PARTICIPATION OF GREEK MARRIED WOMEN IN FULL-TIME PAID EMPLOYMENT

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Abstract
In this paper we analyze the static labor supply behavior of married women in Greece using micro data from the National Household Budget Survey of 1998/99. To that end, a conventional Probit model is employed for the estimation of the participation decision; a typical OLS regression corrected for selectivity bias is used for the estimation of the wage equation; and, a Tobit procedure is utilized for the estimation of the labor supply function. The econometric results confirm the presence of a sample selection criterion that separates working from non-working married women. The labor force participation decision is affected by the presence of children, human capital characteristics, region of residence, husbands' earnings and non-work income. The same factors appear to influence, in a plausible manner, the hours of work decision. Moreover, the labor supply elasticity with respect to the hourly wage is about 0.84 (calculated at the sample means). Finally, human capital variables such as education and age appear to explain adequately the observed wage structure of Greek married women.

JEL Classification: J22, J48, C24

Keywords: Labor supply, Married women, Greece

1. Introduction

As a rule, female LFP rates are substantially lower that those for men and have attracted the attention of many labor economists worldwide. It is well known that female economic behavior with regard to labor market decisions depends on several factors that result in complex labor supply schedules over the life cycle. This beha-

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vior has been at the core of labor supply research since the early seventies and it has focused on the investigation of the factors that influence the participation decision and its extent, the explanation of non-participation, the role of preferences and the interdependencies with decisions concerning marriage, child-bearing, divorce and retirement, (Pollak, 2003).

The Greek LFP rate of women increased from 29.8 per cent in 1980 to 35.1 per cent in 1989 and to almost 39 per cent in 2002. In the same period and in the pursuit of their labor market objectives, Greek women acquired higher levels of formal education, delayed marriage and reduced childbearing, (Kanellopoulos and Mavromaras, 2002). Despite recent increases however, Greek women display low levels of LFP when they are compared with their counterparts in other European countries and the USA. Table 1 presents information regarding the LFP of women between the ages of 15 and 64 in the USA, the EU and Greece. With regard now to married women, Greece again exhibits low rates of LFP. According to Meghir *et. al.* (1989) the results of the Greek Labor Force Survey for 1981 indicate that the LFP of married women is higher than that for women in general, as expected, much lower than the corresponding rate for Greek men and it does not exceed the proportion of 36 per cent of the female active population. Evidence from published data also reveals that for the most productive ages, 25-49 years, the LFP of married women in 1983 was about 41% while in 1991 it exceeded the 50% mark, (Kanellopoulou 1994). Finally, in the period 1994-1997 Greece ranks 8th among EU-11 member-states in the LFP rate of married women (Pietro-Rondriquez J., Rodriquez-Gutierrez C. 2003). The average LFP rate of married women in the 11 member states was about 53 per cent, while Greece exhibited a rate of about 44 per cent.

Table 1. Labor Force Participation Rates of Women, aged 15-64 years

	1990	1997	1998	1999	2000	2001
United States	67.8	70.7	70.7	70.7	70.8	70.5
European Union	54.8	58.0	58.7	59.4	60.1	60.1
Greece	42.6	46.0	48.5	49.7	49.7	48.8

Source: OECD Employment Outlook 2002

The LFP of Greek women and the interrelated issues have not been studied to any substantial extent. This is mainly due to the lack of informative data sets available to researchers. Data sets amenable to labor market studies have become available only recently. The 1998-99 NHBS is a case in point and contains the minimum data requirements for carrying out research on LFP issues. The survey contains information on earnings and income, hours of work as well as personal, family and employment characteristics of women.

The major objective of this paper is to investigate the labor supply schedule of married women in Greece. The investigation concerns the Labor Force Participation (LFP) of married women, the offered market wage and the amount of hours supplied in the market. For this purpose, we will employ cross-sectional data from the 1998-99 National Household Budget Survey (NHBS) and contemporary econometric tools. The paper is structured as follows. Section 2 briefly reviews the theoretical and empirical issues concerning labor force participation. Section 3 presents information in the form of descriptive statistics of LFP of married women as well as of the related economic and demographic variables. Section 4 reports the results of estimation of the participation, wage and labor supply equations. A discussion of the results is also contained in this section. Major findings are summarized in Section 5, which also includes suggestions for further research.

2. Theoretical and Econometric considerations

One of the major objectives of most labor supply studies is the identification and investigation of the factors that influence the labor force participation decision. As a rule, the theoretical approach is based on the utility-maximizing framework of consumer theory and time allocation. More specifically, the labor supply behavior of an individual is determined primarily by the relationship between the market wage offered and the shadow wage, i.e., the value of time in non market activities. The first wage pertains to the market demand function while the second to the individual's supply function.[1] The empirical findings in the relevant literature indicate that women's labor supply behavior, i.e., decision to participate and labor supply in term of hours allocated to work, is responsive to changes in wage rates, human capital characteristics, non-labor income, husband's wage, if the woman is married, and to the presence of children, particularly of pre-school age[2] in the household.

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1. For a detailed presentation of these issues see (Becker, 1965; Heckman, 1974; Smith, 1980; Killingsworth 1983; Mroz, 1987).
2. Killingsworth and Heckman (1986) provide a comprehensive review of the related literature.

The simultaneous character (participation and the extent of labor supply) of the labor supply decisions has been addressed in a large number of studies and the same holds for the econometric issues associated with sample selection, i.e., the fact that wages offered are not observed for non participants. The early work of Heckman on the development of sample selection bias-corrected techniques played an important role in more recent labor supply studies (see Heckman, 1974, 1979; Killingsworth, 1983; and Killingsworth and Heckman, 1986, for an extensive and detailed review of the issues involved).

Assuming that there are no fixed costs of entering and leaving the labor market and that the hours of work vary freely, the married woman's labor supply behaviour is shaped by two relations. The first is associated with the market wage rate, w_{im}, and the second with the shadow value of time in non market activities, w_{ir}. Following Franz (1985) we assume that the market wage w_{im} is determined by a set of independent variables X_{wi},

$$w_{im} = X_{wi}\beta_w + \varepsilon_{wi} \tag{1}$$

where, ε_{wi} is a normally distributed random error. The shadow wage equation (at zero hours of work), w_{ir}, is also a linear function of X_{ri}:

$$w_{ir} = X_{ri}\beta_r + \varepsilon_{ri} \tag{2}$$

where, ε_{ri} represents a random normally distributed error.

Taking into consideration the decision rule for participation in the labor market, i.e., $w_{im} > w_{ir}$, the reduced form equation of the labor supply function is as follows:

$$w_{im} = \qquad X_{wi}\beta_w + \varepsilon_{wi}$$

$$h_i = \left\{ \begin{array}{lll} 0 & \text{if} & w_{ri} \geq w_{im} \\[2mm] X_h\beta_h + \varepsilon_{hi} & \text{if} & w_{ri} < w_{im} \end{array} \right. \tag{3}$$

where, h_i represents working hours for the sub-sample of working women, X_{hi} is the set of the explanatory variables associated with h_i, β_h and ε_{hi}[3] are the corresponding parameters and errors, respectively. Given the simultaneous character of both, the

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3. Note that $\varepsilon_{hi} = \varepsilon_{wi} - \varepsilon_{ri}$. Since ε_{wi} and ε_{ri} are jointly normally distributed, then ε_{hi} and ε_{wi} are also jointly normally distributed.

participation decision and the extent of labor supply, if the observed variables in X_{wi} include one variable which does not appear in X_{ri}, then the system of equations (1) and (2) is identified (Wooldridge, 2002). The behavioral model of the woman's labor supply schedule represented in (3) cannot be estimated with simple regression techniques since market wage rates for non-working women are not observed.

Therefore, if the estimation of the wage rate equation in (3) is restricted to working women only, then the conditional expected value of is given by:

$$
\begin{aligned}
E(w_{im}|h_i > 0) &= E(w_{im}|\varepsilon_{hi} > -X_{hi}\beta_h) \\
&= X_{wi}\beta_w + E(\varepsilon_{wi}|\varepsilon_{hi} > -X_{hi}\beta_h) \\
&= X_{wi}\beta_w + \left(\frac{\rho_{hw}}{\sigma_h}\right)M_i
\end{aligned}
\tag{4}
$$

where, $M_i \equiv \left[\dfrac{\phi(z_i)}{\Phi(-Z_i)}\right]$ is the Inverse Mill's ratio and $Z_i \equiv -\dfrac{(X_{hi}\beta_h)}{\sigma_h}$

Thus, the market wage function to be estimated is:

$$
w_{im} = X_{wi}\beta_w + \left(\frac{\rho_{hw}}{\sigma_h}\right)M_i + \varepsilon_{mi}
\tag{5}
$$

Since the value of M_i is not known, equation (5) cannot be estimated via conventional methods. A consistent estimate of M_i can be obtained by maximizing the probability that a married woman is working, conditional on the variables included in Z_i. The estimated coefficient $\hat{M}_i$ for each woman in the entire sample is then included as an additional explanatory variable in the market wage rate equation (Wooldridge, 2002).

Given the estimation results of the wage equation (5), we can proceed with the estimation of the structural labor supply function for the entire population of married women, (i.e., working women and non-working ones). Since the distribution of hours is truncated at zero hours, we use the Tobit maximum likelihood technique to estimate the labor supply function (Franz, 1985; Averrett and Hotchkiss, 1997). This procedure requires the use of a latent variable h_i^*, which is determined as follows:

$$
h_i^* = X_{hi}\beta_h + \varepsilon_{hi}
$$
$$
h_i = \begin{cases} h_i^* & \text{if } h_i^* > 0 \\ 0 & \text{if } h_i^* \le 0 \end{cases}
\tag{6}
$$

Maximizing the underlying likelihood function of expression (6) we are able to obtain estimates of and, as well as the probability of participation:

$$L\left(\beta_h, \sigma_h^2\right) = \left[\prod_{h_i \leq 0} P\left(h_i = 0\right)\right]\left[\prod_{h_i > 0} P\left(h_i = h_i^*\right)\right]$$

$$= \left[\prod_{h_i \leq 0} \Phi\left(-\frac{X_{hi}\beta_h}{\sigma_h}\right)\right]\left[\prod_{h_i > 0} \phi\left(\frac{X_{hi}\beta_h}{\sigma_h}\right)\right] \tag{7}$$

Finally, in order to obtain an estimate of the implied labor supply elasticity with respect to the market wage we first need to distinguish the determinants of the labor supply decision from the determinants of the market wage rate. This is necessary since we lack reliable data on the determinants of market wages, i.e., experience, vocational training, etc. Thus, the parameter estimate of the predicted market wage in the Tobit equation is expected to be biased. To avoid this problem and following Heckman (1980) and Franz (1985) we need to determine one variable that clearly affects market wages and then use it as a proxy for wages in the labor supply equation.[4] In this case, the market wage equation and the labor supply equation can be estimated independently.

3. Data and variable definitions

The data utilized in the empirical analysis are extracted from the 1998-99 NHBS, which is carried out by the National Statistical Service of Greece. They refer to women between the ages of 15 and 64, married,[5] with spouse present and reporting (the spouse) positive income from work in the previous year (1998). We have dropped from the sample a) those women who were employed in temporary/part-time jobs or in farming in 1998, since we do not know the extent of this employment, i.e., hours of work on a yearly basis, b) self-employed women, and c) students. The total number of women dropped from the sample, for the reasons above, is 394.[6] Thus, a

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4. Heckman, (1980) and Franz, (1985) use "experience" and "vocational training", respectively. In the present application we use "education", which is readily available.

5. There is no doubt that the decisions regarding marriage and labor supply are interrelated. However, the simultaneous investigation of these decisions requires the use of panel data which are not, at present, at our disposal.

6. This figure also includes those married women who worked in 1998 but didn't provide information on either their annual earnings from labor or their working hours.

woman is classified as working if she has positive income from labor in 1998 and satisfies the aforementioned sample selection criteria. After these adjustments are made, the data set consists of 606 married women who worked in full time jobs in 1998 and of 854 non-working ones.[7] The comparison between working and non-working women reveals that working women are younger, more educated, have more children below the age of 13, have less property income and more capital income than non-working ones and most of them live in the greater Athens conurbation.

The participation decision is represented by a dummy variable (PART) which takes the value of 1 if the married woman reported positive income from labor in 1998 and zero otherwise, (Killingsworth, 1983 pp. 236 and 239). In this application the important "hours of work" variable (HOURS) is measured by the variable "usual hours of work on a weekly basis" reported in the survey. The equally important market hourly wage rate (WAGE) for working women was obtained by first transforming "annual earnings from labor" to "weekly earnings from labor" and then by dividing through by HOURS.[8] Although this indirect method of obtaining wage rates reduces the efficiency of the estimates of labor supply parameters, it does not introduce bias or inconsistency (Killingsworth, 1983).

In the Mincerian tradition, the (logarithm of) market wage rate is assumed to depend on schooling and labor market experience. In our case, schooling is measured by the education variable (EDUC), which is a continuous variable of the completed years of schooling. Furthermore, empirical evidence suggests that a married woman with higher education is more likely to be in the labor force. Since information on labor market experience, as such, is not available we will attempt to capture the effect of "labor market experience" on wages by employing the age (AGE) variable, which is readily available.

A large number of households in our sample, more than 50 per cent, report income from sources other than work. This non-work income is composed, mainly, of property income (PROPERTY) and capital income, (CAPITAL). Property income consists exclusively of income from rents while capital includes income from interest payments and dividends. We examine separately the two sources of non-work income because, in the static framework adopted, property income is a more permanent source of income than capital income and, thus, only the former is expected to have a significant effect on labor supply decisions. In general, and if we assume that

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7. A "non-working married woman" is one who does not report income from labor in 1998 but satisfies all the remaining selection criteria, i.e., age between 15 -64, spouse present and reporting positive income from work.

8. Overtime pay is included in 'annual earnings from labor' but hours of overtime are not available.

leisure is a normal good, an increase in non-work income is expected to reduce both the likelihood of participation in the labor market and the extent of labor supply.

In the context of a household/family labor supply model, the income earned by the husband plays an important role in determining the labor supply choices of his wife. To capture this interrelationship between the labor supply decisions of the family members we have employed the variable which represents the husband's annual earnings from labor, (HUSLAB). It is reasonable to expect a negative relationship between HUSLAB and the likelihood of the wife being in the labor force, *ceteris paribus*.

The composition of the household is also expected to be an important factor in the analysis of the wife's time allocation decisions. We have constructed the variable (NKIDL13) to represent the number of children of less than 13 years old in the household. This variable is expected to exert a negative impact on the likelihood of labor force participation of married women and especially of young married women, *ceteris paribus*.

Finally, the region of residence is also expected to affect preferences for work. Published data for Greece show that the LFP for women exhibits a drastic increase in major conurbations (Kanellopoulos and Mavromaras, 2002). In the present application, the dummy variable (ATTIKI) is constructed to reflect regional effects. It takes the value of 1 if the household is situated in the prefecture of Attiki and zero otherwise.

Table 2 presents the sample means of all the exogenous and endogenous variables which are used for the estimation of the participation equation, the market wage function and the hours of work equation.

Table 2. Descriptive Statistics

	Non-Workers	*Workers*	*Total Sample*
Number of observations	854	606	1640
PART	-	-	0.41
			(0.49)
HOURS	-	36.61	-
		(9.35)	
WAGE[2]	-	1985.75	-
		(1456.66)	
NKIDL13	0.72	0.82	0.76
	(0.91)	(0.86)	(0.89)
PROPERTY[2a]	158587	117642	141592
	(545953)	(413614)	(495590)
CAPITAL[2a]	101539	414839	231580
	(722213)	(4825744)	(3159983)
EDUC[1]	9.48	13.20	11.02
	(3.73)	(4.18)	(4.33)
AGE[1]	40.87	38.99	40.09
	(10.52)	(7.69)	(9.49)
HUSLAB[2a]	4029071	4283222	4134561
	(2695528)	(2932595)	(2798187)
ATTIKI[3]	0.51	0.63	0.56
	(0.50)	(0.48)	(0.56)

Source: National Household Budget Survey-Greece, 1998-1999
[1]In Years, [2]In drachmas, [3]Percentage
* Standard deviations in parentheses.

4. Empirical results

The statistical package LIMDEP 7.0 was used for the estimation of the model. Table 3 presents the results of the participation equation and Table 4 the estimated wage and labor supply functions for married women in Greece. The participation model predicts correctly the status of 71.5% of the sample, i.e., of both workers and non-workers. For the sub-sample of workers the correct predictions were relatively lower (58.1%) than that of non workers (81.1%). For the participation equation a goodness of fit measure based on the likelihood ratio test statistic (or McFadden's R^2) is computed to be 0.181, which represents a satisfactory fit of our model. For the wage selection regression the conventional R^2 measure is 0.268 indicating a rather poor fit. It is however, much better than those reported in the international literature where, R^2 values for wage-generating functions seldom exceed the 10% mark. A mis-specification Cragg test has also been conducted and it did not reveal any significant specification problems of our labor supply-tobit model.

Several factors appear to influence the married woman's labor force participation decisions, shown in Table 3. The presence of children of less than 13 years old tends, as expected, to increase the housewife's value of time in the household, thus affecting negatively the probability of participation in the labor market in periods in which the need for childcare or housework is high.[9] The relevant parameter estimate has the expected sign and it is statistically significant. The estimated coefficients on education and age are also statistically significant with the expected sign. This is in agreement with the finding reported by Meghir *et al.*, (1989) and supports the hypothesis that existing human capital endowments and fertility issues affect the probability of participation in Greece.[10] One can also observe that husband's earnings have a negative effect on the wife's probability of participation in full time employment, indicating that intra-family time allocation decisions are interdependent. As expected, property income has a strong negative effect on participation while the effect of capital income is positive and hardly significant.[11] Three factors exhibit a strong positive effect on participation. First, more educated married women are more likely to be employed in a full time job than less educated ones. Second, a higher probability is also observed for women that live in the greater Athens conurbation and, third, the age-participation profile does exist and it is non-linear.

9. More age groups for children and more regions were originally incorporated. However, a joint statistical test revealed that a finer age and region classification could not be supported by the data.
10. In Meghir *et al.*, (1989), p. 400, Table 1, the estimated coefficients for the effect of education and children of less than six years on participation are 0.106 and -0.141, respectively.
11. Nevertheless, the positive sign of the CAPITAL variable is interesting and it certainly requires further investigation.

Table 3. Estimated Results of the Participation Equation

Variables	Participation Equation		Marginal Effects
	Estimated Coefficients	t-values	Estimated Coefficients
Intercept	-6.038	-8.953***	-2.322***
NKIDL13	-.086	-1.807*	-.033*
PROPERTY	-.265	-3.292***	-.102***
CAPITAL	.047	1.687*	.018*
EDUC	.139	14.458***	.053***
AGE	.234	6.900***	.090***
AGE squared	-.002	-7.002***	-.001***
HUSLAB	-.041	-3.021***	-.016***
ATTIKI	.150	2.037**	.057**
Observations			1460
Log-Likelihood			-811.55
Mc Fadden			.181
Chi – squared (8d.f.)			358.55

Source: National Household Budget Survey-Greece, 1998-1999
Asterisks indicate statistical significance, *** at 1%, ** at 5%, * at 10%.

Turning now to the estimated results of the wage –selection equation, Table 4, we observe that both education and age play a statistically important role in wage formation. The estimated coefficients have the expected signs and indicate that years of education and age exert a strong positive effect on wage rates. Lastly, it should be noted that our test for the presence of selectivity bias could not be rejected by the data indicating that such a bias does really exist. The high and positive value of the selection term indicates that the unobserved variables that raise the probability of participation also increase the market wage (Heckman, 1980, p.230).

Table 4. Estimated Results of the Wage amd Labor Supply Functions

Variables	Hourly Wage		Hours Worked		Marginal Effects
	Estimated Coefficients	t-values	Estimated Coefficients	t-values	Estimated Coefficients
Intercept	2.6652	2.484***	-175.43	-8.442***	-77.596***
NKIDL13	-	-	-3.220	-2.279**	-1.424**
PROPERTY	-	-	-7.674	-3.170***	-3.394***
CAPITAL	-	-	.5845	2.001**	.2585**
EDUC	.1214	6.847***	3.698	13.166***	1.635***
AGE	.1189	2.959***	7.309	7.014***	3.232***
AGE squared	-.0012	-2.452***	-.0936	-7.263***	-.041***
HUSLAB	-	-	-1.115	-2.717***	-.493***
ATTIKI	-	-	6.270	2.834***	2.773***
Lamda	.5391	2.556***			
R-squared	.268				
Log likelihood			-3484.522		

Source: National Household Budget Survey-Greece, 1998-1999
Asterisks indicate statistical significance, *** at 1%, ** at 5%, * at 10%.

The Tobit estimates of the labor supply equation are also reported in Table 4. The estimated coefficients have the expected signs and they are statistically significant. They show that the extent of labor supply is positively affected by age, education and region of residence and negatively affected by non-work income, husband's earnings and the number of children of less than 13 years old. The two age variables have the expected signs indicating that the lifetime labor supply profile is non-linear. Furthermore, husband's earnings exert a negative impact on the wife's labor supply schedule, indicating that significant substitutabilities do exist within the Greek households.

From the obtained results we were able to calculate a measure of the implied labor supply elasticity with respect to hourly wage rates. The elasticity is evaluated at sample means and is found to be 0.83.[12] This value does not differ considerably from those elasticities reported in the review article by Killingsworth and Heckman (1986) and it provides evidence for the rather inelastic character of the labor supply function of married women in the Greek labor market.

Finally, column 3 of Table 4 presents the marginal effects of the labor supply function at sample means. The marginal effects are obtained by multiplying the labour supply estimates of Table 4 (column 2) by an adjustment factor. This adjustment factor is estimated at the mean values of all the explanatory variables and shows the estimated probability of observing a positive response, ($h>0$). In our case, the adjustment factor is equal to 0.44, which means that the estimated probability of a woman being in the labor force is about 0.44, (Wooldridge, 2002).[13] Thus, the effect of one more year of schooling on hours supplied is about 1.6 additional hours per week. Similarly, a 10 per cent increase in property income reduces the wife's expected supplied hours by 3.3 hours per week.

5. Conclusions

The main purpose of this paper was to apply the well established theoretical and empirical methodology of labor supply analysis, developed over the last 30 years, in order to estimate the labor supply schedule of married women in Greece. The major

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12. The elasticity estimate is calculated according to the instructions of J. Heckman (1980, p. 228, Table 5.3), i.e., by dividing the EDUC coefficient in the wage function into the EDUC coefficient in the labor supply function, and dividing by average weekly hours supplied by working women (36.61 hours). See also Killingsworth and Heckman, 1986; Franz, 1985.

13. From equation 6, the partial effects at sample means are given by:

$$\frac{\partial E(h_i|X_i)}{\partial X_i} = \phi\left(\frac{\overline{X}\hat{\beta}_h}{\hat{\sigma}_h}\right) \cdot \hat{\beta} = \widehat{\text{Prob}}(h>0|X) \cdot \hat{\beta}$$

motive for this project, apart from the extremely limited amount of related research in Greece, is that the required micro data have only recently started to be collected in household budget surveys, which are carried out in a systematic way by the National Statistical Service of Greece. Using data from the 1998/99 NHBS and modern econometric tools we were able to identify the major factors that influence female labor market participation, the offered market wages as well as the sensitivity of the labor supply to market wage rate changes, in Greece. Our findings are theoretically plausible and, in general, consistent with earlier labor supply studies for married women worldwide.

Our results indicate that the labor force participation decision of Greek married women is shaped by human capital variables, i.e., education and age, by the composition of the household and, in particular, the presence of children of primary school age, the existence of property income, the size of husband's labor income and by geographical factors. With respect to the market wage, our findings indicate that they are influenced by the same human capital variables and by unobserved factors, i.e., the presence of selectivity could not be rejected by the data. Finally, the estimation of a standard labor supply equation revealed that hours of work in full time paid employment by married women are determined by the same factors that shape the participation decision.

To the extent that an increase in female labor force participation is a target of employment policy, our results warrant further investigation of measures that reduce the time requirements of child care in the household. Public and private day-care centers and the "all day" primary school, recently introduced by the Ministry of Education in the Greek public school system are cases that deserve further investigation. The same holds for the extent of labor supply in full time paid employment. Finally, the estimated labor supply elasticity indicates that an increase in the market wage will cause an increase in hours supplied, albeit less than analogous, i.e., labor supply is wage inelastic.

Undoubtedly, more complete and informative labor and employment data sets are needed in the case of Greece. In addition, since the decisions concerning various labor supply aspects are not of a static character, emphasis should be placed on the more dynamic panel data bases, currently created in Greece and the EU. The use of panel data is expected to shed more light on the interdependencies of labor supply and time allocation, with issues concerning marriage, fertility, education, retirement, etc.

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