INTERGENERATIONAL HEALTH MOBILITY: AN EMPIRICAL APPROACH BASED ON THE ECHP

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ABSTRACT

This paper is focused on the study of intergenerational health mobility using data from the European Community Household Panel (ECHP). In particular, the relationships between self-assessed health of parents and their sons are analysed. The evidence obtained suggests that sons' reported health depends significantly on the self-assessed health of their fathers.

KEYWORDS: Intergenerational mobility, health mobility, health inequalities, European Community Household Panel (ECHP).

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1. INTRODUCTION

During the last years, population health has been considered as a fundamental aspect in all countries and one of the most important indicators of life quality. In this way, policy makers have an increased interest in social inequalities in health and on those characteristics of individuals that are related to health.

Traditionally, population health has been measured through different indicators such as life expectancy, infant mortality, death rates, disability, self-assessed health, happiness or well being. However, health and its outcomes continue being a complex matter and therefore difficult to measure. By this way, individuals' health has being specified as an individual characteristic function based on different inputs (Grossman, 1972; Bound, 1990; Smith, 1999; Fuchs, 2004). Thus, one of the most commonly used indicators of individuals' health status is Self-Assessed Health (SAH) which is classified into five categories reflecting negative health rating (bad or very bad health) *versus* positive or neutral health ratings (very good, good or fair health). In this sense, there exist important relationships between health and socioeconomic status (Benzeval *et al.*, 2000; Salas, 2002; Adams *et al.*, 2003; Fritjers *et al.*, 2003) and between health and lifestyles (Contoyannis and Jones, 2004).

In recent papers, some authors have focused their attention on the dynamics of health. However, health mobility studies are mainly concerned with the evolution over time of individual's health. Rice *et al*. (2004) analyse the dynamics of a categorical indicator of self-assessed health using eight waves

(1991-1998) of the British Household Panel Survey (BHPS). Hauck and Rice (2004) identify whether individuals within different social and economic strata experience differential mobility over time in their respective mental health distributions using the BHPS. Jones and López-Nicolás (2004) define an index of health-related income mobility as one minus the ratio by which the concentration index for the joint distribution of longitudinal averages differs from the weighted average of the cross sectional concentration indices. However, empirical analysis of intergenerational health dynamics has not received much attention although there exists evidence suggesting that sons' reported health depends significantly on the self-assessed health of their parents. In this way, Case *et al*. (2004) suggest that health is a potentially important transmission mechanism for the intergenerational correlation of income and education. These authors find that, controlling for parental income, education and social class, children who have poor health also have significantly lower educational attainment, poorer adult health and lower socio-economic status. More recently, Doyle *et al*. (2005) have investigated the relationship between key parental characteristics of education and income on child health using data from the Health Survey of England.

In this paper, we will focus on intergenerational health mobility in Spain using the information contained in the European Community Household Panel (ECHP). We will use the econometric framework proposed by Solon (1992) and Zimmermam (1992) considering averages of individual's health on subsequent years as a measure of long term health status. Following these theoretical and methodological approaches, health mobility can be analysed across socio-economic groups, educational attainment and social class group.

The paper is organised as follows. Section two describes the data sources we have used and characteristics of the variables involved in our analysis together with the principal methodological decisions we have taken. In section three, we describe intergenerational income health from a theoretical and empirical framework and finally, section four gives a summary and conclusion.

2. DATA DESCRIPTION: THE EUROPEAN COMMUNITY HOUSEHOLD PANEL (ECHP)

The source of data used in this paper is taken from the European Community Household Panel for Spain (ECHP). This survey contains data on individuals and households for the European Union countries with eight waves available (1994-2001)[1]. The main advantage is that information is homogeneous among countries since the questionnaire is similar across them. This source of data is coordinated by the *European Commission's Statistical Office* (EUROSTAT). The ECHP is a representative database of households of different European Union countries, it was elaborated for the first time in 1994 and it was composed by 60,500 households (approximately 170,000 individuals). In the case of Spain, the first wave was composed by 7,206 households (23,025 individuals). TABLE 1 includes information about households and individuals´ sample composition for Spain.

Also, this survey includes rich new information about income, education, employment, health, etc. In this sense, it is important to highlight that it is the first

[1] See Peracchi (2002).

fixed and harmonized panel for studying socio-economic factors of the households and individuals inside the European Union.

The variable we use as a proxy of individual's health status is the SAH that each individual reports of their own health status and the possible responses are ordered qualitatively. Thus, SAH variable is a subjective response to the question "How is your heath in general?" and it takes the values "1" (very good), "2" (good), "3" (fair), "4" (bad) and "5" (very bad). This variable is also included in other longitudinal surveys, such as the *British Household Panel Survey* (BHPS) in the case of the United Kingdom, the *Canadian National Population Health Survey* (NPHS) for Canada, the *National Health Interview Survey* (NHIS) for United States, etc., and it has facilitated recent research on individuals' health status explanation.

Also, it is important to point out the different distribution of SAH by gender. In this sense, men usually report better levels of SAH than women. This fact might reflect the different perception of health by gender (maybe because men´s life expectancy is shorter than women´s one). Another possible explanation of gender differentials, especially at older ages, is the mortality selection (Ahn, 2002). In this case, as the mortality rate is higher for men than for women, those who survive in higher mortality environment are on average genetically stronger than the survivors in lower mortality environment. For this reason, we classify individuals by gender.

The ECHP is particularly useful for the study of intergenerational health mobility because it provides data on the socio-economic status of both respondents and their parents. The starting point for this analysis of mobility is the existence of information for the same individuals in eight different periods. Thus, it is possible to study correlations in SAH. The main sample includes 692 father-son pairs, 872 mother-son pairs, 642 father-daughter pairs and 833 mother-daughter pairs from the ECHP. As an example, FIGURES 1 and 2 show the distribution of SAH (Sons and Daughter *versus* Fathers and Mothers) for years 1994 and 2001[2] and it suggests the different pattern of this variable. Also, TABLE 2 presents relative frequencies for the classification of SAH. It can be noticed that men report better health than women. Finally, TABLE 3 presents some summary statistics on the age and SAH of the main sample in 1994. So, the sample mean age for sons in the first wave is less than 30 (24.11 years old) while the sample mean for fathers is 55. Obviously, sons and daughters are observed at an earlier stage of their life cycle. This fact justifies that their mean SAH is lower and the standard deviation of their SAH is higher. Note that lower SAH means better health.

3. INTERGENERATIONAL HEALTH MOBILITY: THEORETICAL FRAMEWORK

In this section, we study the link between parents' self-assessed health and that of their children. Although there exist different approximations for the study of income mobility (Prais, 1955; Shorrocks, 1978; Bartholomew, 1973; Hart, 1976 and 1983; Maasoumi *et al*., 1986; Fields *et al*., 1996; Hammarstedt and

[2] Similar results are obtained for the other waves.

Palme, 2006), there exist few attempts to measure intergenerational health mobility.

In this paper, we analyse the level of dependence on inherited conditions and the potential for intergenerational health mobility in Spain. The basic model is the following[3]:

$$h_{1i} = \rho\, h_{0i} + \varepsilon_i\,, \qquad (1)$$

where h_{1i} represents self-assessed health for a son in family *i*, h_{0i} the same variable for his father and ρ the correlation between h_{0i} and h_{1i}, and ε_i is an error term. However, downward biases in the intergenerational correlations are generated because of the use of short-run proxies (for instance, using only single-year measures of health) and because of the characteristics of the data (Solon 1989).

So, we have extended the previous model incorporating age profiles. Thus, son's self assessed health in year *t* can be expressed as:

$$h_{1it} = h_{1i} + \alpha_1 + \beta_1 A_{1it} + \gamma_1 A_{1it}^2 + \upsilon_{1it}\,, \qquad (2)$$

where A_{1i} is the age of the son from family *i*. Also, parent's health status in year *s* can be expressed as:

$$h_{0is} = h_{0i} + \alpha_0 + \beta_0 A_{0is} + \gamma_0 A_{0is}^2 + \upsilon_{0is}\,, \qquad (3)$$

where A_{0is} is the age of the father (or mother) from family *i* in year *s*. Combining these equations, individual's observed status in year *t* can be expressed as a regression function of parent's observed status in year *s* considering age for both parents and individuals. However, estimates based on averages of several years of

[3] See Solon *et al*. (1991), Behrman and Taubman (1985) and Lillard and Willis (1978).

data are preferred over those in a cross-section due to the reduction of the effects of transitory variation in the measured variable (Solon, 1992; Couch and Dunn, 1997). Thus, taking into account the errors in variables bias, we consider average parent's health status over *T* years, so the model considered is:

$$h_{1it} = (\alpha_1 - \rho\alpha_0) + \rho\,\overline{h}_{0i} + \beta_1 A_{1it} + \gamma_1 A_{1it}^2 - \rho\beta_0 \overline{A}_{0i} - \rho\gamma_0 \overline{A_{0i}^2} + \varepsilon_i + \upsilon_{1it} - \rho\overline{\upsilon}_{0i}\,. \quad (4)$$

One important aspect is the definition of the individuals' self-assessed health. For the sons we have considered the response to the question "How is your health in general?" and it takes the values "1" (very good), "2" (good), "3" (fair), "4" (bad) and "5" very bad. For the fathers we have built a dummy variable which takes value one if fathers' response is good or very good health and zero otherwise.

In this way, regression analysis is used through specifying an ordered probit model (see Greene, 2003; Jones 2000 and 2001). Results using STATA 8.0. are shown in TABLES 4-7. Also, we have tested the specification of the models using a RESET test which suggests that the models are not mis-specified. We can observe that there exists a negative and highly significant relationship between son´s and daughter's self-assessed health and parents´ health. Thus, if parent´s health is good or very good, the probability of the son´s reporting good or very good health is higher.

Furthermore, we are interested in the impact of parental health on child health outcomes (controlling by the age), so we are going to compare the results with those obtained including in the analysis other instrumental variables such as household income and parental educational attainment. In fact, there exists a significant and positive effect of income, with children in poorer families having significantly worse health than children from richer families (Case *et al*., 2002). However, the measurement of income inequality can be affected by the heterogeneity of the households.

Our income variable is equivalised annual net household income (LINCOMEOCDMO) adjusted using OECD modified scale to take into account household size and composition. In this sense, we have used household information rendering the component family by using equivalence scales. The modified OECD scale gives a weight of 1 to the first adult, 0.5 to other persons aged 14 or over and 0.3 to each child aged less than 14. For each person, the "equivalised total net income" is calculated as its household total net income divided by equivalised household size. In this case, we use the logarithm of household´s income (OECD modified scale) taking into account the concavity in the health-income relationship (Gravelle, 1998; Jones and Wildman, 2004; Cantarero *et al*., 2005).

The second group of variables are referred to the maximum level of education completed. In the ECHP, education is classified into three categories based on ISCED classification: less than secondary level (ISCED 0-2), second stage of secondary level (ISCED 3) and third level (ISCED 5-7). Thus, a dummy variable which takes value 1 if parental educational attainment is less than secondary level has been included.

The econometric model that has be used to deal with these ordered categorical variables is the ordered probit model. However, the coefficients on the explanatory variables in the ordered probit model have a qualitative interpretation (see Jones, 2001). Thus, a positive coefficient means that an individual is more likely to report a higher category of self-assessed health. That is, worse health. On the other hand, a negative coefficient implies individuals are likely to report good or very good health. Also, we have test the specification of the models using a RESET test. TABLES 4-7 show the estimates for the ordered probit model obtained using the method of maximum likelihood estimation. These tables include coefficients and z-ratios (the z-ratio is computed by taking the ratio of the coefficient and the standard error). The results obtained suggest that the models are not mis-specified.

Thus, the qualitative interpretation is that those individuals whose father or mother report good or very good health are more likely to report good or very good health. So, we will say that there exists “Parents’ Health Effect”.

However, we are interested in the quantitative implications of these results. So, we have considered a new statistical model in which our dependent is a dichotomy variable which takes a value of 1 if the individual (son or daughter) reports good or very good health. As previously, factors such as age, average parents’ health and other instrumental variables (household income and education) could be relevant in explaining whether an individual reports good or very good health. In this way, a set of factors, gathered in a vector *x* explain this fact so the probability model is a regression:

$$E(y \mid x) = F(x, \beta)\ . \tag{5}$$

The set of parameters β reflects the impact of changes in x on the probability. In order to estimate this equation, a nonlinear specification of $F(.)$ can prevent logical inconsistency and the possibility of predicted probabilities outside the range [0,1]. The most common nonlinear parametric specifications are logit and probit models which have been analysed. So, we will use a latent variable interpretation (Jones, 2001; Greene, 2003) through probit models estimated by maximum likelihood estimation. Results for sons and fathers relationships are presented in TABLES 8-15.

Also, we have calculated marginal effects (for the continuous explanatory variables) and average effects (for the binary explanatory variables). On average the probability of a men whose father reports good or very good health is between 5 percent and 10 percent more than for the reference individual (see TABLE 8). Thus, a high value shows individual's health is influenced by his/her parents' SAH. On the other hand, a low value indicates a very mobile society in terms of health where individual's health does not depend on his/her parents' ones. Similar results are obtained when we consider mother-son pairs, father-daughter pairs and mother-daughter pairs (see TABLES 9-15).

4. CONCLUSIONS

In this paper intergenerational health mobility has been analyzed using the eight waves available of the ECHP data for Spain. Although, it is known that there exist other factors that affect individuals´ health, the relationship between parents´ and sons´ (or daughters') self-assessed health (intergenerational health mobility) should be taken into account. Despite the importance of the study of health mobility, few attempts have been made to measure intergenerational mobility not only in the European Union but also in other countries such as United States. In this sense, although there exists a growing and new literature on health mobility, we still know very little about intergenerational health mobility.

Therefore, this paper is concentrated on possible intergenerational correlations measuring the link between an individual's health and his/her parents'. In this paper, son-father, son-mother, daughter-father and daughter-mother pairs have been considered and we can conclude that those individuals whose parents report good or very good health are most probably to report better health. So, we will say that there exists "parents health effect".

We have studied the impact of both paternal and maternal influences on child health outcomes testing that individuals' health is influenced by their parents' health. We can conclude that on average, in Spain and using the information contained in the ECHP (1994-2001), the probability of an individual whose father (or mother) reports good or very good health is between 5 percent and 10 percent more than for the reference individual. Thus, the results obtained suggest that although there exists strong influence between personal characteristics (age, gender and household composition), education level, household income and perceived health status, it should be considered the relationship between individuals' SAH and their parents' SAH.

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TABLE 1

Household´s sample composition in ECHP (1994-2001). Number of unweighted observations

Country		Wave 1 (1994)	Wave 2 (1995)	Wave 3 (1996)	Wave 4 (1997)	Wave 5 (1998)	Wave 6 (1999)	Wave 7 (2000)	Wave 8 (2001)
Spain	Household	7206	6522	6267	5794	5485	5418	5132	4966
	Individuals	23025	20708	19712	18167	16728	16222	15048	14320

Source: Authors´ calculation based on ECHP data.

TABLE 2

Relative Frequencies (%) for the classifications of SAH. Country: Spain.

	SAH	Wave 1 (1994)	Wave 2 (1995)	Wave 3 (1996)	Wave 4 (1997)	Wave 5 (1998)	Wave 6 (1999)	Wave 7 (2000)	Wave 8 (2001)
FATHERS	Very Good (1)	10.81	11.31	11.76	8.99	9.04	7.66	7.65	6.61
	Good (2)	46.10	47.25	46.12	49.55	46.87	50.00	46.14	47.10
	Fair (3)	30.03	28.44	29.62	29.23	30.60	29.35	32.11	32.82
	Bad (4)	11.79	9.94	10.93	11.10	10.63	11.41	12.83	11.94
	Very Bad (5)	1.28	3.06	1.58	1.13	2.86	1.58	1.28	1.53
MOTHERS	Very Good (1)	9.85	9.48	9.37	6.62	8.24	6.74	5.22	4.90
	Good (2)	36.48	39.57	40.54	40.99	39.05	40.41	42.11	41.18
	Fair (3)	32.14	33.35	32.70	34.91	33.57	35.07	33.14	36.53
	Bad (4)	18.36	15.23	14.67	15.36	16.73	15.48	17.65	15.38
	Very Bad (5)	3.17	2.37	2.71	2.13	2.41	2.29	1.88	2.01
SONS	Very Good (1)	39.56	38.59	36.38	31.55	30.83	28.70	27.40	29.36
	Good (2)	48.90	50.61	52.38	56.75	57.79	59.79	62.04	58.09
	Fair (3)	8.76	8.70	8.47	9.36	8.68	8.66	8.90	10.81
	Bad (4)	2.45	1.63	2.38	2.07	2.17	2.65	1.34	1.46
	Very Bad (5)	0.32	0.48	0.40	0.27	0.53	0.19	0.32	0.28
DAUGHTERS	Very Good (1)	33.54	33.81	33.68	28.95	25.57	23.95	25.17	22.72
	Good (2)	52.09	53.54	54.44	59.02	60.46	64.01	62.31	60.03
	Fair (3)	10.61	10.79	9.44	9.20	10.98	10.20	10.34	13.84
	Bad (4)	2.94	1.86	2.15	2.55	2.57	1.70	1.70	2.44
	Very Bad (5)	0.82	0.00	0.28	0.28	0.42	0.14	0.48	0.96

Source: Authors’ calculation based on ECHP data

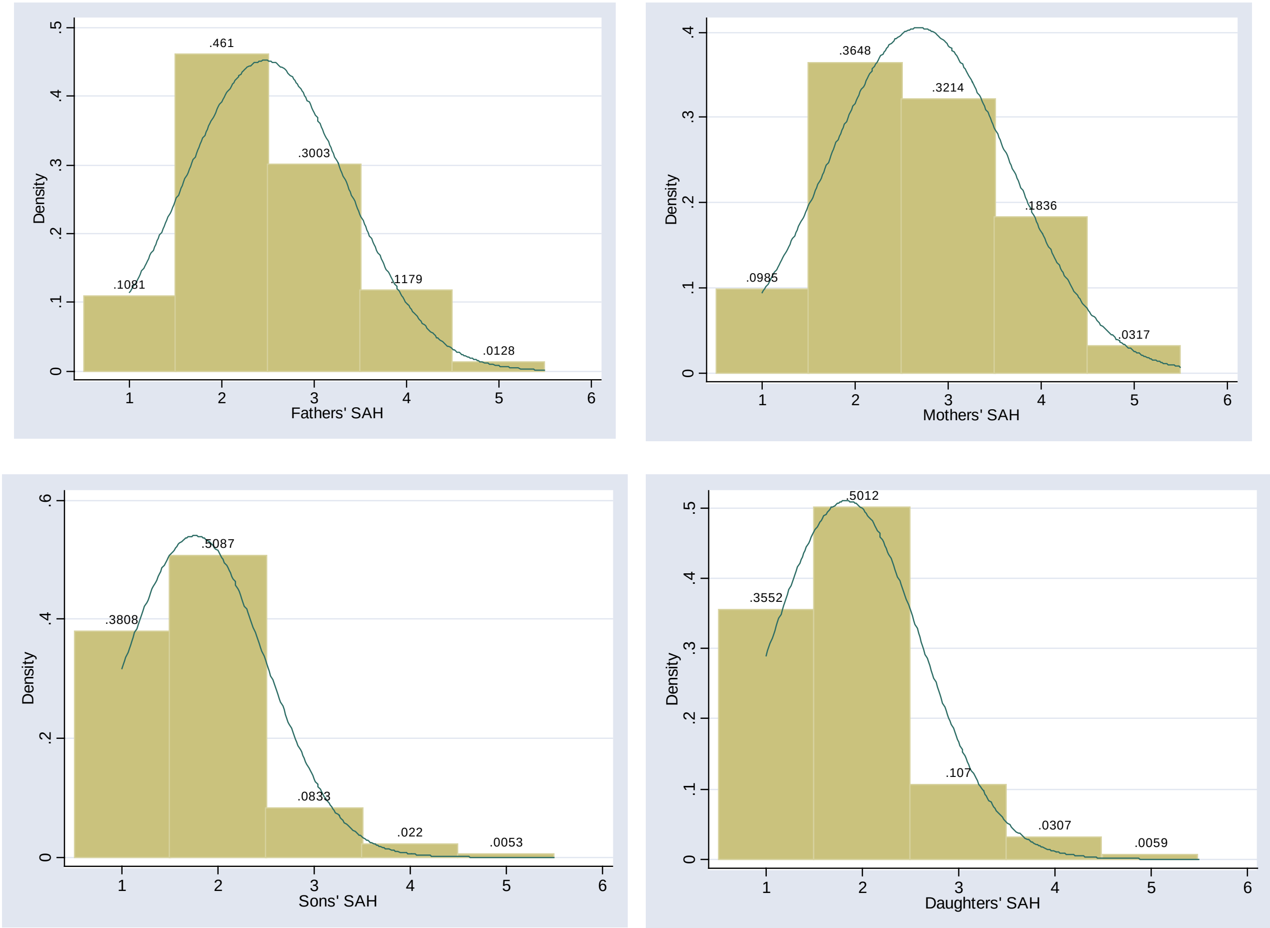
TABLE 3: Summary Statistics.

Variable	**1994**			
	Mean	**Standard deviation**	**Min.**	**Max.**
Son's age	24.11	7.35	16	63
Daughter' age	24.89	9.55	17	67
Father's age	54.81	9.55	33	85
Mother's age	55.54	10.46	34	85

Source: Author´s calculation based on ECHP (Spain).

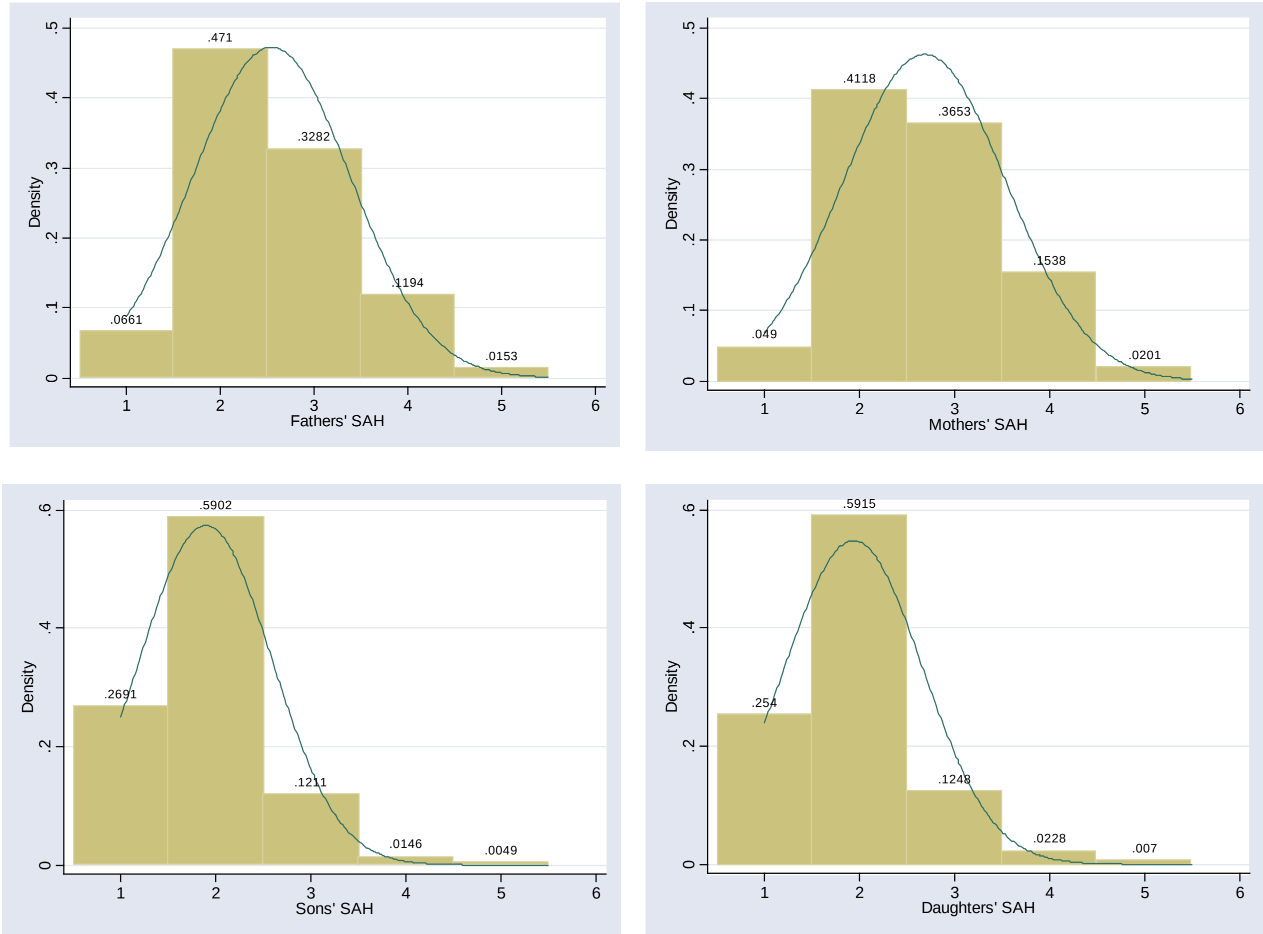
FIGURE 1

Distribution of SAH: Sons and Daughters versus Fathers and Mothers. Country: Spain. Year: 1994



Source: Authors' elaboration based on ECHP data.

FIGURE 2
Distribution of SAH: Sons and Daughters versus Fathers and Mothers. Country: Spain.
Year: 2001



Source: Authors' elaboration based on ECHP data.

TABLE 4
Ordered probit model estimation.
Dependent variable Son's SAH in 2001.

Year of son's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	-0.2635							-0.2549						
	(-2.99)	-0.2369						(-2.83)	-0.2189					
		(-2.63)							(-2.37)					
1995	-0.2438		-0.2564					-0.2230		-0.2422				
	(-2.74)		(-2.84)					(-2.43)		(-2.60)				
		-0.2667		-0.4376					-0.2532		-0.3872			
		(-2.97)		(-4.76)					(-2.73)		(-4.12)			
1996	-0.3110		-0.4445		-0.2547			-0.2999		-0.3959		-0.1981		
	(-3.46)		(-4.84)		(-2.72)			(-3.24)		(-4.23)		(-2.07)		
		-0.3653		-0.3333		-0.2562			-0.3127		-0.2848		-0.1984	
		(-4.02)		(-3.57)		(-2.64)			(-3.37)		(-2.97)		(-1.99)	
1997	-0.3238		-0.3077		-0.2223		-0.2185	-0.2753		-0.2516		-0.1659		-0.2316
	(-3.61)		(-3.31)		(-2.31)		(-2.26)	(-3.02)		(-2.64)		(-1.68)		(-2.35)
		0.3142		-0.2241		-0.2391			-0.2631		-0.1700		-0.2536	
1998		(-3.41)		(-2.34)		(-2.48)			(-2.80)		(-1.73)		(-2.58)	
	-0.3079		-0.1959		-0.1869			-0.2572		-0.1464		-0.1953		
	(-3.35)		(-2.05)		(--1.96)			(-2.75)		(-1.50)		(-2.01)		
1999		-0.2081		-0.1386					-0.1626		-0.1445			
		(-2.18)		(-1.45)					(-1.67)		(-1.49)			
	-0.2988		-0.0919					-0.2481		-0.0959				
	(-3.180)		(-0.97)					(-2.57)		(-0.99)				
2000		-0.1161							-0.1235					
		(-1.24)							(-1.29)					
	-0.1586							-0.1649						
	(-1.74)							(-1.78)						
2001														

Note: *z*-statistics are in parentheses

TABLE 5
Ordered probit model estimation.
Dependent variable Daughter's SAH in 2001.

Year of daughter's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
	-0.3307							-0.2793						
1994	(-3.54)							(-2.87)						
		-0.4179							-0.3429					
		(-4.33)							(-3.38)					
1995	-0.4589		-0.2307					-0.3897		-0.1938				
	(-4.80)		(-2.43)					(-3.88)		(-1.94)				
		-0.2663		-0.3547					-0.2333		-0.3168			
		(-2.85)		(-3.65)					(-2.39)		(-3.11)			
1996	-0.3146		-0.3503		-0.2522			-0.2866		-0.3140		-0.2127		
	(-3.39)		(-3.66)		(-2.44)			(-2.97)		(-3.17)		(-1.97)		
		-0.3786		-0.2083		-0.4099			-0.3476		-0.1671		-0.3856	
		(-3.95)		(-2.05)		(-3.98)			(-3.48)		(-1.58)		(-3.60)	
1997	-0.4526		-0.2759		-0.3814		-0.3855	-0.4255		-0.2382		-0.3598		-0.3107
	(-4.76)		(-2.69)		(-3.75)		(-3.79)	(-4.34)		(-2.227)		(-3.42)		(-2.96)
		-0.3714		-0.3524		-0.3732			-0.3432		-0.3159		-0.2996	
		(-3.68)		(-3.46)		(-3.69)			(-3.29)		(-3.00)		(-2.89)	
1998	-0.3496		-0.3269		-0.4200			-0.3178		-0.2808		-0.3346		
	(-3.48)		(-3.26)		(-4.10)			(-3.05)		(-2.72)		(-3.16)		
1999		-0.2997		-0.4515					-0.2487		-0.3702			
		(-3.01)		(-4.44)					(-2.42)		(-3.54)			
	-0.2918		-0.4397					-0.2527		-0.3558				
	(-2.96)		(-4.39)					(-2.52)		(-3.44)				
2000		-0.4434							-0.3689					
		(-4.49)							(-3.64)					
	-0.3968							-0.3199						
	(-4.13)							(-3.23)						
2001														

Note: z-statistics are in parentheses

TABLE 6
Ordered probit model estimation.
Dependent variable Son's SAH in 2001.

Year of son's SAH	Mother's SAH							Mother's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	-0.1348 (-1.66)							-0.1189 (-1.42)						
		-0.2179 (-2.61)							-0.2094 (-2.43)					
1995	-0.2424 (-3.01)		-0.2945 (-3.43)					-0.2360 (-2.83)		-0.2819 (-3.21)				
		-0.2826 (-3.36)		-0.2928 (-3.31)					-0.2693 (-3.10)		-0.2764 (-3.05)			
1996	-0.2495 (-3.04)		-0.3654 (-4.21)		-0.2907 (-3.22)			-0.2365 (-2.84)		-0.3512 (-3.94)		-0.2581 (-2.80)		
		-0.3074 (-3.63)		-0.2599 (-2.90)		-0.2509 (-2.66)			-0.2928 (-3.41)		-0.2237 (-2.44)		-0.2436 (-2.52)	
1997	-0.3047 (-3.67)		-0.2695 (-3.06)		-0.2225 (-2.36)		-0.2969 (-3.12)	-0.2911 (-3.47)		-0.2345 (-2.62)		-0.2117 (-2.18)		-0.2943 (-3.02)
		-0.3234 (-3.74)		-0.1389 (-1.51)		-0.3086 (-3.28)			-0.2893 (-3.30)		-0.1248 (-1.34)		-0.3104 (-3.21)	
1998	-0.3312 (-3.87)		-0.1390 (-1.54)		-0.2241 (-2.45)			-0.2948 (-3.40)		-0.1210 (-1.33)		-0.2158 (-2.32)		
1999		0.1756 (-1.96)		-0.2589 (-2.84)					-0.1569 (-1.73)		-0.2507 (-2.71)			
	-0.2904 (-3.37)		-0.2226 (-2.47)					-0.2745 (-3.14)		-0.2137 (-2.34)				
2000		-0.2380 (-2.71)							-0.2301 (-2.59)					
	-0.2584 (-3.05)							-0.2513 (-2.93)						
2001														

Note: z-statistics are in parentheses.

TABLE 7
Ordered probit model estimation.
Dependent variable Daughter's SAH in 2001.

Year of daughter's SAH	Mother's SAH							Mother's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	-0.3564							-0.3116						
	(-4.19)	-0.4179						(-3.52)	-0.3429					
		(-4.33)							(-3.38)					
1995	-0.2754		-0.2817					-0.2208		-0.2466				
	(-3.26)		(-3.17)					(-2.50)		(-2.61)				
		-0.2663		-0.2651					-0.2333		-0.1675			
		(-2.85)		(-2.92)					(-2.39)		(-1.74)			
1996	-0.1985		-0.2745		-0.1417			-0.1518		-0.1772		-0.0414		
	(-2.35)		(-3.12)		(-1.495)			(-1.72)		(-1.89)		(-0.41)		
		-0.3786		-0.1445		-0.4509			-0.3476		-0.0418		-0.3804	
		(-3.95)		(-1.56)		(-4.65)			(-3.48)		(-0.42)		(-3.69)	
1997	-0.2503		-0.1739		-0.3675		-0.3867	-0.1888		-0.0802		-0.2833		-0.3156
	(-2.92)		(-1.88)		(-3.90)		(-4.02)	(-2.15)		(-0.82)		(-2.80)		(-3.07)
		-0.3714		-0.4146		-0.3787			-0.3432		-0.3418		-0.3015	
		(-3.68)		(-4.43)		(-5.52)			(-3.29)		(-3.46)		(-4.21)	
1998	-0.1735		-0.4372		-0.3769			-0.1035		-0.3687		-0.3076		
	(-1.96)		(-4.71)		(-4.02)			(-1.13)		(-3.81)		(-3.11)		
1999		-0.2997		-0.3894					-0.2487		-0.3239			
		(-3.01)		(-4.12)					(-2.42)		(-3.27)			
	-0.3783		-0.3354					-0.3167		-0.2689				
	(-4.27)		(-3.64)					(-3.45)		(-2.81)				
2000		-0.4434							-0.3689					
		(-4.49)							(-3.64)					
	-0.4421							0.3898						
	(-4.94)							(4.19)						
2001														

Note: z-statistics are in parentheses.

TABLE 8
Probit model estimation.
Dependent variable Son's SAH in 2001.

Year of son's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.4750							0.4354						
	(3.29)	0.4042						(2.97)	0.3548					
		(2.68)							(2.32)					
1995	0.4682		0.6512					0.4179		0.6049				
	(3.17)		(3.94)					(2.78)		(3.59)				
		0.6571		0.5181					0.6111		0.4777			
		(4.07)		(3.34)					(3.72)		(3.04)			
1996	0.6727		0.5728		0.5370			0.6344		0.5373		0.4729		
	(4.28)		(3.63)		(3.40)			(3.97)		(3.37)		(2.92)		
		0.3624		0.6277		0.3033			0.3224		0.5794		0.2472	
		(2.47)		(3.90)		(1.90)			(2.17)		(3.51)		(1.50)	
1997	0.2068		0.5626		0.3337		0.5239	0.1682		0.5081		0.2863		0.4873
	(1.49)		(3.65)		(2.09)		(2.97)	(1.19)		(3.22)		(1.75)		(2.72)
		0.5021		0.3717		0.4449			0.4569		0.3227		0.4028	
1998		(3.38)		(2.34)		(2.63)			(3.01)		(1.99)		(2.34)	
	0.4404		0.2233		0.2967			0.3882		0.1669		0.2544		
	(3.10)		(1.46)		(1.85)			(2.68)		(1.07)		(1.56)		
1999		0.1914		0.1081					0.1338		0.0613			
		(1.28)		(0.70)					(0.87)		(0.39)			
	0.2940		0.2149					0.2324		0.1760				
	(2.02)		(1.38)					(1.55)		(1.11)				
2000		0.1859							0.1391					
		(1.24)							(0.91)					
	0.2332							0.1953						
	(1.60)							(1.30)						
2001														

Note: *z*-statistics are in parentheses

TABLE 9

Probit model estimation. Average and Marginal Effects

Dependent variable Son's SAH in 2001.

Year of son's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.07160							0.0644						
	(3.29)	0.0579						(2.97)	0.0489					
		(2.68)							(2.32)					
1995	0.0679		0.0892					0.0584		0.0805				
	(3.17)		(3.94)					(2.78)		(3.59)				
		0.0911		0.0760					0.0822		0.0692			
		(4.07)		(3.34)					(3.72)		(3.04)			
1996	0.0953		0.0824		0.0804			0.0868		0.0764		0.0682		
	(4.28)		(3.63)		(3.40)			(3.97)		(3.37)		(2.92)		
		0.0560		0.0919		0.0423			0.0491		0.0812		0.0341	
		(2.47)		(3.90)		(1.90)			(2.17)		(3.51)		(1.50)	
1997	0.0334		0.0852		0.0463		0.0669	0.0266		0.0736		0.0392		0.0619
	(1.49)		(3.65)		(2.09)		(2.97)	(1.19)		(3.22)		(1.75)		(2.72)
		0.0781		0.0514		0.0588			0.0677		0.0440		0.05302	
1998		(3.38)		(2.34)		(2.63)			(3.01)		(1.99)		(2.34)	
	0.0715		0.0322		0.0414			0.0600		0.0237		0.0352		
	(3.10)		(1.46)		(1.85)			(2.68)		(1.07)		(1.56)		
1999		0.0280		0.0159					0.0193		0.0089			
		(1.28)		(0.70)					(0.87)		(0.39)			
	0.0433		0.0308					0.03367		0.0250				
	(2.02)		(1.38)					(1.55)		(1.11)				
2000		0.2724							0.201					
		(1.24)							(0.91)					
	0.0344							0.0283						
	(1.60)							(1.30)						
2001														

Note: *z*-statistics are in parentheses

TABLE 10
Probit model estimation.
Dependent variable Son's SAH in 2001.

Year of daughter's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.3533							0.2681						
	(2.31)	0.6559						(1.69)	0.5550					
		(3.75)							(3.05)					
1995	0.8098		0.5131					0.7263		0.4851				
	(4.68)		(3.01)					(4.03)		(2.71)				
		0.6282		0.4175					0.6121		0.3954			
		(3.73)		(2.66)					(3.48)		(2.41)			
1996	0.5953		0.3837		0.4135			0.5767		0.3592		0.3398		
	(3.68)		(2.53)		(2.40)			(3.43)		(2.29)		(1.91)		
		0.4495		0.4231		0.4418			0.4332		0.3528		0.3687	
		(2.94)		(2.51)		(2.59)			(2.72)		(2.03)		(2.10)	
1997	0.5039		0.6057		0.3130		0.6388	0.4896		0.5393		0.2399		0.5879
	(3.40)		(3.39)		(1.94)		(3.92)	(3.20)		(2.92)		(1.44)		(3.53)
		0.6844		0.2461		0.6061			0.6270		0.1620		0.5549	
1998		(3.88)		(1.54)		(3.80)			(3.47)		(0.98)		(3.41)	
	0.6480		0.1942		0.6796			0.5815		0.1132		0.6206		
	(3.910)		(1.25)		(4.07)			(3.42)		(0.71)		(3.63)		
1999		0.2018		0.7695					0.1123		0.7131			
		(1.31)		(4.53)					(0.71)		(4.11)			
	0.2130		0.7114					0.1579		0.6559				
	(1.40)		(4.41)					(1.02)		(3.98)				
2000		0.6623							0.6127					
		(4.27)							(3.87)					
	0.6463							0.5955						
	(4.40)							(3.96)						
2001														

Note: *z*-statistics are in parentheses

TABLE 11

Probit model estimation. Average and Marginal Effects

Dependent variable Son's SAH in 2001.

Year of daughter's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.0586							0.0433						
	(2.31)	0.0908						(1.69)	0.0741					
		(3.75)							(3.05)					
1995	0.1132		0.0737					0.0981		0.0696				
	(4.68)		(3.01)					(4.03)		(2.71)				
		0.0901		0.0723					0.08771		0.0685			
		(3.73)		(2.66)					(3.48)		(2.41)			
1996	0.0882		0.0675		0.0622			0.0852		0.0632		0.0500		
	(3.68)		(2.53)		(2.40)			(3.43)		(2.29)		(1.91)		
		0.0784		0.0644		0.0685			0.0755		0.0524		0.0566	
		(2.94)		(2.51)		(2.59)			(2.72)		(2.03)		(2.10)	
1997	0.0897		0.0870		0.0509		0.1294	0.0869		0.0759		0.0385		0.1186
	(3.40)		(3.39)		(1.94)		(3.92)	(3.20)		(2.92)		(1.44)		(3.53)
		0.0986		0.0406		0.1246			0.0882		0.0264		0.1134	
1998		(3.88)		(1.54)		(3.80)			(3.47)		(0.98)		(3.41)	
	0.0983		0.0326		0.1348			0.0861		0.0187		0.1230		
	(3.910)		(1.25)		(4.07)			(3.42)		(0.71)		(3.63)		
1999		0.0341		0.1487					0.0186		0.1367			
		(1.31)		(4.53)					(0.71)		(4.11)			
	0.0361		0.1427					0.0261		0.1311				
	(1.40)		(4.41)					(1.02)		(3.98)				
2000		0.1359							0.01249					
		(4.27)							(3.87)					
	0.1368							0.1253						
	(4.40)							(3.96)						
2001														

Note: *z*-statistics are in parentheses

TABLE 12
Probit model estimation.
Dependent variable Son's SAH in 2001.

Year of son's SAH	Mother's SAH							Mother's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.2973							0.2591						
	(2.20)	0.5196						(1.87)	0.4952					
		(3.53)							(3.27)					
1995	0.5246		0.3875					0.5041		0.3317				
	(3.81)		(2.61)					(3.56)		(2.19)				
		0.4598		0.3548					0.3932		0.3348			
		(3.14)		(2.32)					(2.61)		(2.13)			
1996	0.3858		0.3798		0.4784			0.3423		0.3668		0.4251		
	(2.81)		(2.54)		(3.07)			(2.45)		(2.39)		(2.65)		
		0.3557		0.4522		0.5815			0.3409		0.3975		0.5588	
		(2.50)		(2.96)		(3.23)			(2.36)		(2.52)		(3.04)	
1997	0.3606		0.40956		0.5290		0.3893	0.3466		0.3462		0.5021		0.3498
	(2.63)		(2.79)		(3.01)		(2.36)	(2.49)		(2.31)		(2.78)		(2.07)
		0.4558		0.4133		0.4224			0.3950		0.3842		0.3901	
1998		(3.17)		(2.57)		(2.58)			(2.70)		(2.35)		(2.33)	
	0.3823		0.4020		0.3471			0.3154		0.3669		0.3069		
	(2.80)		(2.58)		(2.26)			(2.26)		(2.32)		(1.97)		
1999		0.4473		0.4183					0.4098		0.3795			
		(2.90)		(2.69)					(2.61)		(2.49)			
	0.4764		0.3429					0.4445		0.3034				
	(3.30)		(2.29)					(3.03)		(2.00)				
2000		0.3828							0.3481					
		(2.64)							(2.37)					
	0.4125							0.3787						
	(3.03)							(2.74)						
2001														

Note: *z*-statistics are in parentheses

TABLE 13
Probit model estimation. Average and Marginal Effects
Dependent variable Son's SAH in 2001.

Year of son's SAH	Mother's SAH							Mother's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.0497							0.04311						
	(2.20)	0.0834						(1.87)	0.0796					
		(3.53)							(3.27)					
1995	0.0869		0.0642					0.0834		0.0536				
	(3.81)		(2.61)					(3.56)		(2.19)				
		0.0751		0.0582					0.0628		0.0550			
		(3.14)		(2.32)					(2.61)		(2.13)			
1996	0.0657		0.0622		0.0778			0.0565		0.0600		0.0678		
	(2.81)		(2.54)		(3.07)			(2.45)		(2.39)		(2.65)		
		0.0594		0.0745		0.0811			0.0569		0.0643		0.0777	
		(2.50)		(2.96)		(3.23)			(2.36)		(2.52)		(3.04)	
1997	0.0611		0.0692		0.0753		0.0649	0.0587		0.0575		0.0714		0.0586
	(2.63)		(2.79)		(3.01)		(2.36)	(2.49)		(2.31)		(2.78)		(2.07)
		0.0764		0.0627		0.0697			0.0649		0.0582		0.0644	
1998		(3.17)		(2.57)		(2.58)			(2.70)		(2.35)		(2.33)	
	0.0667		0.0617		0.0595			0.0539		0.0563		0.0528		
	(2.80)		(2.58)		(2.26)			(2.26)		(2.32)		(1.97)		
1999		0.0685		0.0697					0.0628		0.0634			
		(2.90)		(2.69)					(2.61)		(2.49)			
	0.0743		0.0593					0.0691		0.0525				
	(3.30)		(2.29)					(3.03)		(2.00)				
2000		0.0660							0.0599					
		(2.64)							(2.37)					
	0.0728							0.0666						
	(3.03)							(2.74)						
2001														

Note: *z*-statistics are in parentheses

TABLE 14
Probit model estimation.
Dependent variable Son's SAH in 2001.

Year of daughter's SAH	Mother's SAH							Mother's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.7721							0.6744						
	(4.72)	0.5843						(4.00)	0.5223					
		(3.70)							(3.13)					
1995	0.5148		0.3348					0.4452		0.2806				
	(3.61)		(2.17)					(2.99)		(1.72)				
		0.3123		0.2711					0.2502		0.1809			
		(2.14)		(1.91)					(1.63)		(1.21)			
1996	0.3356		0.3293		0.3291			0.2856		0.2485		0.2017		
	(2.39)		(2.41)		(2.12)			(1.96)		(1.72)		(1.23)		
		0.3810		0.4222		0.5968			0.3152		0.2978		0.6689	
		(2.80)		(2.76)		(3.51)			(2.23)		(1.84)		(3.34)	
1997	0.4126		0.4866		0.4838		0.4571	0.3605		0.3085		0.4803		0.3690
	(3.12)		(3.15)		(3.09)		(3.07)	(2.66)		(2.27)		(2.84)		(2.34)
		0.4783		0.5104		0.4254			0.3743		0.5051		0.3385	
1998		(3.20)		(3.29)		(2.96)			(2.40)		(3.06)		(2.24)	
	0.5194		0.4812		0.4793			0.4325		0.4667		0.4031		
	(3.62)		(3.18)		(3.31)			(2.91)		(2.93)		(2.66)		
1999		0.4261		0.5290					0.4165		0.4595			
		(2.95)		(3.56)					(2.75)		(2.98)			
	0.4304		0.4452					0.4138		0.3763				
	(3.11)		(3.18)					(2.87)		(2.60)				
2000		0.5386							0.4770					
		(3.77)							(3.24)					
	0.6013							0.5487						
	(4.41)							(3.90)						
2001														

Note: *z*-statistics are in parentheses

TABLE 15
Probit model estimation. Average and Marginal Effects
Dependent variable Son's SAH in 2001.

Year of daughter's SAH	Father's SAH							Father's SAH and instrumental variables						
	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average	Two-year average	Three-year average	Four-year average	Five-year average	Six-year average	Seven-year average	Eight-year average
1994	0.1147							0.0976						
	(4.72)	0.0906						(4.00)	0.0794					
		(3.70)							(3.13)					
1995	0.0848		0.0532					0.0716		0.0446				
	(3.61)		(2.17)					(2.99)		(1.72)				
		0.0506		0.0536					0.0405		0.0361			
		(2.14)		(1.91)					(1.63)		(1.21)			
1996	0.0549		0.0645		0.0573			0.0464		0.0489		0.0349		
	(2.39)		(2.41)		(2.12)			(1.96)		(1.72)		(1.23)		
		0.0743		0.0718		0.0960			0.0615		0.0504		0.0962	
		(2.80)		(2.76)		(3.51)			(2.23)		(1.84)		(3.34)	
1997	0.0812		0.0812		0.0822		0.0989	0.0707		0.0611		0.0806		0.0812
	(3.12)		(3.15)		(3.09)		(3.07)	(2.66)		(2.27)		(2.84)		(2.34)
		0.0811		0.0866		0.0935			0.0625		0.0847		0.0755	
1998		(3.20)		(3.29)		(2.96)			(2.40)		(3.06)		(2.24)	
	0.0895		0.0831		0.1039			0.0728		0.0797		0.0883		
	(3.62)		(3.18)		(3.31)			(2.91)		(2.93)		(2.66)		
1999		0.0759		0.1125					0.0733		0.0986			
		(2.95)		(3.56)					(2.75)		(2.98)			
	0.0780		0.0983					0.0742		0.0836				
	(3.11)		(3.18)					(2.87)		(2.60)				
2000		0.1155							0.1028					
		(3.77)							(3.24)					
	0.1306							0.1193						
	(4.41)							(3.90)						
2001														

Note: *z*-statistics are in parentheses

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