostly private consumption, they are included in private consumption.

that household members are characterized by individual preferences and that their weight in the household decision process can change over time.

6 Conclusions

This paper makes three main contributions to the literature on intertemporal household behavior.

First, evidence is presented which suggests that the intertemporal decisions of couples differ from the intertemporal decisions of singles. Consequently, to model, test, and estimate the intertemporal behavior of couples, one should not rely on life-cycle models that are constructed to characterize the behavior of a single agent.

Second, a life-cycle model is developed to analyze the intertemporal behavior of couples. This model have two main features: (i) household members are represented by means of individual preferences and (ii) they cannot commit to future allocations of resources.

Third, evidence is reported which indicates that if household decisions are properly taken into consideration the life-cycle model is consistent with the patterns of non-durable consumption observed in US household-level data.

References

[1] Altonji, Joseph G. and Lewis Segal: "Small Sample Bias in GMM Estimation of Covariance Structures," *Journal of Business and Economic Statistics*, 14, no. 3, (Jul., 1996): 353-366.

[2] Attanasio, Orazio P. and Martin Browning: "Consumption over the Life Cycle and over the Business Cycle," *The American Economic Review*, 85, no. 5, (Dec., 1995): 1118-1137.

[3] Attanasio, Orazio P. and Low, Hamish: "Estimating Euler Equations," *Review of Economic Dynamics*, 7, no. 2, (Apr., 2004): 406-435.

[4] Attanasio, Orazio P. and Guglielmo Weber: "Is Consumption Growth Consistent with Intertemporal Optimization? Evidence from the Consumer Expenditure Survey," *Journal of Political Economy* 103, no. 6, (1995): 1121-1157.

[5] Barsky, Robert B., Thomas F. Juster, Miles S. Kimball, and Matthew D. Shapiro: "Preference Parameters and Behavioral Heterogeneity: An Experimental Approach in the Health and Retirement Study," *Quarterly Journal of Economics*, 112, no. 2, (May, 1997): 537-579.

[6] Becker, Gary S.: *A Treatise of the Family,* Harvard University Press, Cambridge, Mass. (1991).

[7] Blundell, R., P. A. Chiappori, T. Magnac, and C. Meghir: "Collective Labor Supply: Heterogeneity and Nonpartecipation," *The Institute for Fiscal Studies Working Paper,* (2001).

[8] Browning, Martin, Francois Bourguignon, Pierre-André Chiappori, and Valerie Lechene: "Income and Outcomes: A Structural Model of Intrahousehold Allocation," *The Journal of Political Economy*, 102, no. 6. (Dec., 1994): 1067-1096.

[9] Browning, M. and P. A. Chiappori: "Efficient Intra-household Allocations: A General Characterization and Empirical Tests," *Econometrica*, 66, no. 6, (Nov., 1998): 1241-78.

[10] Browning, Martin and Annamaria Lusardi: "Household Savings: Micro Theories and Micro Facts," *Journal of Economic Literature*, 34, (Dec., 1996): 1797-1855.

[11] Browning, Martin and Costas Meghir: "The Effects of Male and Female Labor Supply on Commodity Demands," *Econometrica*, 59, no. 4, (Jul., 1991): 925-951.

[12] Carroll, Christopher D.: "Death to the Log-Linearized Consumption Euler Equation! (And Very Poor Health to the Second-Order Approximation)," *Advances in Macroeconomics*, 1, no. 1, Article 6 (2001).

[13] Chamberlain, Gary: "Panel Data," in *The Handbook of Econometrics*, 2, edited by Zvi Griliches and Michael D. Intriligator. New York: North-Holland, 1984.

[14] Chiappori, Pierre-André: "Rational Household Labor Supply," *Econometrica*, 56, (Jan., 1988): 63-90.

[15] Chiappori, Pierre-André: "Collective Labor Supply and Welfare," *Journal of Political Economy,* 100, no. 3, (1992): 437-467.

[16] Chiappori, Pierre-André, Bernard Fortin, and Guy Lacroix: "Household Labor Supply, Sharing Rule and the Marriage Market," *Journal of Political Economy,* 110, no. 1, (2002): 37-72.

[17] Davis, Lucas, Maurizio Mazzocco, and Shintaro Yamaguchi: "Labor Supply, Wealth Dynamics and Marital Decisions," Working Paper, University of Wisconsin, 2004.

[18] Duflo, Esther and Christopher Udry: "Intrahousehold Resource Allocation in Côte D'Ivore: Social Norms, Separate Accounts and Consumption Choices," NBER Working Paper, (May, 2004).

[19] Flavin, Marjorie A.: "The Adjustment of Consumption to Changing Expectations about Future Income," *Journal of Political Economy*, 89, (Oct., 1981): 974-1009.

[20] Hall, Robert E.: "Stochastic Implications of the Life Cycle-Permanent Income Hypothesis: Theory and Evidence," *The Journal of Political Economy*, 86, no. 6. (Dec., 1978): 971-987.

[21] Hall, Robert E. and Frederic S. Mishkin: "The Sensitivity of Consumption to Transitory Income: Estimates from Panel Data on Households," *Econometrica,* 50, no. 2, (Mar., 1982): 461-481.

[22] Hansen, Lars Peter: "Large Sample Properties of Generalized Method of Moments Estimators," *Econometrica*, 50, no. 4, (Jul., 1982): pp. 1029-1054.

[23] Heckman, James J.: "The Common Structure of Statistical Models of Truncation, Sample Selection and Limited Dependent Variables and a Simpler Estimator for Such Models," *Annals of Economic and Social Measurement*, 5, (1976): 475-492.

[24] Heckman, James J.: "Sample Selection Bias as a Specification Error," *Econometrica,* 47, (Jan., 1979): 153-161.

[25] Kocherlakota, Narayana R.: "Implications of Efficient Risk Sharing without Commitment," *Review of Economic Studies,* 63, no. 4, (Oct., 1996): 595-609.

[26] Ligon, Ethan: "Dynamic Bargaining in Households," Manuscript, University of California at Berkeley, 2004.

[27] Ligon, Ethan, Jonathan P. Thomas, and Tim Worrall: "Informal Insurance Arrangements with Limited Commitment: Theory and Evidence from Village Economies," *Review of Economic Studies,* 69, (2002): 209-244.

[28] Ludvigson, Sydney, and Christina H. Paxson: "Approximation Bias in Linearized Euler Equations," *Review of Economics and Statistics*, 83, no. 2, (May, 2001): 242-256.

[29] Lundberg, Shelly and Robert A. Pollak: "Separate Spheres Bargaining and the Marriage Market," *Journal of Political Economy*, 101, no. 6. (Dec., 1993): 988-1010.

[30] Lundberg, Shelly, Richard Startz and Steven Stillman: "The Retirement-Consumption Puzzle: a Marital Bargaining Approach," *Journal of Public Economics*, 87, no. 5-6. (May, 2003): 1199-1218.

[31] Marcet, A. and R. Marimon: "Communication, Commitment and Growth," *Journal of Economic Theory,* 58, no. 2, (1992): 219-49.

[32] Marcet, A. and R. Marimon: "Recursive Contracts," Unpublished Manuscript Universitat Pompeu Fabra, (1998).

[33] Mazzocco, Maurizio: "Savings, Risk Sharing and Preferences for Risk," *The American Economic Review*, 94, no. 4, (Sep. 2004a), pp. 1169-1182.

[34] Mazzocco, Maurizio: "Household Intertemporal Behavior: a Collective Characterization and a Test of Commitment," Manuscript, Department of Economics, University of Wisconsin, (2004b).

[35] Mazzocco, Maurizio: "Individual Euler Equations Rather Than Household Euler Equations," Manuscript, Department of Economics, University of Wisconsin, (2005).

[36] Meghir, Costas and Guglielmo Weber: "Intertemporal Nonseparability or Borrowing Restrictions? A Disaggregate Analysis using a U.S. Consumption Panel," *Econometrica,* 64, no. 5. (Sep., 1996): 1151-1181.

[37] Newey, W. K. and Daniel McFadden: "Large Sample Estimation and Hypothesis Testing," in *The Handbook of Econometrics*, 4, edited by R.F. Engle and D.L. McFadden. Elsevier Science B.V., 1994.

[38] Newey, W. K. and Kenneth West: "Hypothesis Testing with Efficient Method of Moments Estimation," *International Economic Review*, 28, (1987): 777-787.

[39] Runkle, David E.: "Liquidity Constraints and the Permanent-Income Hypothesis," *Journal of Monetary Economics*, 27, no. 1, (1991): 73-98.

[40] Sargent, Thomas J.: "Rational Expectations, Econometric Exogeneity, and Consumption," *The Journal of Political Economy*, 86, no. 4, (Aug., 1978): 673-700.

[41] Shea, John: "Instrument Relevance in Multivariate Linear Models: A Simple Measure," *The Review of Economics and Statistics*, 86, no. 2, (May, 1997): 348-352.

[42] Stock, James H., Jonathan H. Wright, and Motohiro Yogo: "A Survey of Weak Instruments and Weak Identification in Generalized Method of Moments," *Journal of Business and Economic Statistics*, 20, no. 4, (Oct., 2002): 518-529.

[43] Stock, James H. and Motohiro Yogo: "Testing for Weak Instruments in Linear IV Regression," unpublished manuscript, Harvard University.

[44] Thomas, Duncan: "Intra-Household Resource Allocation: An Inferential Approach," *The Journal of Human Resources*, 25, no. 4, (Autumn, 1990): 635-664.

[45] Tunali, Insan: "A General Structure for Models of Double-selection and an Application to a Joint Migration/Earnings Process with Re-migration," *Research in Labor Economics*, 8, Part B, (1986): 235-283.

[46] Wooldridge, J. M.: *Econometric Analysis of Cross Section and Panel Data*, 1st edition, Cambridge MA, MIT Press 2002.

[47] Zeldes, Stephen P.: "Consumption and Liquidity Constraints: an Empirical Investigation," *Journal of Political Economy*, 97, (2) (1989): 305-346.

A Proof of Proposition 1

Let ϕ_1 and ϕ_2 be defined as follows:

$$\phi_1\left(\hat{C},\hat{Q},\hat{Z}\right) = \ln\left\{V_C\left(\exp\left\{\hat{C}\right\}E[C], \exp\left\{\hat{Q}\right\}E[Q], M\left(\hat{Z}+E[Z]\right)\right)\right\}$$
$$\phi_2\left(\hat{C},\hat{Q},\hat{Z}\right) = \ln\left\{V_Q\left(\exp\left\{\hat{C}\right\}E[C], \exp\left\{\hat{Q}\right\}E[Q], M\left(\hat{Z}+E[Z]\right)\right)\right\}$$

where V_C and V_Q are household marginal utilities. Let the one-variable functions $\vartheta_1 : I_1 \to \mathbb{R}$ and $\vartheta_2 : I_2 \to \mathbb{R}$ be defined as follows:

$$\vartheta_1(t) = \phi_1(t\hat{C}, t\hat{Q}, t\hat{Z})$$
$$\vartheta_2(t) = \phi_2(t\hat{C}, t\hat{Q}, t\hat{Z})$$

where $I_1 = (-a, a)$ and $I_2 = (-b, b)$. Applying the one-variable Taylor's formula with remainder,

$$\vartheta_i(t) = \vartheta_i(0) + \vartheta_i'(0)t + \vartheta_i''(0)t^2 + r_i(t), \quad for\, i = 1, 2, \tag{9}$$

with

$$r_i(t) = \frac{1}{3!}\int_0^t (t-s)^3\vartheta_i'''(s)ds.$$

Applying the chain rule, we have,

$$\vartheta_i'(t) = \frac{\partial\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{C}}\hat{C} + \frac{\partial\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{Q}}\hat{Q} + \sum_j \frac{\partial\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{z}_j}\hat{z}_j$$
$$\vartheta_i''(t) = \frac{\partial^2\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{C}^2}\hat{C}^2 + \frac{\partial^2\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{Q}^2}\hat{Q}^2 + \frac{\partial^2\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{Q}\partial\hat{C}}\hat{Q}\hat{C}$$
$$+\sum_j \frac{\partial^2\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{z}_j\partial\hat{C}}\hat{z}_j\hat{C} + \sum_j \frac{\partial^2\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{z}_j\partial\hat{Q}}\hat{z}_j\hat{Q} + \sum_j\sum_h \frac{\partial^2\phi_i(t\hat{C},t\hat{Q},t\hat{Z})}{\partial\hat{z}_j\partial\hat{z}_h}\hat{z}_j\hat{z}_h.$$

Hence, from (9), with $t = 1$,

$$\phi_i(\hat{C},\hat{Q},\hat{Z}) = \phi_i(0) + \frac{\partial\phi_i(0)}{\partial\hat{C}}\hat{C} + \frac{\partial\phi_i(0)}{\partial\hat{Q}}\hat{Q} + \sum_j \frac{\partial\phi_i(0)}{\partial\hat{z}_j}\hat{z}_j + \frac{\partial^2\phi_i(0)}{\partial\hat{C}^2}\hat{C}^2 + \frac{\partial^2\phi_i(0)}{\partial\hat{Q}^2}\hat{Q}^2 \tag{10}$$
$$+\frac{\partial^2\phi_i(0)}{\partial\hat{C}\partial\hat{Q}}\hat{C}\hat{Q} + \sum_j \frac{\partial^2\phi_i(0)}{\partial\hat{C}\partial\hat{z}_j}\hat{C}\hat{z}_j + \sum_j \frac{\partial^2\phi_i(0)}{\partial\hat{Q}\partial\hat{z}_j}\hat{Q}\hat{z}_j + \sum_j\sum_h \frac{\partial^2\phi_i(0)}{\partial\hat{z}_j\partial\hat{z}_h}\hat{z}_j\hat{z}_h + R_i(\hat{C},\hat{Q},\hat{Z}).$$

Finally by definition of $\phi_i(\hat{C},\hat{Q},\hat{Z})$, we have,

$$\frac{\partial\phi_1}{\partial\hat{z}_j} = \frac{V_{CM}}{V_C}\frac{\partial M}{\partial z_j}, \quad \frac{\partial^2\phi_1}{\partial\hat{C}\partial\hat{z}_j} = \frac{V_C V_{CCM} - V_{CM}V_{CC}}{V_C^2}\frac{\partial M}{\partial z_j}C, \tag{11}$$
$$\frac{\partial^2\phi_1}{\partial\hat{Q}\partial\hat{z}_j} = \frac{V_C V_{CQM} - V_{CM}V_{CQ}}{V_C^2}\frac{\partial M}{\partial z_j}Q, \quad \frac{\partial\phi_2}{\partial\hat{z}_j} = \frac{V_{QM}}{V_Q}\frac{\partial M}{\partial z_j}, \tag{12}$$
$$\frac{\partial^2\phi_2}{\partial\hat{C}\partial\hat{z}_j} = \frac{V_Q V_{QCM} - V_{QM}V_{QC}}{V_Q^2}\frac{\partial M}{\partial z_j}C, \quad \frac{\partial^2\phi_2}{\partial\hat{Q}\partial\hat{z}_j} = \frac{V_Q V_{QQM} - V_{QM}V_{QQ}}{V_Q^2}\frac{\partial M}{\partial z_j}Q, \tag{13}$$

where $V_{\cdot,M}\frac{\partial M}{\partial z_j}$ is shorthand for $V'_{\cdot,M}\cdot M_{z_j}$, with $V_{\cdot,M}=[V_{\cdot,M_1},V_{\cdot,M_2}]'$ and $M_{z_j}=\left[\frac{\partial M_1}{\partial z_j},\frac{\partial M_2}{\partial z_j}\right]'$.

Under the assumption of rational expectations, the household Euler equations can be written in the form,

$$\frac{V_C\left(C_{t+1},Q_{t+1},M(Z)\right)\beta R_{t+1}}{V_C\left(C_t,Q_t,M(Z)\right)}=1+e_{t+1,C}$$
$$\frac{V_Q\left(C_{t+1},Q_{t+1},M(Z)\right)\beta R_{t+1}P_t}{V_Q\left(C_t,Q_t,M(Z)\right)P_{t+1}}=1+e_{t+1,Q}$$

where $e_{t+1,C}$ and $e_{t+1,Q}$ are the expectation errors. Taking logs and using $\phi_1=\ln V_C$ and $\phi_2=\ln V_Q$, we have,

$$\phi_i(\hat{C}_{t+1},\hat{Q}_{t+1},\hat{Z})-\phi_i(\hat{C}_t,\hat{Q}_t,\hat{Z})=-\ln\beta-\ln R^i_{t+1}+ln(1+e_{t+1})\quad i=1,2, \tag{14}$$

where $R^1_{t+1}=R_{t+1}$ and $R^2_{t+1}=\frac{R_{t+1}P_t}{P_{t+1}}$.

By Kocherlakota (1996) and Ligon, Thomas and Worrall (2002) at most one agent is constrained. Without loss of generality, assume that agent 1 is constrained in period $t+1$. This implies,

$$M_{1,t+1}=M_{1,t}+\lambda_{1,t+1}\quad\text{and}\quad M_{2,t+1}=M_{2,t}.$$

Consequently,

$$\frac{\partial M_{1,t+1}}{\partial\hat{z}_i}=\frac{\partial M_{1,t}}{\partial\hat{z}_i}+\frac{\partial\lambda_{1,t+1}}{\partial\hat{z}_i},\quad\text{and}\quad\frac{\partial M_{2,t+1}}{\partial\hat{z}_i}=\frac{\partial M_{2,t}}{\partial\hat{z}_i}.$$

Then, given the assumption that if all the distribution factors are equal to their expected value the participation constraints do not bind, substituting for ϕ_i in equation (14) using equations (10), (11), (12) and (13) the result follows. Moreover,

$$\alpha_{i,8}=\frac{V_{CM}}{V_C}\frac{\partial\lambda_{1,t+1}}{\partial z_i}\qquad\delta_{i,8}=\frac{V_{QM}}{V_Q}\frac{\partial\lambda_{1,t+1}}{\partial z_i}, \tag{15}$$

$$\alpha_{i,9}=\frac{V_CV_{CCM}-V_{CM}V_{CC}}{V_C^2}\frac{\partial\lambda_{1,t+1}}{\partial z_i}\qquad\delta_{i,9}=\frac{V_QV_{QCM}-V_{QM}V_{QC}}{V_Q^2}\frac{\partial\lambda_{1,t+1}}{\partial z_i}, \tag{16}$$

$$\alpha_{i,10}=\frac{V_CV_{CQM}-V_{CM}V_{CQ}}{V_C^2}\frac{\partial\lambda_{1,t+1}}{\partial z_i}\qquad\delta_{i,10}=\frac{V_QV_{QQM}-V_{QM}V_{QQ}}{V_Q^2}\frac{\partial\lambda_{1,t+1}}{\partial z_i}. \tag{17}$$

B Derivation of Euler Equations with Selection

Let $E_t\left[V_i^s(X)\right]$ and $E_t\left[V_{i,j}^m(X)\right]$ be the expected value at time t for agent i of being, respectively, single and married to agent j, where X is the set of variables affecting household formation. Taking a first order Taylor expansion of $V_i^s(X)$ and $V_{i,j}^m(X)$, the expected value of being single and married can be approximated as follows:

$$E_t\left[V_i^s(X)\right]\simeq X_i^t\beta^s+e_{i,t}^s,$$
$$E_t\left[V_{i,j}^m(X)\right]\simeq X_{i,j}^t\beta^m+e_{i,j,t}^m,$$

with $E_t\left[e_{i,t}^s\right]=E_t\left[e_{i,j,t}^m\right]=0$. Denote with $E_t\left[\hat{V}_{i,j}^m(X)\right]$ the value generated by the best feasible match available to agent i, i.e.

$$E_t\left[\hat{V}_{i,j}^m(X)\right]=\max_{j\in J}E_t\left[V_{i,j}^m(X)\right]\simeq X_{i,j}^t\hat{\beta}^m+\hat{e}_{i,j,t}^m,$$

where J is the set of feasible spouses available to agent i and a feasible spouse is defined as an agent who is willing to be matched with agent i. Let $D^m_{i,j,t}$ be a dummy variable equal to 1 if agent i is married to or cohabiting with agent j in period t. Then the selection decision at t can be written in the form,

$$\begin{aligned} D^m_{i,j,t} &= 1 \quad \text{if} \quad \left(X^t_{i,j}\hat{\beta}^m + \hat{e}^m_{i,j,t}\right) - \left(X^t_i\beta^s + e^s_{i,t}\right) > 0, \\ D^m_{i,j,t} &= 0 \quad \text{otherwise.} \end{aligned}$$

It is important to remark that the marriage decision of agent i takes into account the decision made by a potential spouse through the choice of the best feasible match.[22] Consider the households that are not changing marital status during the sample period and let household i be the household containing agent i. Then, its Euler equations can be written as follows:[23]

$$\begin{aligned} \Delta \log\left(C^m_{i,t+1}\right) &= \alpha^m + \gamma^m \log R_{t+1} + \phi^{m'}\Delta z_{i,t+1} + \epsilon^m_{i,t+1} \quad \text{if } e_{i,j,\tau} > -X^\tau_{i,j}\beta, \quad \tau = t, t+1 \quad (18) \\ \Delta \log\left(C^s_{i,t+1}\right) &= \alpha^s + \gamma^s \log R_{t+1} + \phi^{s'}\Delta z_{i,t+1} + \epsilon^s_{i,t+1} \quad \text{if } e_{i,j,\tau} \leq -X^\tau_{i,j}\beta, \quad \tau = t, t+1 \quad (19) \end{aligned}$$

where $e_{i,j,\tau} = \hat{e}^m_{i,j,\tau} - e^s_{i,\tau}$ and $\beta = \hat{\beta}^m - \beta^s$. Assume that for each t and for $h = s, m$, $(\epsilon^h_i, e_{i,j,t}, e_{i,j,t+1})$ is a trivariate normal distribution with mean vector 0 and covariance matrix,

$$\begin{bmatrix} \sigma^2_{\epsilon,h} & \rho^t_{\epsilon,h} & \rho^{t+1}_{\epsilon,h} \\ & 1 & \rho \\ & & 1 \end{bmatrix}.$$

Then, by Tunali (1986), the household Euler equations (18) and (19) can be rewritten in the form,

$$\Delta \log\left(C^m_{i,t+1}\right) = \alpha^m + \gamma^m \log R_{t+1} + \phi^{m'}\Delta z_{i,t+1} + \sum_{\tau=t,t+1} \sigma_{\epsilon,m}\rho^\tau_{\epsilon,m}\xi^m_{i,\tau} + \eta^m_{i,t+1} \quad \text{if } e_{i,j,\tau} > -X^\tau_{i,j}\beta, \ \tau = t, t+1$$

$$\Delta \log\left(C^s_{i,t+1}\right) = \alpha^s + \gamma^s \log R_{t+1} + \phi^{s'}\Delta z_{i,t+1} + \sum_{\tau=t,t+1} \sigma_{\epsilon,s}\rho^\tau_{\epsilon,s}\xi^s_{i,\tau} + \eta^s_{i,t+1} \quad \text{if } e_{i,j,\tau} \leq -X^\tau_{i,j}\beta, \ \tau = t, t+1,$$

where $\eta^h_{i,t+1}$ are the new residuals, with zero conditional mean, $\xi^m_{i,t}$ and $\xi^s_{i,t}$ are defined as follows,

$$\xi^m_{i,t} = \frac{\phi\left(X^t_{i,j}\beta\right)\Phi\left(\dfrac{X^{t+1}_{i,j}\beta - \rho X^t_{i,j}\beta}{(1-\rho^2)^{1/2}}\right)}{G\left(X^t_{i,j}\beta, X^{t+1}_{i,j}\beta, \rho\right)}, \quad \xi^s_{i,t} = -\frac{\phi\left(X^t_{i,j}\beta\right)\Phi\left(-\dfrac{X^{t+1}_{i,j}\beta - \rho X^t_{i,j}\beta}{(1-\rho^2)^{1/2}}\right)}{G\left(-X^t_{i,j}\beta, -X^{t+1}_{i,j}\beta, \rho\right)},$$

with ϕ, Φ and G, respectively, the standard univariate normal density function, the standard univariate normal distribution function and the standard bivariate normal distribution function, and $\xi^m_{i,t+1}$ and $\xi^s_{i,t+1}$ can be obtained by reversing the subscripts t and $t+1$ in $\xi^m_{i,t}$ and $\xi^s_{i,t}$.

[22] This implies that the set of variables affecting the marital decision includes also variables related to the potential spouse. In the data, these variables are not observed for singles and therefore will not be used in the estimation.

[23] The Euler equations of households with changes in marital status are not discussed since they are not part of the estimation. For this type of households, individual Euler equations should be used following Mazzocco (2005).

C Tables

Cohort Definition and Summary Statistics.

Table 1: Cohort Definition for Couples and Singles

cohort	Year of Birth	Age in 1982	Average Cell Size Couples	Average Cell Size Singles
1	1926-1932	56-50	303.3	166.7
2	1933-1939	49-43	280.7	163.7
3	1940-1946	42-36	352.7	182.5
4	1947-1953	35-29	455.6	245.1
5	1954-1960	28-22	418.9	271.2
6	1961-1967	21-15	313.6	249.6
7	1968-1974	14-8	236.3	235.9

Table 2: Summary Statistics of Main Variables

Variable	Singles	Couples
mean consumption growth	0.001	0.001
	[0.055]	[0.053]
mean age of head	37.4	41.8
	[9.5]	[10.6]
mean family size	1.9	3.6
	[1.5]	[1.4]
mean number of children	0.65	1.26
	[1.09]	[1.24]
mean monthly real consumption	623.5	1028.9
	[515.9]	[713.3]
mean annual income	21342.1	38890.2
	[19978.9]	[30862.6]
number of observations	213	263
number of cohorts	7	7

Excess Sensitivity Test.

Table 3: Estimation of Household Euler Equations. Group 1: singles, divorcees, widows and separated respondents. Group 2: married and cohabiting couples.

Ind. Variable	Singles	Couples	Singles	Couples	Singles	Couples	Couples	Couples
$\ln(R_{t+1})$	0.202	0.989**	0.195	0.883**	0.150	0.897**	0.171	0.387
	[0.368]	[0.388]	[0.353]	[0.388]	[0.356]	[0.388]	[0.560]	[0.519]
$\Delta \ln(\text{famsize})$	0.708**	1.692**	0.890**	1.650**	0.812**	1.678**	1.747**	1.771**
	[0.264]	[0.394]	[0.251]	[0.399]	[0.256]	[0.398]	[0.405]	[0.397]
Δkids	−0.270*	−0.361**	−0.313**	−0.354**	−0.269*	−0.357**	−0.331**	−0.343**
	[0.156]	[0.107]	[0.151]	[0.108]	[0.146]	[0.109]	[0.110]	[0.109]
Δkidsyoungt2	−1.144**	−0.918**	−1.115**	−0.923**	−1.072**	−0.913**	−0.935**	−0.912**
	[0.554]	[0.300]	[0.533]	[0.297]	[0.509]	[0.304]	[0.307]	[0.312]
Δhw	-	-	0.873**	0.144	0.850**	-	0.397	-
			[0.319]	[0.374]	[0.360]		[0.402]	
$\Delta \ln(hl)$	-	-	-	-	−0.048	-	-	-
					[0.233]			
Δww	-	-	-	0.233	-	0.226	0.140	0.136
				[0.174]		[0.182]	[0.188]	[0.192]
$\Delta \ln(wl)$	-	-	-	-	-	−0.034	-	−0.037
						[0.082]		[0.088]
$\ln(y_{t-1})$	0.010	0.061**	0.013	0.056**	0.014	0.055**	0.232**	0.205**
	[0.025]	[0.026]	[0.026]	[0.027]	[0.026]	[0.027]	[0.080]	[0.077]
$\ln(y_{h,t-1})$	-	-	-	-	-	-	−0.041	−0.046
							[0.055]	[0.054]
$\ln(y_{w,t-1})$	-	-	-	-	-	-	−0.141**	−0.109**
							[0.059]	[0.054]
J-Statistic	43.1	34.5	40.6	35.1	44.1	35.0	27.8	29.9
$P > \chi^2$	0.23	0.85	0.28	0.77	0.14	0.77	0.93	0.88
n. of observ.	213	263	213	263	213	263	263	263
n. of cohort	7	7	7	7	7	7	7	7

Asymptotic standard errors are in brackets. All specifications include a constant and three seasonal dummies. The instrument set is the same across columns and includes the first lag of family size growth and of the change in two education dummies, the first equal to one if the head only attended elementary school, the second equal to one if the head attended high school but did not graduate; the first, second, and third lags of nominal municipal bond interest rate, the change in number of children, the change in number of children younger than 2, labor supply growth of the spouse if present, real consumption growth, real municipal bond interest rate, and marginal tax growth; the first, second, third, and fourth lags of the change in dummy equal to one if the head works and in a dummy equal to one if the wife works and is present, nominal 3-month treasury bill rate growth; the second and third lags of salary growth; the second, third and fourth lags of income growth and head's leisure growth. hw and ww are dummies equal to 1 if the head works and if the spouse works. $\ln(hl)$ and $\ln(wl)$ are the logs of head's and spouse's quarterly leisure. y_{t-1}, $y_{h,t-1}$ and $y_{w,t-1}$ are household, head's and spouse's income at $t-1$. (**) and (*) indicate that the coefficient is significant, respectively, at the 5 and 10 percent level.

Table 4: Estimation of Household Euler Equations for Single Women and Men.

Ind. Variable	Single Women	Single Men	Single Women	Single Men	Single Women	Single Men
$\ln(R_{t+1})$	0.069	0.327	0.037	0.329	0.179	0.201
	[0.465]	[0.590]	[0.468]	[0.590]	[0.467]	[0.593]
$\Delta \ln(\text{famsize})$	0.908^{**}	0.203	0.834^{**}	0.202	0.648^{**}	0.159
	[0.246]	[0.260]	[0.256]	[0.260]	[0.272]	[0.255]
Δkids	-0.408^{**}	-0.092	-0.399^{**}	-0.102	-0.259	-0.132
	[0.146]	[0.233]	[0.146]	[0.236]	[0.164]	[0.227]
Δkidsyoungt2	-0.178	0.844	-0.074	0.889	-0.105	0.962
	[0.302]	[0.675]	[0.330]	[0.680]	[0.347]	[0.671]
Δhw	-	-	0.234	-0.102	0.766^{**}	-0.257
			[0.212]	[0.357]	[0.276]	[0.387]
$\Delta \ln(hl)$	-	-	-	-	0.592^{**}	-0.161
					[0.283]	[0.213]
$\ln(y_{t-1})$	-0.014	0.002	-0.013	0.003	0.005	-0.007
	[0.031]	[0.045]	[0.030]	[0.044]	[0.031]	[0.045]
J-Statistic	46.2	34.4	46.3	34.2	43.7	35.4
$P > \chi^2$	0.14	0.59	0.12	0.56	0.15	0.45
n. of observ.	281	178	281	178	281	178
n. of cohort	7	7	7	7	7	7

See note at table 3.

Excess Sensitivity Test with Selection Correction.

Table 5: Estimation of Household Euler Equations with correction for selection. Group 1: singles, divorcees, widows and separated respondents. Group 2: married and cohabiting couples.

Ind. Variable	Singles	Couples	Singles	Couples	Singles	Couples	Couples	Couples
$\ln(R_{t+1})$	0.101	1.073^{**}	0.005	1.023^{**}	-0.057	0.965^{**}	0.170	0.465
	[0.519]	[0.443]	[0.547]	[0.473]	[0.535]	[0.446]	[0.681]	[0.609]
$\Delta\ln(\text{famsize})$	0.701^{**}	1.799^{**}	0.766^{**}	1.780^{**}	0.769^{**}	1.758^{**}	1.769^{**}	1.714^{**}
	[0.246]	[0.416]	[0.270]	[0.440]	[0.264]	[0.420]	[0.428]	[0.391]
Δkids	-0.211	-0.339^{**}	-0.209	-0.339^{**}	-0.192	-0.332^{**}	-0.292^{**}	-0.278^{**}
	[0.153]	[0.112]	[0.165]	[0.120]	[0.158]	[0.118]	[0.121]	[0.118]
Δkidsyoungt2	-0.990^{**}	-0.862^{**}	-1.244^{**}	-0.919^{**}	-1.221^{**}	-0.787^{**}	-0.715^{*}	-0.639^{*}
	[0.485]	[0.342]	[0.516]	[0.372]	[0.503]	[0.359]	[0.376]	[0.378]
Δhw	-	-	1.008^{**}	0.053	1.074^{**}	-	0.475	-
			[0.346]	[0.444]	[0.370]		[0.456]	
$\Delta\ln(hl)$	-	-	-	-	0.115	-	-	-
					[0.236]			
Δww	-	-	-	0.345	-	0.385	0.235	0.234
				[0.243]		[0.253]	[0.254]	[0.270]
$\Delta\ln(wl)$	-	-	-	-	-	-0.018	-	-0.056
						[0.104]		[0.116]
$\ln(y_{t-1})$	0.012	0.085^{**}	0.029	0.077^{**}	0.040	0.070^{**}	0.267^{**}	0.239^{**}
	[0.042]	[0.031]	[0.042]	[0.027]	[0.043]	[0.032]	[0.104]	[0.096]
$\ln(y_{h,t-1})$	-	-	-	-	-	-	-0.049	-0.061
							[0.069]	[0.066]
$\ln(y_{w,t-1})$	-	-	-	-	-	-	-0.174^{**}	-0.133^{*}
							[0.088]	[0.079]
ξ_{t+1}	0.082	0.001	0.125	0.007	0.120	-0.043	-0.138	-0.207
	[0.152]	[0.263]	[0.155]	[0.271]	[0.149]	[0.276]	[0.328]	[0.323]
ξ_t	-0.084	-0.067	-0.145	-0.053	-0.155	-0.003	0.178	0.242
	[0.171]	[0.318]	[0.171]	[0.328]	[0.168]	[0.341]	[0.419]	[0.416]
J-Statistic	41.9	28.3	38.0	26.6	38.1	26.9	21.4	24.8
$P > \chi^2$	0.20	0.78	0.29	0.77	0.25	0.76	0.90	0.78
n. of observ.	213	263	213	263	213	263	263	263
n. of cohort	7	7	7	7	7	7	7	7

ξ_τ is the inverse Mills' ratio at τ. See note at table 3 for the instrument set and the definition of other variables.

Table 6: Estimation of Household Euler Equations for Single Women and Men, with correction for selection.

Ind. Variable	Single Women	Single Men	Single Women	Single Men	Single Women	Single Men
$\ln(R_{t+1})$	0.093	0.823	0.384	0.703	0.274	0.902
	[0.818]	[1.178]	[0.870]	[1.222]	[0.878]	[1.260]
$\Delta \ln(\text{famsize})$	0.550	0.341	0.596**	0.337	0.448	0.290
	[0.256]	[0.221]	[0.263]	[0.222]	[0.278]	[0.210]
Δkids	−0.232	−0.222	−0.289*	−0.220	−0.191	−0.225
	[0.162]	[0.257]	[0.166]	[0.270]	[0.173]	[0.262]
Δkidsyoungt2	0.126	0.752	0.424	0.751	0.265	0.917
	[0.326]	[0.593]	[0.369]	[0.599]	[0.384]	[0.598]
Δhw	-	-	0.306	−0.053	0.772**	−0.171
			[0.259]	[0.396]	[0.306]	[0.420]
$\Delta \ln(hl)$	-	-	-	-	0.496**	−0.247
					[0.325]	[0.207]
$\ln(y_{t-1})$	0.018	−0.001	0.009	0.017	0.005	−0.031
	[0.038]	[0.051]	[0.041]	[0.052]	[0.041]	[0.051]
ξ_{t+1}	−0.966	0.132	−1.325*	0.081	−1.158	0.281
	[0.643]	[0.353]	[0.801]	[0.358]	[0.760]	[0.424]
ξ_t	0.799	−0.062	1.190	−0.030	1.026	−0.143
	[0.611]	[0.287]	[0.772]	[0.283]	[0.707]	[0.332]
J-Statistic	41.8	36.8	41.0	36.6	37.8	37.8
$P > \chi^2$	0.17	0.34	0.16	0.31	0.22	0.22
n. of observ.	281	178	281	178	281	178
n. of cohort	7	7	7	7	7	7

See note at table 5.

Excess Sensitivity Test Using the Identity Matrix.

Table 7: Estimation of Household Euler Equations with Identity Matrix. Group 1: singles, divorcees, widows and separated respondents. Group 2: married and cohabiting couples.

Ind. Variable	Singles	Couples	Singles	Couples	Singles	Couples	Couples	Couples
$\ln(R_{t+1})$	0.212	0.997**	0.267	0.951**	0.170	0.847**	0.175	0.274
	[0.474]	[0.470]	[0.448]	[0.467]	[0.447]	[0.469]	[0.692]	[0.651]
$\Delta\ln(\text{famsize})$	0.663**	1.586**	0.629**	1.489**	0.575**	1.516**	1.508**	1.573**
	[0.314]	[0.456]	[0.296]	[0.461]	[0.293]	[0.472]	[0.483]	[0.485]
Δkids	−0.317*	−0.307**	−0.264	−0.274**	−0.267	−0.285**	−0.271*	−0.290**
	[0.185]	[0.131]	[0.177]	[0.132]	[0.170]	[0.137]	[0.140]	[0.141]
Δkidsyoungt2	−1.302**	−0.874**	−0.857	−0.805	−1.072**	−0.859**	−0.855**	−0.804**
	[0.609]	[0.349]	[0.615]	[0.349]	[0.596]	[0.355]	[0.367]	[0.366]
Δhw	-	-	0.796**	−0.109	0.580	-	0.231	-
			[0.394]	[0.383]	[0.457]		[0.446]	
$\Delta\ln(hl)$	-	-	-	-	−0.217	-	-	-
					[0.255]			
Δww	-	-	-	0.358	-	0.315	0.366	0.337
				[0.226]		[0.247]	[0.237]	[0.255]
$\Delta\ln(wl)$	-	-	-	-	-	−0.045	-	−0.039
						[0.111]		[0.114]
$\ln(y_{t-1})$	−0.009	0.063**	0.008	0.061*	0.001	0.062*	0.254**	0.234**
	[0.037]	[0.032]	[0.026]	[0.032]	[0.036]	[0.032]	[0.110]	[0.102]
$\ln(y_{h,t-1})$	-	-	-	-	-	-	−0.084	−0.079
							[0.070]	[0.069]
$\ln(y_{w,t-1})$	-	-	-	-	-	-	−0.127*	−0.110*
							[0.071]	[0.063]
n. of observ.	213	263	213	263	213	263	263	263
n. of cohort	7	7	7	7	7	7	7	7

See note at table 3.

Table 8: Estimation of Household Euler Equations with Identity Matrix for Single Women and Men.

Ind. Variable	Single Women	Single Men	Single Women	Single Men	Single Women	Single Men
$\ln(R_{t+1})$	0.237	0.113	0.255	0.113	0.333	0.080
	[0.499]	[0.665]	[0.498]	[0.667]	[0.522]	[0.662]
$\Delta\ln(\text{famsize})$	0.998**	0.340	0.930**	0.348	0.856**	0.362
	[0.277]	[0.318]	[0.284]	[0.324]	[0.301]	[0.322]
Δkids	−0.453**	−0.018	−0.441**	−0.030	−0.365**	−0.070
	[0.150]	[0.271]	[0.150]	[0.281]	[0.165]	[0.286]
Δkidsyoungt2	−0.239	0.444	−0.114	0.461	−0.266	0.540
	[0.312]	[0.703]	[0.334]	[0.714]	[0.364]	[0.719]
Δhw	-	-	0.249	−0.064	0.521*	−0.193
			[0.243]	[0.417]	[0.316]	[0.466]
$\Delta\ln(hl)$	-	-	-	-	0.478	−0.138
					[0.331]	[0.232]
$\ln(y_{t-1})$	−0.007	−0.019	−0.002	−0.019	−0.001	−0.022
	[0.035]	[0.053]	[0.035]	[0.053]	[0.037]	[0.043]
n. of observ.	281	178	281	178	281	178
n. of cohort	7	7	7	7	7	7

See note at table 3.

Proportionality Test.

Table 9: Proportionality test with head's and spouse's income as distribution factors. The unconstrained, constrained, and standard models are the no-commitment model, the no-commitment model with the proportionality condition, the model with all the distribution factor terms constrained to be zero.

Tests: Distance Statistic/$P > \chi^2$			5.9/0.31		120.9/1.1e-012	
Independent Variable	priv. unc.	pub. unc.	priv. con.	pub. con.	priv. std.	pub. std.
$\ln \hat{R}_{t+1}$	-0.004	0.159	0.011	0.263	-0.141	0.440^{**}
	[0.241]	[0.297]	[0.241]	[0.297]	[0.126]	[0.171]
$\ln (C_{t+1}/C_t)$	-	0.668^{**}	-	0.751^{**}	-	0.903^{**}
		[0.130]		[0.130]		[0.095]
$\ln (Q_{t+1}/Q_t)$	0.204^{**}	-	0.197^{**}	-	0.264^{**}	-
	[0.067]		[0.067]		[0.053]	
$\hat{y}_{h,t+1}$	0.0039^{*}	-0.0004	-0.0004	0.0002	-	-
	[0.0023]	[0.0036]	[0.0024]	[0.0036]		
$\hat{y}_{h,t+1} \ln (C_{t+1}/C_t)$	0.0126^{*}	0.0004	0.0132^{**}	0.0013	-	-
	[0.0067]	[0.007]	[0.0066]	[0.0072]		
$\hat{y}_{h,t+1} \ln (Q_{t+1}/Q_t)$	0.0011	-0.0018	-0.0010	-0.0007	-	-
	[0.0037]	[0.0043]	[0.0037]	[0.0042]		
$\hat{y}_{h,t+1} \ln \left(C_{t+1}/\bar{C}\right)$	0.0095	-0.0023	0.0070	-0.0079	-	-
	[0.0074]	[0.0081]	[0.0074]	[0.0081]		
$\hat{y}_{h,t+1} \ln \left(Q_{t+1}/\bar{Q}\right)$	-0.0087^{*}	0.0048	-0.0061	0.0044	-	-
	[0.0050]	[0.0063]	[0.0050]	[0.0063]		
$\hat{y}^2_{h,t+1}$	0.00005	0.00015	0.00002	0.00018^{*}	-	-
	[0.0001]	[0.00010]	[0.00007]	[0.00010]		
$\hat{y}_{w,t+1}$	-0.0078^{*}	0.0032	-0.0009	0.0006	-	-
	[0.0046]	[0.0071]	[0.0045]	[0.0071]		
$\hat{y}_{w,t+1} \ln (C_{t+1}/C_t)$	-0.0048	0.0237^{*}	-0.0103	0.0134	-	-
	[0.0105]	[0.0127]	[0.0105]	[0.0127]		
$\hat{y}_{w,t+1} \ln (Q_{t+1}/Q_t)$	0.0243^{**}	-0.0252^{**}	0.0259^{**}	-0.0234^{**}	-	-
	[0.0060]	[0.0092]	[0.0060]	[0.0092]		
$\hat{y}_{w,t+1} \ln \left(C_{t+1}/\bar{C}\right)$	0.0166	-0.0329^{**}	0.0176	-0.0199	-	-
	[0.0116]	[0.0149]	[0.0116]	[0.0149]		
$\hat{y}_{w,t+1} \ln \left(Q_{t+1}/\bar{Q}\right)$	-0.0130^{*}	0.0103	-0.0155^{**}	0.0112	-	-
	[0.0078]	[0.0090]	[0.0077]	[0.0090]		
$\hat{y}^2_{w,t+1}$	0.0002	-0.0001	0.00001	-0.0001	-	-
	[0.0002]	[0.0002]	[0.0001]	[0.0002]		
$\hat{y}_{h,t+1}\hat{y}_{w,t+1}$	-0.00025^{*}	-0.00023	0.00037^{**}	-0.00028	-	-
	[0.00014]	[0.00020]	[0.00014]	[0.00020]		
$\Delta \left(\ln \left(C_{t+1}/\bar{C}\right)\right)^2$	0.151	-0.181	0.193	-0.170	0.245^{**}	-0.047
	[0.119]	[0.126]	[0.119]	[0.126]	[0.093]	[0.093]
$\Delta \left(\ln \left(Q_{t+1}/\bar{Q}\right)\right)^2$	0.005	-0.293^{**}	0.012	-0.303^{**}	0.086^{**}	-0.251^{**}
	[0.043]	[0.053]	[0.043]	[0.053]	[0.035]	[0.043]
$\Delta \left(\ln \left(C_{t+1}/\bar{C}\right) \ln \left(Q_{t+1}/\bar{Q}\right)\right)$	-0.287^{**}	0.133	-0.287^{**}	0.147	-0.222^{**}	-0.181
	[0.140]	[0.170]	[0.139]	[0.180]	[0.104]	[0.170]
$\Delta \ln$ (family size)	0.763^{**}	-0.152	0.893^{**}	-0.361	0.895^{**}	-1.005^{**}
	[0.315]	[0.475]	[0.314]	[0.475]	[0.263]	[0.374]
Δchildren	-0.127	0.116	-0.104^{**}	0.172	-0.171^{**}	0.161
	[0.093]	[0.141]	[0.093]	[0.141]	[0.076]	[0.112]
Δchildren younger than 2	-0.909^{**}	-0.181	-0.921^{**}	-0.261	-1.159^{**}	0.010
	[0.258]	[0.312]	[0.258]	[0.312]	[0.220]	[0.261]
Δhead works	0.292	0.091	0.254	0.302	0.097	-0.150
	[0.300]	[0.381]	[0.300]	[0.382]	[0.217]	[0.298]
Δspouse works	0.154	0.137	0.046	0.111	0.047	0.349
	[0.150]	[0.202]	[0.150]	[0.202]	[0.122]	[0.161]
J-Statistic/$P > \chi^2$	91.0/0.81		96.9/-		211.9/-	
n. observations/n. cohorts					263/7	

Asymptotic standard errors are in brackets. All specifications include a constant and three seasonal dummies. $\hat{R}_{t+1} = R_{t+1}$ in the private Euler equation and $\hat{R}_{t+1} = R_{t+1}P_t/P_{t+1}$ in the public Euler equation. The instrument set is obtained by adding to the instrument set used in table 3 the first lag of salary growth, income growth, the first to fourth lags of the private and public $\hat{R}_{t+1}$, the first to fourth lags of growth in husband's and wife's income, the square of these income variables, the growth of their ratio, and by replacing the first to fourth lags of total consumption with the first to fourth lags of public consumption. For a variable x, $\hat{x}$ indicates the demeaned variable. Sample means have been used to calculate the variables that depend on expected values. The J-statistics is reported only for the no-commitment Euler equations because they are the only equations that are estimated using the efficient weighting matrix.

Table 10: Proportionality test, using wife's income and the ratio of individual incomes as distribution factors. The unconstrained and constrained models are the no-commitment model and the no-commitment model with the proportionality condition. The estimates of the standard model correspond to the estimates reported in table 9.

Tests: Distance Statistic/$P > \chi^2$			7.9/0.16	
Independent Variable	priv. unc.	pub. unc.	priv. con.	pub. con.
$\ln \hat{R}_{t+1}$	0.021	0.050	0.080	-0.033
	[0.250]	[0.352]	[0.250]	[0.352]
$\ln(C_{t+1}/C_t)$	-	1.273**	-	1.262**
		[0.043]		[0.043]
$\ln(Q_{t+1}/Q_t)$	0.681**	-	0.673**	-
	[0.026]		[0.025]	
$\hat{y}_{h,t+1}$	-0.0046	-0.0054	-0.0018	0.0011
	[0.0040]	[0.0053]	[0.0040]	[0.0027]
$\hat{y}_{h,t+1} \ln(C_{t+1}/C_t)$	-0.0125	0.0175	-0.0077	0.0129
	[0.0105]	[0.0014]	[0.0105]	[0.0141]
$\hat{y}_{h,t+1} \ln(Q_{t+1}/Q_t)$	0.0414**	-0.0537**	0.0412**	-0.0532**
	[0.0078]	[0.0111]	[0.0077]	[0.0111]
$\hat{y}_{h,t+1} \ln\left(C_{t+1}/\bar{C}\right)$	0.0056	-0.0109	0.0104	-0.0018
	[0.0104]	[0.0147]	[0.0103]	[0.0147]
$\hat{y}_{h,t+1} \ln\left(Q_{t+1}/\bar{Q}\right)$	-0.0188**	0.0228**	-0.0144*	0.0171
	[0.0080]	[0.0110]	[0.0080]	[0.0110]
$\hat{y}^2_{h,t+1}$	0.0092	-0.0099	0.0024	0.0013
	[0.0115]	[0.00163]	[0.0115]	[0.0163]
$\widehat{ry}_{t+1}$	0.0071**	-0.0100**	-0.0001	0.0001
	[0.0026]	[0.0036]	[0.0026]	[0.0036]
$\widehat{ry}_{t+1} \ln(C_{t+1}/C_t)$	-0.0049**	0.0063*	-0.0055**	0.0070**
	[0.0023]	[0.0033]	[0.0024]	[0.0033]
$\widehat{ry}_{t+1} \ln(Q_{t+1}/Q_t)$	0.0014	-0.0014	0.0017*	-0.0019
	[0.0010]	[0.0015]	[0.0010]	[0.0015]
$\widehat{ry}_{t+1} \ln\left(C_{t+1}/\bar{C}\right)$	0.0012	-0.0021	0.0007	-0.0012
	[0.0016]	[0.0022]	[0.0016]	[0.0022]
$\widehat{ry}_{t+1} \ln\left(Q_{t+1}/\bar{Q}\right)$	-0.0002	0.0001	-0.0010	0.0012
	[0.0010]	[0.0013]	[0.0009]	[0.0013]
$\widehat{ry}^2_{t+1}$	-0.0050**	0.0069**	0.0010	-0.0013
	[0.0024]	[0.0033]	[0.0024]	[0.0033]
$\hat{y}_{h,t+1}\widehat{ry}_{t+1}$	0.036	-0.0459	-0.0043	0.0072
	[0.022]	[0.0292]	[0.0222]	[0.0292]
$\Delta\left(\ln\left(C_{t+1}/\bar{C}\right)\right)^2$	0.621**	-0.808	0.622**	-0.805**
	[0.114]	[0.155]	[0.087]	[0.155]
$\Delta\left(\ln\left(Q_{t+1}/\bar{Q}\right)\right)^2$	0.099**	-0.151**	0.143**	-0.211**
	[0.048]	[0.067]	[0.048]	[0.067]
$\Delta\left(\ln\left(C_{t+1}/\bar{C}\right)\ln\left(Q_{t+1}/\bar{Q}\right)\right)$	-0.348**	0.454**	-0.422**	0.544**
	[0.148]	[0.208]	[0.148]	[0.208]
$\Delta \ln$ (family size)	0.220	-0.311	0.281	-0.394
	[0.355]	[0.505]	[0.355]	[0.505]
Δchildren	-0.078	0.117	-0.063	0.097
	[0.105]	[0.148]	[0.104]	[0.148]
Δchildren younger than 2	-1.034**	1.279**	-0.904**	1.096**
	[0.316]	[0.449]	[0.316]	[0.449]
Δhead works	0.607*	-0.831*	0.651**	-0.868**
	[0.321]	[0.439]	[0.321]	[0.439]
Δspouse works	-0.440**	0.584**	-0.315*	0.446*
	[0.166]	[0.232]	[0.166]	[0.232]
J-Statistic/$P > \chi^2$	81.2/0.95		88.9/-	
n. observations/n. cohorts			263/7	

See note at table 9.