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ABSTRACT

Intra-Household Time Allocation: Gender Differences in Caring for Children

This paper analyses the intra-household allocation of time to show gender differences in childcare. In the framework of a general efficiency approach, hours spent on childcare by each parent are regressed against individual and household characteristics, for five samples (Denmark, France, Germany, Italy and Spain), with data being drawn from the European Community Household Panel-ECHP (1994-2001). Empirical results show a clear inequality in childcare between fathers and mothers, with this being more evident in Mediterranean countries. Panel data estimates reveal that, in general, caring tasks are mainly influenced by the presence of young children in the household, by the total non-labor income, and by the ratio of mothers' non-labor income to family's non-labor income, with this latter variable exhibiting a different behavior across genders and across countries.

JEL Classification: D13, J22, C33

Keywords: childcare, gender differences, intra-household allocation, time use

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INTRODUCTION

Despite the trend towards an egalitarian sharing of the caring tasks between parents within a household, important gender differences persist. For example, the number of hours per week (h/w) that mothers dedicate to caring for family members is considerably higher than that of fathers. International data from the European Community Household Panel, ECHP (1994-2001) reveals in Table 1 that the average number of hours fathers dedicate to caring for children varies markedly between Southern and Northern European countries (7.45 h/w and 7.97 h/w for Spain and Italy, respectively, against 19.38 h/w for Denmark), while the hours for mothers, always higher, do not show this great variation (30.14 h/w for Italy and 37.63 h/w for France).

In order to explain intra-household allocation of available time among leisure, paid-work outside the home and non-paid housework (including childcare), two main theoretical approximations can be followed, namely the efficiency approach and the game-theoretic approach. The efficiency approach stems from the traditional or unitary model, which assumes that a household acts as a single decision-making unit, maximizing its utility function subject to the budget constraint (Gary Becker, 1965). However, as emphasized by Frederic Vermeulen (2002), some weaknesses of this model have led to a reinterpretation, called the collective model, which holds that a household consists of several individuals with their own rational preferences, in such a way that the intra-family decision process must lead to Pareto-efficient allocations (Pierre-Andre Chiappori, 1988, 1992, 1997).

On the other hand, the game-theoretic approach, which takes into account several decision-makers in a household, also includes two models. The first is a non-co-operative model, in such a way that the Nash equilibrium implies that family members maximise their utility, taking the other individuals' behaviour as given (see, for example, Yoram Weiss and Robert Willis, 1985; Kai Konrad and Kjell Lommerud, 1995). The second incorporates elements of co-operative game theory in a household model, specifically that of axiomatic bargaining theory, in such a way that household members reach the Nash or the Kalai-Smorodinsky solutions after trying to agree on how to divide the gains of co-operation (see Marilyn Manser and Murray Brown, 1980; Marjorie McElroy and Mary Horney, 1981).

In recent years, two factors have led to a growing interest in the determinants of childcare separate from other time uses. First, the existence of relevant gender

differentials in the amount of time allocated to this activity (see, e.g., Table 1), and, second, the perception that there is no good market substitute for such activity, the most time-consuming task in the home. In this article, we use the efficiency approach to model intra-household time allocation in order to show European gender differences in caring for children. This general approach has several characteristics. First, it allows for the possibility of considering a common source of income, that is to say, the family income (see Hironori Kato and Manabu Matsumoto, 2008). Second, it accounts for the fact that the household consists of several members having different preferences, in such a way that a variable relating the labor income of the mother to that of the father is included, to more adequately capture the influence of bargaining power on intra-household allocation of time. Finally, Pareto efficiency exists in the time allocation among the household members.

(Table 1)

Specifically, we analyze how socio-economic incentives determine parental allocation of time to childcare within the household, for five representative European countries, bearing in mind the following two conditions. First, despite the recent increase of women's participation in the labor market (and in hours of work), there persist clear differences between mothers and fathers in the time worked in the market, and in the time allocated to childcare, with this activity having the special characteristic that the caregivers are not paid by the market. Second, these differences are the result of a bargaining process within the household, in such a way that individual preferences are relevant, but the resulting allocation of time by each of the parents, to each activity, must be seen in a family context, where each parent's income may be an important determinant of that allocation.

We use the eight available waves of the ECHP (1994-2001) in order to estimate the hours dedicated by each parent to caring for children for five national samples (Denmark, France, Germany, Italy and Spain). The structure of the Panel, which includes relevant information on the factors affecting the alternative uses of household time, allows us to control for the unobservable heterogeneity problem, as well as to eliminate the bias derived from aggregation. We simultaneously estimate the childcare hours of each parent for each country, focusing on couples where both parents work outside the home, and compare these results with those obtained from couples where only the father is employed, thus considering possible differential behaviours across

those samples. In the analysis we must take into account that allocations by each parent of time spent on childcare and in paid-work are jointly, endogenously, determined. The most interesting finding of the estimations lies in obtaining cross-country evidence on gender differences in the personal and family characteristics influencing decisions about the hours dedicated to childcare, with this evidence allowing us to make international comparisons of different welfare state regimes and social norms, for both genders.

THEORETICAL CONSIDERATIONS

Economists argue that, in order to properly model the analysis of the intra-household allocation of time, an adequate theoretical framework is required. We follow here the efficiency approach, which, encompassing both the unitary and collective models, allows us to address the question of how the responsibilities of caring for children within the household are allocated.

Although the consideration of household production in the study of the time-allocation process dates back to Becker (1965), its inclusion in a general theoretical framework, in which households are considered to consist of different individuals with their own preferences, came later (Reuben Gronau, 1977). Even more recent is the consideration of childcare as an activity different from leisure and/or home production (David Ribar, 1995). Childcare shares with leisure its enjoyment, and the fact that it is time-consuming. Simultaneously, it requires much effort and is not remunerated, which makes it very similar to home production. What makes childcare quite different from leisure and home production is that it is difficult to substitute for it in the market. Empirical literature has found significant differences between these alternative uses of time, and the economic factors affecting them. The most recent evidence tends to show that childcare can be assimilated more to paid work than other non-paid activities (Jean Kimmel and Rachel Connelly 2007; Rachel Connelly and Jean Kimmel 2007).

The determinants of time devoted to childcare that have been most commonly studied are related to the time involved in other activities, mainly, labor supply, to wages, to non-labor income and to individual and household characteristics. We briefly summarize some of the results. First, more hours of paid work are related to own lower hours of childcare and more hours by the spouse. This evidence, however, is somewhat more significant in the case of men (Keith Bryant and Cathleen Zick 1996; Daniel

Hallberg and Anders Klevmarken 2003; Sanders Korenman, Mei Liao, and June O’Neill 2005; Connelly and Kimmel 2007). Thus, the increased participation of women in paid work has meant a reduction in their hours devoted to leisure and home production, but not in those devoted to childcare; whereas male workers, in contrast, have maintained their time in paid work and augmented the number of hours devoted to childcare and to housework (Liana Sayer, Suzanne Bianchi, and John Robinson 2004; Suzanne Bianchi and Sara Raley 2005; Korenman, Liao, and O’Neill 2005; John Sandberg and Sandra Hoffert 2005; Peter Howie, John Wicks, John M. Fitzgerald, Douglas Dalenberg, and Rachel Connelly 2006; Charlene Kalenkoski, David Ribar, and Leslie Stratton 2007).¹ This leads us to conclude that childcare activity has an important investment component, so that parents desire higher quality childcare for their children, which, in turn, requires more parental time.

Second, in regards to earnings, differences in behavior have been found by gender. Thus, whereas higher wages of fathers are associated with more hours spent on childcare by mothers, the opposite is not true, so that an increase of mothers’ wages does not lead to more hours spent on childcare by fathers (Peter Kooreman and Ariel Kapteyn, 1987; Korenman, Liao, and O’Neill 2005). More differences are found in the influence of own wages on time spent on childcare. In European countries, the impact is negligible (Henriette Van den Brink and Wim Groot 1997, for the Netherlands; Hallberg and Klevmarken 2003, for Sweden; Charlene Kalenkoski, David Ribar, and Leslie Stratton 2009, for the UK), whereas in the US, higher wages imply more hours spent on childcare (Kimmel and Connelly, 2007 and Connelly and Kimmel, 2007).² One simple way to include, in a single variable, own and spouse’s earnings or wages, is to construct a measure expressing the earnings of one as a fraction of the other’s, or of total family income. This variable can be interpreted as an indicator of the bargaining power of one of the spouses as against the other. It has been found that a higher fraction of women’s income is associated with fewer hours spent on housework in Spain (Begoña Alvarez and Daniel Miles 2003), and in the US (Joni Hersch and Leslie Stratton 1994; Michael Bittman, Paula England, Liana Sayer, Nancy Folbre, and George Matheson 2003). In assessing its effect on childcare, the only study that has employed this kind of variable is Connelly and Kimmel (2007) for the US, who found that an increase in the relative wage of mothers leads to an increase in the share of childcare carried out by mothers.

Some possible individual and family characteristics influencing the number of hours devoted to childcare include education, number and age of the children, age or cohort effects, and the availability of external child care. Among these, only the variables expressing the number of children and their age are found to be relevant since, on the one hand, education and age, both highly correlated with wages, are usually found to be non-significant and, on the other hand, the lack of reliable data makes the results derived from the inclusion of out-of-household childcare non-robust. Kalenkoski, Ribar, and Stratton (2007) focus on the differences in marital status across families, showing that there are no significant differences, for the US and the UK, between married and cohabitant couples. Finally, since differences between genders are in fact observed, some authors claim the existence of gender, and other specific related factors, which can be associated with different gender norms across countries (see for instance Bittman et al. 2003; Joost de Laat and Almudena Sevilla-Sanz 2006; Stephanie Seguino 2007), as well as unobservable effects, which can only be controlled for through the use of longitudinal data (Alvarez and Miles 2003).

All these determinants are addressed in this work. Although we discuss this in depth later, we now advance several features. First, we include variables related to earnings, with a twofold aim: to represent specialization in the allocation of time (Gary Becker 1991), and also bargaining power (Shelly Lundberg and Robert Pollack 1993). Additionally, these variables are included in such a way that the specification is compatible with both the unitary and the collective models of intra-household time allocation, within the more general efficiency approach. Second, the number of hours spent on paid work are explicitly included to take into account the interdependence between both uses of time. Unfortunately, the database used does not provide information about time devoted to both leisure and housework, so these activities are omitted from our analysis. Thus, our study is based on a reduced form specification,³ which is close in spirit to that used by Hersch and Stratton (1994) and Alvarez and Miles (2003), for explaining housework time, and Hallberg and Klevmarken (2003) and Kalenkoski, Ribar, and Stratton (2005, 2007) who study time allocated to childcare in Sweden and the UK and the US, respectively. Third, we have introduced a set of variables expressing the number of children living in the household by age group, and the occurrence of a birth in the year of the interview. Fourth, since our information is provided in panel data form, we can control for the unobservable heterogeneity that is

assumed to be constant over time. Finally, in order to account for differences in gender norms, we have studied five EU countries using the same database.

Focusing on this latter aspect of the analysis, these countries represent a great deal of variation within the EU, in regards to their welfare regime types and policies related to childcare and women's participation in the labor market, as well as in social norms and stereotypes (Francesca Bettio and Janneke Plantenga 2004; Seguino 2007). The traditional literature in sociology (see e.g. Gosta Esping-Andersen 1990), typically considers three regime models: Anglo-Saxon, Continental European and Nordic European, associated, respectively, with liberal, conservative and social democratic countries. However, recent contributions by Rosanna Trifiletti (1999) and Wil Arts and John Gelissen (2002), among others, have suggested new typologies be added, with one being the so-called Mediterranean model.

Bettio and Plantenga (2004), examining only care-giving tasks, and using data from the third wave of the ECHP, year 1996, group EU countries according to childcare provisions (both formal and informal) based on information from social childcare services, leave arrangements and financial provisions (see their Table 3). This grouping is close to the traditional literature mentioned above, and they find two extreme clusters, with several subgroups in between. The first cluster includes the Mediterranean countries (Spain, Italy and Greece), which seem to delegate all the management of childcare to the family. These countries are characterized by a high index of informal care, with formal childcare arrangements being quite underdeveloped (see also Trifiletti 1999). At the other extreme, is the cluster of the Nordic countries (Denmark, Sweden and Finland), which follow a universalist approach, with extensive formal childcare resources. The role of the family in providing care is substituted almost entirely by the state. Different subgroups of countries can be found in intermediate positions, with little differences among them. Thus, the Anglo-Saxon countries in the Esping-Andersen terminology (the UK and Ireland in Europe) have childcare outcomes very close to those of the Mediterranean, with the central continental countries (Germany, France, Belgium, etc) in between the Mediterranean and the Nordic countries. Thus, these central countries are characterized by fairly extended collective agreements, growing in number, through which private care is publicly facilitated, although it has not substituted for informal childcare.

Accordingly, we include the following countries in our analysis. Denmark as

representative of the social democratic Scandinavian countries, in which there exists generous maternity leave and extensive help in childbearing and childcare.⁴ Two Central Continental countries (France and Germany), also with generous maternity leave, but less extensive help in childcare. And, finally, two Mediterranean countries (Italy and Spain) in which informal childcare, mainly provided within the family, is the rule. As a whole, the five sample countries cover an ample range of the variations observed within Europe. For more on these differences see Wendy Sigle-Rushton and Jane Waldfogel (2007) and Trifiletti (1999).

DATA AND DESCRIPTIVE ANALYSIS

Data used in this work, the eight waves of the ECHP (1994-2001), provide abundant information about both the personal and labour characteristics of individuals, with this information being homogenous across the five sample countries, given that the questionnaire is the same and the statistical analyses are coordinated by EUROSTAT.⁵ Recent studies (see, e.g., Hallberg and Klevmarcken 2003; Korenman, Liao, and O'Neill 2005; Kimmel and Connelly 2007; Connelly and Kimmel, 2007; Kato and Matsumoto 2008) have benefited from the availability of Time Use Surveys, which allow the study of the allocation of time to different activities (leisure, paid work, housework, childcare, sleeping and so on) within a simultaneous framework. Furthermore, the record of time allocated by each interviewee is for a complete day, so that full information is available, subject to minimal recall measurement errors. However, previously used databases have several drawbacks, two of which are significant: the lack of longitudinal information, which prevents us from controlling for unobserved heterogeneity, and the lack of information on the intra-household allocation of time among family members, since full information on time allocation is only collected for a single individual. Our use of the ECHP permits us to overcome these two drawbacks.

We have selected families with two parents and at least one child, in which the spouses are of working age, that is to say, between 25 and 64 years old, and constructed two samples. In the first, we include the families in which both parents work, whereas in the second we include those families in which only the father works. The use of both samples allows us to compare results between both types of family, with this strategy casting some light on the distinct behaviour between the different participation status of

mothers. The dependent variable is the number of weekly hours dedicated to caring for children, considered for each parent (*ChildCareFather*, *ChildCareMother*). A number of socio-economic factors influence the total amount of time devoted to this activity.

We begin by including several variables referring to the bargaining power within the household. Although there are some criticisms of the methodological individualism of bargaining models applied to intra-household time allocation (Bina Agarwal 1997), most recent studies include variables capturing the influence of bargaining power on the allocation of time. A standard measure of bargaining power is the ratio between women's and men's earnings, or between women's and family earnings.⁶ We have chosen an indicator of the fraction of mother's non-labor income over the family's non-labor income, which is defined as *Ratio*, preferring this to a measure which expresses relative wages, for two reasons. First, because when analyzing couples where women do not work, we need an indicator of the bargaining power within that couple. Second, given that the inclusion of all variables indicating educational level and age approximates wages, all of these may be correlated (Kalenkoski, Ribar, and Stratton 2009). The interpretation of *Ratio* is intuitive, the greater this variable, the greater the bargaining power that mothers possess.

Nevertheless, this is not the only variable reflecting bargaining power. Other factors that may influence bargaining are related to individual wages, cohort effects or social norms. Following Kalenkoski, Ribar, and Stratton (2007) and Kimmel and Connelly (2007), wages are approximated by the educational level. Education is expressed as the highest level of studies completed. We have considered three levels: *Educ1*, primary level (basic education or less), that is the reference category; *Educ2*, secondary level (secondary education, Baccalaureate or vocational training); and *Educ3*, corresponding to university. Regarding cohort effects, the average age of the parents (*AverageAge*) is included in the estimation which, in addition to expressing the effect of the parents' ages on childcare, can also be seen as an indicator of the attitude of the family to the division of family work, derived from the different traditional or modern roles of the parents. Finally, it has been shown that factors, such as social norms and stereotypes, may affect bargaining power (Jonsoong Kim and Lydia Zepeda 2004). The fact that we study several countries, with marked differences in welfare regimes and social norms, may be helpful in identifying, indirectly, their effect on time allocation.

We also include three variables which refer to the presence of children in the household, and which may affect the time dedicated to caring. The first of these variables, *Children<16*, indicates the number of children under age 16 who live with the family, while the second, *Children<12*, is a dummy variable which indicates that there is a child under age 12 living with the family. The third, *Birth*, indicates whether there has been a birth in the family during the year of the interview.⁷ As explained above, our specification is general, so as to incorporate features from both the unitary and the collective models. Therefore, in addition to the variable *Ratio*, and those expressing educational levels and age, which can approximate wage rates, we include the family non-labor income (*FamilyIncome*) as a separate regressor. It may be argued that higher family income will negatively influence the time spent on childcare, if this task can be easily hired in the market, but this is not empirically observed. By contrast, since childcare has an important investment component, previous evidence has shown that higher family income is associated with more hours spent on childcare. With respect to the hours of remunerated work of the parents (*WorkedFather*, *WorkedMother*), it is very likely that the greater the number of hours worked by the individual, the fewer hours of childcare activities, and the greater the number of hours required from the spouse, these effects being more evident in the case of fathers (Bryant and Zick 1996; Hallberg and Klevmarken 2003; Connelly and Kimmel 2007).

Table 1 shows the average and the standard deviation of each of the variables used in the analysis for the unweighted pooled data. Note that considerations are given in turn, and with respect to each of the five countries in question, first to all the families, then to families in which both parents work and, finally, to families in which only the father works outside the home. Whereas the last row of this Table includes the number of observations, that is to say, the number of families, a detailed Table A1 in the Appendix displays these disaggregated per wave and per sub-sample.

With respect to the dependent variable, caring for children, it is clearly observed in the five samples that mothers dedicate more hours than fathers to this activity, ranging from almost five times more in Spain to less than twice as much in Denmark. When distinguishing between the cases where both parents work, and where only the fathers work outside the home, all differences decrease in the first case, and increase in the second. Thus, when both parents work, differences in Spain and Italy decline to “only” three times more for mothers than for fathers, with Denmark again being the country

where the difference is the smallest. In the case in which only the father works, the greatest difference is almost ten times in Spain, and the lowest again in Denmark, slightly more than twice as much. We can also note that mothers dedicate less time to caring for children when both parents work, as compared to the case where only the father works, with the opposite applying to the fathers. An outstanding feature is that time spent in childcare by fathers in Denmark is by far the highest, more than twice that of any other country, whereas differences in childcare across countries by mothers are much smaller. Thus, the majority of the differences across Northern, Central and Southern countries are basically observed in the amount of time devoted by fathers to childcare (see also Bettio and Plantenga, 2004 and de Laat and Sevilla-Sanz, 2006).

In regards to the explanatory variables, we begin with the age variable, *AverageAge*. The average age is very similar across countries, ranging from 38 years for Danish and German households, to 40 years for Spanish and Italian households, with this average being similar in the two sub-samples. Regarding educational attainment, we can observe in all five countries that, in general, mothers show greater percentages at the primary level of education than fathers and, further, that fathers exhibit either the same or greater percentages than mothers at the higher education level. If we now compare countries, we find that Spain stands out because of its high percentage of individuals with primary education, more than 60%, with Denmark and Germany at the opposite extreme, with less than 20%. Additionally, for all five countries, we can observe a greater percentage of individuals with only primary education in those families in which only the father works, and a greater percentage of individuals with higher education in those families where both parents work. These differences are more evident in the case of mothers. This allows us to establish that first, the level of education when only the father works is lower than when both father and mother work and, second, differences across subsamples are much more significant in the case of mothers, with these facts underlining the importance of considering the participation status of mothers.

With respect to the three variables referring to the presence of children in the family, *Children<16*, *Children<12* and *Birth*, we can observe that the number of children under age 16 is in all cases above 1.55, reaching 1.80 in France and Denmark. These figures agree with those presented for other countries by de Laat and Sevilla-Sanz (2006). We can also note that, in general, this number is higher in families where only the father works. In regards to the presence of children under age 12, we can see that, in almost

90% of families with children, there is a child younger than 12, with few differences across countries and across subsamples. Similarly, the percentage of families with a birth in the corresponding year is very similar in all countries, about 7%, with this figure being somewhat higher in Denmark, 10%.

The next variable to be considered is *FamilyIncome*, measured as the family's non-labor income in thousands of real euros per year, in purchasing power parity. First, we can identify small differences in mean values between the five sample countries, the highest value being observed in Denmark, which is double the lowest value, observed in Spain. Second, non-labor earnings in Italy, Spain and France are clearly higher in families in which both parents work, than in those in which only the father works; they are almost the same in Denmark, and slightly lower in Germany. One could argue from these values that public transfers, an important part of non-labor income, are in Southern countries mainly allocated only to workers, as opposed to Central and Nordic countries, in which mothers do not need to be workers in order to receive public benefits (see Trifiletti 1999). This is partially supported by the evidence offered by the variable *Ratio*, defined as the proportion of the mother's non-labor income over the family's non-labor income. When only the father works, this figure is much higher in Denmark, over 40%, around 15% in Central countries, and less than 11% in the Mediterranean countries. When both parents work, Denmark again shows the highest fraction, over 70%, with values between 25% and 40% in the other sample countries. In the whole sample, values are qualitatively similar to these latter.

Finally, we have also included those variables which refer to the hours dedicated to working outside the home. Note that the average number of hours worked by fathers does not greatly vary, whether both parents work or only the father does. The most hours worked per week by fathers appears in Spain, 46, while the fewest are in France and Germany, 40. With respect to mothers, greater differences across countries can be observed. Beginning with the fact that the proportion of parents in the samples who both work varies from only 31% in Spain and 42% in Italy, to slightly over 50% in Germany and France, and up to 81% in Denmark; the number of hours per week worked by mothers increases as we move North. Thus, in Spain the average is less than 14 hours, around 15 in Italy, 17 in Germany, almost 20 in France and almost 30 in Denmark. However, when both parents work, the highest values are found in the Mediterranean countries, and in Denmark, with values around 35 hours per week. In the

Central countries, these values are closer to 30 hours. The explanation seems clear. Fewer mothers work in the Mediterranean countries, but when they do, they work almost as many hours as fathers. This evidence has also been found by Trifiletti (1999), which allows her to claim the distinct characterization of the Mediterranean or Latin rim of welfare states, compared to the conservative Central European countries. Thus, it is confirmed that benefits for mothers are only available if they are workers. When adding the time spent on childcare to the time spent on paid work, the highest figures are observed in Denmark for all three subsamples. This is clearly higher than in the other sample countries which, in general, exhibit figures quite similar among themselves. Another noteworthy result is that, when both parents work, the total amount of time spent on both activities is greater for mothers than for fathers, with differences ranging from 5 hours in Denmark to almost 14 hours in France.

A first assessment of gender differences in the number of hours dedicated to childcare can be obtained from two indicators proposed by Lawrence Haddad and Ravi Kanbur (1990). These indices, commonly known as HK and IR, provide an inequality measure from the individual values indicated for each of the parents. In particular, HK is the ratio between the difference of the two values for both parents and their sum, whilst IR is computed as the ratio between the lowest and the highest values for each of the variables. In Table 2 we present the values of both indicators, with these being calculated for the total number of families, as well as for those in which both parents work, and for those in which only the father works. Both inequality measures oscillate between 0 and 1, with HK indicating the maximum equality when it is 0, and the maximum inequality when it is 1, and IR being interpreted in the opposite way. Given that the interpretation of the two indices is analogous, we focus here on describing the results derived from the first indicator, HK. Considering first the total number of families, a significant difference can be seen between Denmark and the rest of the sample countries. In these latter, inequality in caring for children ranges between 0.65 in Germany to 0.76 in Spain, against 0.39 in Denmark. We also note that this inequality is higher in all cases when only the father works, with significant differences across countries, than in the case when both parents work outside the home, where the HK values are more similar across countries.

(Table 2)

MULTIVARIATE ANALYSIS

In this section we first present the estimation strategy followed and we then interpret the results of the estimation of the hours dedicated by each of the parents to caring for children. The dependent variable is regressed against the aforementioned explanatory variables, as expressed in the following specification:

$$h_{it}^A = \mu^A + \beta_1^A Ratio_{it} + \beta_2^A Income_{it} + \delta_1^A z_{it}^A + \delta_2^A z_{it}^A + \alpha_i^A + e_{it}^A \quad i=1, \dots, N; t=1, \dots, T$$

$$h_{it}^B = \mu^B + \beta_1^B Ratio_{it} + \beta_2^B Income_{it} + \delta_1^B z_{it}^B + \delta_2^B z_{it}^B + \alpha_i^B + e_{it}^B \quad i=1, \dots, N; t=1, \dots, T$$

where h_{it}^A and h_{it}^B are the number of hours that each parent (A and B) dedicates to childcare, $Ratio$ is the ratio of mother's non-labor income to that of the family, $Income$ is the family non-labour income, and z includes individual characteristics for each spouse and other family characteristics. The parameters β and δ are the coefficients accompanying the variables; μ and α are constant terms, with μ being the average population and α the individual deviation with respect to this average; and, finally, e are the error terms.

Estimation strategy

We must first note that a number of considerations have shaped our estimation strategy. The first is that childcare is, obviously, considered to be a task with characteristics different from paid work, leisure and housework and, hence, it is worthy of study separately from other uses of time (Suzanne Bianchi 2000; Bianchi and Raley 2005; Howie et al. 2006).⁸

Second, our proposed estimation methodology is close in spirit to the papers by Hallberg and Klevmarken (2003), Kalenkoski, Ribar, and Stratton (2005, 2007) and has been previously applied, among others, by Inmaculada Garcia, José Alberto Molina, and Victor Montuenga (2009) in studying the allocation of time devoted to paid work. It is developed in a reduced form and, since error terms are correlated within the household, both father's and mother's equations are simultaneously estimated in order to gain efficiency.⁹ Given the absence of information in the data base about the hours devoted to other tasks (e.g., housework and leisure) a global treatment of all decisions in a unified framework is not possible. Furthermore, the fact that we are using panel

data methods to control for unobservable heterogeneity, for each couple observed over several years, allows us to obtain more robust estimates when dealing with simultaneity.

Third, since hours spent in leisure and housework by each of the parents are omitted from the analysis, but it is reasonable to think that the decision on the hours devoted to childcare depends on, and influences, the hours devoted to paid work, then an endogeneity problem is likely to arise. In order to take into account such endogeneity, we may instrument it with a variable highly correlated with time in employment, and very likely exogenous, at least at the individual level, to the number of hours devoted to childcare.¹⁰ After some exploratory exercises, one possible instrument is the average number of hours worked by the total of workers employed in the same occupation as the individual, in each year and in each country, and of the same gender. As stated above, the variables *Ratio* and *FamilyIncome* are computed, in all estimates, as the ratio of mother's non-labor income to that of the family, and as the family non-labour income, respectively. In this way, we avoid the induced endogeneity that these variables would have had if we had considered total family income and total mother's income, since in these cases labor income depends on the number of hours worked, which is clearly endogenous.¹¹

Fourth, in regards to the specification, we adopt an efficient theoretical approach which captures features from both unitary and collective models. Thus, *FamilyIncome* is a representative variable in both models, whereas variables representing bargaining power (*Ratio* or *Education*, for example), are specific to the collective model (Kim and Zepeda, 2004).

Fifth, since we are considering couples with children, it is possible that some of the parents, perhaps both, could be unemployed, or simply non-participants. Consequently, the problem of selection into employment may be of great importance in our study. The difficulty is that, taking all the dimensions of our study into account, the selection problem is quite intractable, because we are considering both simultaneity in the parents' decisions, and endogeneity in the time of paid work, within a panel data framework. If, additionally, we consider the problem of selectivity, our task would be quite overwhelming, especially knowing that a clear treatment of selectivity issues with panel data is not straightforward. Thus, although some techniques have been suggested (Jeffrey Wooldridge, 1995, 2002; Ekaterina Kyriazidou, 1997, 2001), no clear-cut conclusions have been reached about the appropriateness of each (see Christian

Dustman and Maria E. Rochina-Barrachina, 2007), particularly when endogeneity exists (see Anastasia Semykina and Jeffrey Wooldridge, 2008). Bearing this in mind, but still with the aim of considering a possible different behavior between two-earner couples, and those with only male earners (there is a very low number of sample couples where the only earner is the mother), we have decided to estimate two separate samples: one sample for those couples where both parents work outside the home, and the other for couples where only the father works. Although we do not explicitly take into account the issue of sample selection and, in consequence, we express our cautions against the potential biases, the estimation of two separate samples is an approximation to compare results and to shed some light on the distinct behavior between the differing participation status of mothers.

Sixth, although the family structure may, in principle, have some influence on the time spent on childcare, through the availability of more resources, generation of new necessities, the possibility of specialization, the raising of collaboration or conflicts within the household, previous evidence shows negligible differences between types of couples (see Kalenkoski, Ribar, and Stratton 2007). This, along with our aim of analyzing intra-household allocation of time, leads us to consider only those families with two parents, either married or cohabitant.

Seventh, the five sample countries cover an ample range of the variations observed within Europe. As discussed above, they are thought to capture heterogeneity in welfare state regime types, across Northern, Central and Southern countries. However, not only can differences across countries be explained by different welfare state regimes, but gender norms and stereotypes also play a role in the performance of childcare and its determinants. Thus, Kim and Zepeda (2004) argue that social norms, for example, wage discrimination against women, weaken mothers' bargaining power. Almudena Sevilla-Sanz (2007) shows that less egalitarian social norms favor specialization within the family, whereas de Laat and Sevilla-Sanz (2006) extend this argument to analyze their influence on fertility and female participation rates (see also Raquel Fernandez, Alessandra Fogli, and Claudia Olivetti 2004). The five countries considered in this paper also show great differences regarding social norms, being more egalitarian in the Nordic, less so in the Mediterranean, and in an intermediate position in the Central countries.

Results of the estimation

Bearing in mind the aim of our study, focused on the differences across countries in regards to the behavior of fathers and mothers in caring for children, and on the influence of the determinants under consideration, the estimation procedure is structured as follows. First, we estimate each equation corresponding to the hours dedicated by each parent, using aggregated data by OLS. We then use the panel data structure to estimate the equations, considering individual effects, both fixed and random. The LM test shows the preference of the panel estimation over the pool estimation, while the Hausman test reveals that the fixed effects model is the appropriate estimation procedure in all cases.¹²

A first approximation of the final results are obtained from an OLS estimation, with the results being presented in Table 3. Here, simultaneity is accounted for, but unobserved heterogeneity and endogeneity are not. However, our estimation provides some exploratory results for the whole set of regressors and, particularly, for those related to educational levels and the average age. These latter variables are time-invariant, or their time-differentials are constant over time, so that they disappear when mean-differences are taken in estimating by fixed effects. In very general terms, we can see that time spent on childcare increases with the number of children in the household, especially in the case of mothers, and more especially when the children are infants. Moreover, there seems to be an opposite behaviour between fathers and mothers, in regard to the influence of hours of paid work on the hours of childcare. The influence of all these variables will be discussed more thoroughly below, after estimating by fixed effects, and after controlling for the endogeneity of hours of paid work.

Focusing now on the other variables, we can observe that, on average, the older a couple is, the less time is spent on childcare. One simple interpretation is that, since, by construction, all sample couples have at least one dependent child, and statistics show that almost 90% of the sample has a child younger than 12, the negative influence of this variable can be interpreted, not as being a cohort effect, but as that childcare is less intensive in, on average, older couples, probably because children in these couples, although under age 12, are, on average, older than those of the younger couples. However, another interpretation seems also sound. Younger couples, that is to say, couples of more recent cohorts, are more willing, *caeteris paribus*, to spend more time on childcare, supporting the view that childcare now incorporates an important

investment component. This corroborates previous findings in the literature (see, e.g., Bianchi 2000). By gender, the common result is that the negative effect is greater in mothers than in fathers, except in Denmark.

Educational levels have a distinct impact across countries and across genders. In Denmark, a greater education level of mothers leads to more hours spent on childcare by both parents. Similar results, even though weaker, are found for the other sample countries. An exception is Germany, where more educated mothers only implies more time on childcare for fathers whose partners do not work in the market. For their part, the more educated the fathers, the more time both parents spend on childcare, in both subsamples in Spain, and only when the father works in Italy and Denmark. In France, more educated fathers result in less time being spent by both parents on childcare, whereas in Germany there are no significant effects.

This appears to suggest that, overall, greater educational levels, which can be considered to approximate wages, lead to more time being spent with children in four of the sample countries. Estimates for France are not so clear, since higher educational attainments of fathers implies less time spent on childcare by both parents, whereas university-graduate mothers spend more time with their children. In general, we can conclude that the more educated mothers are, the more time they spend on childcare in almost all cases, whereas more educated fathers spend more hours on childcare only in the Southern countries and in Denmark. Expressed in other terms, if we interpret educational levels as an approximation of wages, coefficients in Table 3 are usually found to be statistically significantly positive, except in the case of France and Germany. Specifically, in Italy, Spain and Denmark, higher mothers' own wages leads to more hours spent on childcare by fathers and mothers, whereas higher fathers' own wages mainly implies more hours on childcare by them, but fewer hours by the mothers. In these results, these countries resemble more the case of the US (Kimmel and Connelly, 2007; Connelly and Kimmel, 2007) than that of other European countries (Hallberg and Klevmarcken, 2003, for Sweden; and Kalenkoski, Ribar, and Stratton, 2009, for the UK).

(Table 3)

Although OLS estimates provide a first glance of the determinants of childcare, they suffer from some econometric problems. Since the same couples are followed by the survey over several periods, unobserved heterogeneity can be controlled for by using

panel data estimation techniques. A simple LM test (see the second last row in Table 4) shows that the consideration of individual effects is strongly preferred to the pooled estimation. Furthermore, since those unobserved individual effects are likely to be correlated with the regressors, a fixed effects model must be applied. Thus, for example, the family's willingness to have children may be correlated with the number of children; the desire to have better educated children may also be correlated with parents' education, and so on. Nevertheless, and with the aim of checking the possible correlation between individual effects and observed regressors, we have applied Hausman tests, which confirm the appropriateness of the fixed effects estimation, rather than the random effects, in all five country samples (see last row in Table 4).

After selecting the best specification, we now describe the estimation of the parameters presented in Table 4. In this case, not only have fixed effects estimations been applied, but the simultaneity in the decision-making process between the two parents has also been taken into account. As stated, estimations for fathers and mothers are carried out in a single equation, allowing for different parameters for each of the parents, including the intercepts. The results are now discussed in turn.

(Table 4)

The variable expressing the relative bargaining power of women, *Ratio*, has a negative impact on the time spent by mothers on childcare, in all sample countries, but is only significant in the subsamples in which mothers do not work outside the home, while in Germany and Italy, it is also significant in the subsamples in which both parents work. Additionally, such a reduction of the number of hours of childcare by mothers is accompanied by an increase in the number of hours fathers spend with their children, even though the influence is only significant in Germany, and marginally so in Denmark and Italy. This suggests that a higher bargaining power of women helps them to reduce time spent on childcare, but only achieves an increase of time devoted by fathers to this activity in Germany.¹³

In regard to the *FamilyIncome* variable, differences across countries are evident. Whereas a higher family, non-labor, income positively and significantly influences the number of hours spent on childcare by both parents in France, the opposite result is found for Germany. In Denmark, it reduces the time that mothers who do not work in the market spend with their children, whereas in Italy it increases the time that fathers whose wives do not work outside the home devote to childcare. In Spain, the results

vary somewhat, depending on whether hours of work are instrumented, or not. The case of France can be interpreted as the parents' preference for childcare provided by themselves, compared to hiring such services in the market, whereas the opposite applies in Germany. Thus, it can be interpreted that the investment component of childcare in France is more relevant than in the other sample countries. By contrast, in Germany our results suggest that parents may prefer to devote extra income to hire childcare in the market.¹⁴

With respect to the child variables, almost all coefficients are estimated to be positively significant, with the only exception being the coefficients of variable *Children<16* in Germany, which are found to be negative. Two general results can be observed: that coefficients for mothers are always greater than those of fathers; and that coefficients corresponding to the *Birth* variable are the highest. However, some results differ from these general rules, and we now describe them for each individual variable. First, a newborn child in the family leads to more hours spent on childcare by both parents, in all sample countries. However, coefficients for mothers are considerably higher, between five and ten times those of fathers. Moreover, whereas for mothers such coefficients are higher than those corresponding to variable *Children<12*, except in Denmark, they are clearly lower in the case of fathers, with this being the general rule, although there are certain exceptions. Hence, we can deduce that a new birth in the family necessitates an increase in the time devoted to childcare by mothers, much more than in the case of fathers, and much more than when the child is not an infant. As children grow older, the impact on time devoted to children is more evenly distributed across genders, so that the influence on fathers is quantitatively greater than in the case of a new birth. In the case of Danish fathers, this latter coefficient is non-significant even when both parents work.

Across subsamples, a *Birth* in the family leads to more time on childcare by mothers, with few variations, whether the mother works or not, whereas the impact on fathers is higher when both parents work, as against the case in which only the father works, except in Denmark. These results are, in general, common to both variables, *Birth* and *Children<12*. Taking together the estimates for these two variables, it is apparent that the presence of infants greatly influences time spent on childcare in all countries, with this influence continuing as the children grow older, though in a more moderate way. The only exception is, again, Denmark, where coefficients of variables *Children<12* are

much higher than those of *Birth*, especially for fathers. Clearly, this result may be explained by the benefits and leave arrangements in this latter country, compared to the other countries. In Denmark, in the first years of a child, parental leave is extensive and generous, with facilities for childcare from the moment the father or mother returns to work. However, as described in Bettio and Plantenga (2004), the financial benefits in the other sample countries are not as great, and public care facilities are reduced on return to work.

The variable indicating the number of children under age 16 shows similar results, even though estimated coefficients are somewhat smaller. The most striking result is that estimates for Germany are negative, but they are only significant when mothers do not work outside home. The relevance of this variable suggests that, not only the presence and the age of children have an impact on time devoted to childcare, but also the number of children. It is worth noting that the greatest effect of the number of children on time spent on childcare is observed in Denmark. The more extended coverage of public services and childcare arrangements may explain this result. In summary, the presence of children augments the number of hours spent on childcare, especially in the case of mothers, and when children are infants. In Denmark, and to a lesser extent in Germany, this effect is also observed for fathers, particularly when both parents work.

In regard to the influence of time allocated to paid work on time spent on childcare, one general result emerges. More hours worked by fathers/mothers imply fewer hours devoted by them to childcare, and more hours devoted by their corresponding spouses. That is, more hours in paid work by fathers leads to fewer hours in childcare by them, and more by mothers. Conversely, more hours in paid work by mothers generates more time in childcare by fathers and less by mothers. The statistical significance of this general result declines, when compared to the OLS estimates, and decreases further when endogeneity is instrumented (see Table A2 in the Appendix).¹⁵ From the estimates appearing in Table 4, several comments arise. First, more coefficients are estimated to be significant in the sub-sample in which both parents work. Second, more hours worked by mothers result in significant reductions in the time spent on childcare by mothers, in all sample countries, whereas statistically significant increases in childcare by fathers are only observed in France and Germany. Third, more hours worked by fathers in Denmark and Italy reduce significantly the time spent in childcare by fathers,

and simultaneously increases significantly the time spent in childcare by mothers. In the other sample countries, the influence is almost insignificant. Finally, in Spain, most of the coefficients are found to be insignificant. This latter result suggests that, in Spain, the time spent on childcare is quite inelastic to changes in the hours of paid work, which is in line with the observations from a number of EU countries in Bianchi (2000); Hallberg and Klevmarken (2003); Sayer, Bianchi, and Robinson (2004); Bianchi and Raley (2005); Sandberg and Hoffart (2005).

SUMMARY AND CONCLUSIONS

The objective of this paper has been to analyse gender differences in the allocation of time spent caring for children. To that end, we have considered the efficiency approach to derive demand functions for hours spent on childcare, and estimated these for five national samples, namely Danish, French, German, Italian and Spanish households, drawn from the eight waves of the European Community Household Panel-ECHP (1994-2001).

Before carrying out the econometric analysis, we have first provided a body of descriptive evidence which clearly points to the specialization of mothers in caring for children in the sample countries, even though differences exist among them. Thus, the average number of hours mothers dedicate to caring for children ranges from five times more than men in Mediterranean countries, e.g. Spain, to less than two times more than men in Denmark, as an example of the Nordic countries. The HK and IR indicators confirm this evidence, showing that the greatest inequality in caring for children appears in Spain, and the smallest in Denmark.

In regards to the estimation strategy, the following aspects have been considered. First, time devoted to childcare deserves to be studied separately from other uses of time, such as labour supply or housework. Second, the fact that decisions made in allocating time to childcare depend on, and influence, other time uses, leads us to conclude that endogeneity must be addressed in the analysis of the decision-making process. Third, in modelling intra-household allocation of time, we consider that families consist of two adult members, the parents, each with their own preferences, and that final decisions are taken simultaneously. In this respect, we adopt a general theoretical approach, namely the efficiency approach, which encompasses both unitary

and collective models. Fourth, deriving from this general approach, the parents' decisions about time spent on childcare are modelled in a reduced form, specified by demand functions, which are seen as being influenced by a series of economic determinants, i.e. individual and household characteristics, as well as variables related to bargaining power. Fifth, taking into account that such determinants can vary across welfare state regime types, and social norms and stereotypes, we have carried out the analysis for several EU countries considered to be representative within the EU. Sixth, the database used, the eight waves of the ECHP, from 1994 to 2001, is common for the five sample countries, such that information obtained can be considered to be homogeneous. The fact that the data are provided in panel form has allowed us to control for unobserved individual heterogeneity. Finally, selectivity issues have been partially addressed by analyzing the behavior of those families where both parents work, separately from those where only the father works. Taken together, the simultaneous consideration of all these factors constitutes an important contribution to the existing international literature on the allocation of childcare between parents.

Our fixed effects estimations yield the following relevant results. First, a higher level of mothers' non-labor income, compared to family's non-labor income, implies fewer hours spent on childcare by mothers and more time spent on childcare by fathers. Second, *FamilyIncome* positively influences the number of hours spent on childcare by both parents, in most of the sample countries. This suggests that childcare represents an important investment component, at least in some countries. Third, education variables, which can be interpreted as approximating wages, show differing behaviors across countries, across genders and, less importantly, across subsamples. Fourth, a very robust result across countries is that the presence of young children, especially infants, increases the time spent on childcare by fathers, and more so by mothers. Furthermore, as children grow older, that influence is reduced in importance, but only disappears completely in Germany, for children under sixteen. Fifth, the impact of the number of hours worked on the number of hours spent on childcare differs greatly across genders. More hours on paid work by one of the parents implies more hours on childcare by the corresponding spouse, and fewer hours by the former. These results, however, appear to be significant only in the samples in which both parents work. If instruments are used, robust results are only found to be significant in Germany, suggesting that, in the remaining countries, changes in the number of hours worked are absorbed mainly

through time devoted to other activities, such as leisure or housework.

These results reveal that the case of Denmark is quite different from that of the other countries studied. This is probably due to the social democratic policies characteristic of the Nordic countries, policies that seek to enhance women's participation in paid work, through two channels. The first is greater flexibility in the workplace, i.e. flexible time schedules that allow for childcare during working time, and the establishment and growth of kindergartens at the workplace with adjustable timetables, thus making family and work tasks more compatible. The second is greater security at the workplace, with extensive care arrangements and the aim of equal pay for men and women. These policies have permitted significant growth in equality for women in the workplace in general in Denmark, and also in childcare for those working women who are mothers. In the remaining countries studied, despite the fact that time spent on childcare is now less gender-specific than in the past, the difference with respect to Denmark and the Nordic countries in general is still significant (see also Bettio and Plantenga, 2004). Thus, women's participation in the labor market in Mediterranean countries, despite the gains of recent years, is still about 20 points below that of the Nordic countries. Our data show that both parents work in only 31% of Spanish families, 42% in Italy, compared to 80% in Denmark. At the same time, it appears that increasing the prevalence of women in part-time jobs, which is characteristic of the Central conservative countries, such as Germany or France, does not result in a more balanced sharing of the caring tasks.

Therefore, and taking the Danish case as a benchmark, although promoting women's participation in the labor market helps to reduce inequality between fathers and mothers (see Barbara Bergmann, 2001), such participation should be accompanied by both economic measures (such as modifications in taxation, benefits, allowances, divorce and parenting legislation) and changes in social norms (egalitarian attitudes toward employment, housework and childcare), with the aim of increasing equality in housework tasks, including childcare (Alvarez and Miles 2003; de Laat and Sevilla 2006; Seguino 2007).

NOTES

¹ Mark Aguiar and Erik Hurst (2007) use alternative measures of leisure to find a

different behavior in the US across educational groups, which result in an aggregate increase of leisure time for both men and women over time.

² This result is also found for the US by Kalenkoski, Ribar, and Stratton (2007) and for Switzerland by Alfonso Souza-Poza, Hans Schmid, and Rolf Widmer (2001). However, Korenman, Liao, and O'Neill (2005) do not find influence of own wages on time devoted to childcare in the US.

³ Consequently, we cannot develop a full structural model containing all possible uses of time, as exists in other studies which use Time Use Surveys (Korenman, Liao, and O'Neill 2005; Kimmel and Connelly 2007; Connelly and Kimmel 2007; Kato and Matsumoto 2008).

⁴ Finland is also included in the ECHP, but only since 1996. Sweden has not been considered in our study, since information about hours devoted to childcare is not available. Although the case of the UK has also been excluded, previous evidence for this country exists (e.g. Kalenkoski, Ribar, and Stratton 2005).

⁵ For more information on this data base, see Bettio and Plantenga (2004).

⁶ See Bernard Fortin and Guy Lacroix (1997); Pierre-Andre Chiappori, Bernard Fortin and Guy Lacroix (2002); Bittman et al. (2003); Leora Friedberg and Anthony Webb (2006) among many others. One measure seldom used is the difference in age between husband and wife (see Michael Myck et al. 2006), with this being insignificant in our study. We thank one anonymous referee for calling our attention to this point in a previous version.

⁷ Adults in the survey are considered those individuals 16 years or older. There is no other information about the number of children by age groups (under age 6, etc.).

⁸ As shown in the studies for the US by Connelly and Kimmel (2007) and Kimmel and Connelly (2007), childcare exhibits a behavior quite close to that of paid work, in the sense that first, the number of hours devoted to each activity have increased over time (especially in women), and second, time devoted to paid work and childcare reacts positively to changes in wages.

⁹ See also Chris Van Klaveren, Bernard Van Praag, and Henriette Van der Brink (2006) and Martin Browning and Metter Gortz (2006).

¹⁰ Alvarez and Miles (2003) opted to eliminate the time spent in paid work from the analysis, to avoid endogeneity in the estimation of the determinants of time spent in housework. We would prefer to deal with such endogeneity by applying instruments.

¹¹ We thank anonymous referees for their suggestions regarding the treatment of endogeneity.

¹² Despite problems of endogeneity being somewhat intractable to a simple resolution, our data allows us to instrument variables, with the results, presented in Table A2 in the Appendix, not varying substantially from those obtained without the instrumented variables.

¹³ By contrast, Connelly and Kimmel (2007) find that a higher value of the ratio increases the share of childcare by mothers in the US.

¹⁴ With respect to evidence in other EU countries not included in this paper, Kalenkoski, Ribar, and Stratton (2005), for the UK, using an exogenous indicator variable for the receipt of non-labor income, find no influence of family income on childcare.

¹⁵ Note that OLS estimates are generally found to be significant. A remarkable result is that more hours worked by mothers implies less time in childcare by them, which is significant in all countries when endogeneity is not instrumented, this result is observed only in Germany when endogeneity is dealt with.

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Table 1 Averages and standard deviations of the variables

Variables	Denmark			France			Germany			Italy			Spain			
	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works	
Dependent																
ChildCareFather	19.38 (23.79)	19.11 (23.65)	18.15 (22.40)	9.45 (12.63)	11.20 (13.19)	6.76 (10.10)	9.63 (9.64)	15.48 (9.47)	7.38 (8.17)	7.97 (12.37)	10.10 (13.60)	5.78 (10.01)	7.45 (15.09)	11.10 (17.39)	4.81 (11.54)	
ChildCareMother	32.91 (31.62)	31.44 (30.83)	41.85 (34.82)	37.63 (28.33)	31.43 (24.22)	39.95 (32.98)	30.08 (22.39)	38.19 (19.22)	42.71 (25.99)	30.14 (24.15)	27.91 (21.41)	32.89 (26.31)	36.45 (32.42)	30.73 (27.09)	41.57 (34.59)	
Independent																
AverageAge	38.21 (6.13)	38.60 (5.90)	36.34 (0.65)	38.68 (0.74)	38.59 (0.17)	38.36 (0.57)	38.29 (0.78)	38.06 (0.15)	37.92 (0.57)	39.88 (0.72)	39.55 (0.10)	39.30 (0.58)	39.78 (0.73)	39.06 (0.07)	39.37 (0.48)	0.60 (5.76)
PrimaryFather	0.15 (0.36)	0.13 (0.34)	(2.68) (0.39)	(2.92) (0.49)	(1.08) (0.47)	(0.86) (0.50)	(0.83) (0.40)	(0.38) (0.31)	(1.73) (0.39)	(1.35) (0.50)	(0.25) (0.48)	(17.69) (0.49)	(6.56) (0.49)	(0.71) (0.50)	(5.69) (0.48)	
SecondaryFather	0.47 (0.50)	0.46 (0.50)	0.52 (0.50)	0.34 (0.47)	0.37 (0.48)	0.31 (0.46)	0.56 (0.37)	0.57 (0.49)	0.54 (0.50)	0.37 (0.48)	0.45 (0.50)	0.34 (0.47)	0.18 (0.39)	0.21 (0.40)	0.18 (0.39)	
UniversityFather	0.38 (0.49)	0.41 (0.49)	0.29 (0.45)	0.24 (0.43)	0.26 (0.44)	0.23 (0.42)	0.28 (0.50)	0.31 (0.46)	0.26 (0.44)	0.11 (0.31)	0.17 (0.38)	0.07 (0.26)	0.22 (0.42)	0.36 (0.48)	0.18 (0.38)	
PrimaryMother	0.16 (0.36)	0.12 (0.32)	0.27 (0.44)	0.40 (0.49)	0.32 (0.47)	0.49 (0.50)	0.21 (0.41)	0.14 (0.35)	0.25 (0.44)	0.50 (0.50)	0.32 (0.47)	0.63 (0.48)	0.63 (0.48)	0.39 (0.49)	0.72 (0.45)	
SecondaryMother	0.44 (0.50)	0.44 (0.50)	0.50 (0.50)	0.31 (0.46)	0.33 (0.47)	0.29 (0.45)	0.59 (0.77)	0.58 (0.49)	0.62 (0.49)	0.40 (0.49)	0.51 (0.50)	0.32 (0.47)	0.18 (0.38)	0.21 (0.40)	0.18 (0.38)	
UniversityMother	0.40 (0.49)	0.44 (0.50)	0.23 (0.42)	0.27 (0.44)	0.33 (0.47)	0.18 (0.38)	0.18 (0.38)	0.27 (0.44)	0.11 (0.32)	0.09 (0.29)	0.17 (0.37)	0.04 (0.20)	0.20 (0.40)	0.40 (0.49)	0.11 (0.31)	
Ratio	0.64 (0.41)	0.71 (0.37)	0.42 (0.45)	0.21 (0.35)	0.25 (0.36)	0.17 (0.33)	0.28 (0.42)	0.37 (0.44)	0.14 (0.32)	0.24 (0.38)	0.39 (0.41)	0.11 (0.29)	0.15 (0.33)	0.25 (0.40)	0.08 (0.25)	
FamilyIncome	2.09 (0.42)	2.08 (0.37)	2.09 (0.48)	1.60 (0.31)	1.78 (0.28)	1.44 (0.33)	1.35 (0.94)	1.28 (0.92)	1.39 (0.95)	1.73 (0.64)	2.31 (0.78)	1.42 (0.56)	1.02 (0.57)	1.23 (0.34)	0.94 (0.64)	
Birth	0.10 (0.30)	0.09 (0.29)	0.17 (0.37)	0.08 (0.26)	0.07 (0.25)	0.09 (0.28)	0.07 (0.25)	0.07 (0.26)	0.07 (0.25)	0.07 (0.26)	0.08 (0.26)	0.07 (0.26)	0.06 (0.24)	0.07 (0.26)	0.06 (0.24)	
Children<16	1.82 (0.82)	1.80 (0.79)	1.88 (0.84)	1.83 (0.89)	1.67 (0.72)	2.08 (1.02)	1.68 (0.81)	1.50 (0.67)	1.90 (0.92)	1.55 (0.70)	1.49 (0.64)	1.61 (0.74)	1.62 (0.72)	1.56 (0.66)	1.64 (0.71)	
Children<12	0.89 (0.32)	0.88 (0.33)	0.92 (0.27)	0.87 (0.34)	0.85 (0.35)	0.89 (0.31)	0.84 (0.37)	0.80 (0.40)	0.89 (0.32)	0.83 (0.37)	0.84 (0.37)	0.84 (0.36)	0.86 (0.35)	0.87 (0.33)	0.86 (0.35)	
WorkedFather	42.50 (15.00)	42.61 (10.86)	42.36 (12.58)	39.42 (19.00)	39.21 (15.95)	42.05 (16.64)	40.26 (17.21)	45.35 (11.90)	40.25 (10.59)	42.44 (16.07)	42.34 (11.02)	42.55 (10.86)	46.03 (19.19)	45.83 (12.30)	46.26 (11.99)	
WorkedMother	29.16 (15.59)	35.18 (9.10)	0.00 (0.00)	19.95 (19.04)	32.27 (13.67)	0.00 (0.00)	17.04 (18.26)	29.35 (15.71)	0.00 (0.00)	15.65 (18.50)	33.85 (11.24)	0.00 (0.00)	13.82 (19.61)	37.97 (11.73)	0.00 (0.00)	
Observations	4581	3859	722	11682	7346	4336	10436	6327	5109	14129	6657	7472	11430	4153	7277	

Table 2 Inequality measures

Inequality measures	Denmark			France			Germany			Italy			Spain		
	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works
HK	0.39 (0.34)	0.37 (0.34)	0.51 (0.33)	0.70 (0.35)	0.60 (0.37)	0.84 (0.25)	0.65 (0.31)	0.55 (0.32)	0.74 (0.32)	0.69 (0.34)	0.59 (0.36)	0.79 (0.28)	0.76 (0.33)	0.61 (0.39)	0.85 (0.26)
IR	0.52 (0.35)	0.55 (0.35)	0.40 (0.32)	0.24 (0.31)	0.32 (0.34)	0.12 (0.21)	0.30 (0.29)	0.36 (0.31)	0.20 (0.24)	0.24 (0.29)	0.33 (0.32)	0.15 (0.22)	0.19 (0.29)	0.33 (0.36)	0.11 (0.21)

Note. Standard deviations in brackets

Table 3 OLS estimation

Variables	Denmark				France				Germany			Italy				Spain				
	Both work		Only the father works		Both work		Only the father works		Both work		Mother s	Only the father works		Both work		Only the father works		Both work		Only the father works
	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers
Constant	13.85** (1.64)	14.80** (2.11)	9.09** (2.04)	1.41 (3.08)	6.31** (0.64)	12.46** (1.07)	3.27** (0.58)	16.85** (1.74)	2.31** (0.44)	5.81** (0.91)	3.48** (0.58)	9.26** (1.80)	3.41** (0.83)	2.64** (1.37)	2.79** (0.72)	11.88** (1.58)	7.34** (1.08)	14.22** (1.59)	6.25** (0.69)	16.62** (1.66)
Average Age	-0.17** (0.02)	-0.18** (0.03)	-0.06** (0.03)	-0.02 (0.04)	-0.10** (0.01)	-0.17** (0.02)	-0.06** (0.01)	-0.26** (0.03)	-0.03** (0.01)	-0.08** (0.01)	-0.05** (0.01)	-0.17** (0.03)	-0.04** (0.01)	-0.14** (0.02)	-0.03** (0.01)	0.01 (0.03)	-0.07** (0.02)	-0.16** (0.03)	-0.06** (0.01)	-0.29** (0.03)
SecondaryFather	0.03 (0.58)	-0.48 (0.73)	1.13* (0.82)	2.64** (1.22)	-0.47** (0.23)	-0.86** (0.39)	-0.75** (0.22)	-2.27** (0.68)	-0.12 (0.19)	-0.30 (0.39)	-0.11 (0.20)	-0.48 (0.65)	0.28 (0.23)	-0.05 (0.39)	0.90** (0.17)	1.43** (0.48)	1.25** (0.41)	1.09* (0.62)	1.15** (0.22)	0.95* (0.65)
UniversityFather	0.87* (0.63)	-0.89 (0.80)	1.55* (0.99)	1.81 (1.46)	-0.65** (0.27)	-0.70* (0.46)	0.54** (0.27)	-0.80 (0.84)	-0.21 (0.21)	-0.36 (0.44)	-0.40* (0.24)	-0.66 (0.78)	0.44 (0.36)	-0.42 (0.60)	0.88** (0.33)	0.40 (0.95)	1.42** (0.39)	0.79 (0.60)	1.06** (0.23)	0.05 (0.67)
SecondaryMother	0.99** (0.58)	1.82** (0.73)	1.85** (0.77)	1.84* (1.15)	-0.58** (0.24)	-0.22 (0.41)	0.27 (0.22)	0.27 (0.70)	-0.06 (0.17)	0.14 (0.35)	0.28* (0.18)	0.29 (0.56)	1.08** (0.24)	1.15** (0.40)	0.96** (0.18)	-0.35 (0.52)	1.07** (0.41)	0.41 (0.63)	0.60** (0.23)	2.14** (0.67)
UniversityMother	1.31** (0.63)	2.36** (0.79)	2.87** (1.01)	2.04* (1.50)	0.76** (0.26)	0.65* (0.45)	0.41* (0.29)	2.26** (0.90)	0.01 (0.21)	-0.02 (0.42)	0.68** (0.29)	1.01 (0.92)	1.12** (0.37)	0.82* (0.62)	0.45 (0.41)	-0.09 (1.18)	2.27** (0.39)	-0.08 (0.60)	1.55** (0.23)	2.81** (0.84)
Ratio	0.01 (0.01)	-0.01 (0.01)	0.02* (0.01)	-0.03** (0.02)	0.01 (0.00)	-0.01 (0.01)	0.01 (0.01)	-0.02* (0.01)	0.01** (0.00)	-0.01 (0.00)	0.01* (0.00)	-0.01 (0.01)	0.01 (0.01)	-0.02** (0.01)	0.01 (0.01)	-0.06** (0.01)	0.01* (0.01)	-0.03** (0.01)	0.02** (0.01)	-0.05** (0.01)
FamilyIncome	0.01* (0.01)	0.02** (0.01)	0.01 (0.01)	0.00 (0.01)	0.02** (0.00)	0.02** (0.01)	0.01 (0.00)	0.03** (0.01)	-0.02** (0.01)	-0.06** (0.01)	-0.02** (0.01)	-0.06** (0.02)	0.01 (0.01)	-0.02 (0.02)	0.02** (0.01)	-0.14** (0.04)	0.01 (0.00)	0.01 (0.00)	0.01 (0.00)	0.01* (0.00)
Birth	8.23** (0.92)	26.58** (1.17)	8.08** (1.25)	30.44** (1.90)	5.42** (0.46)	21.39** (0.79)	3.65** (0.38)	22.26** (1.19)	0.55* (0.33)	6.88** (0.67)	0.80** (0.34)	4.86** (1.08)	3.85** (0.49)	15.39** (0.81)	1.96** (0.35)	8.66** (1.00)	7.44** (0.74)	20.42** (1.12)	4.75** (0.41)	26.77** (1.19)
Children<16	2.50** (0.33)	3.30** (0.42)	2.53** (0.59)	4.40** (0.89)	0.01 (0.16)	1.75** (0.27)	-0.14 (0.12)	2.40** (0.37)	0.36** (0.11)	0.99** (0.22)	0.13 (0.10)	0.57* (0.31)	1.34** (0.18)	3.81** (0.30)	0.73** (0.12)	3.85** (0.33)	0.43 (0.27)	2.28** (0.41)	0.14 (0.13)	3.27** (0.38)
Children<12	14.45** (0.73)	24.21** (0.91)	12.16** (1.35)	29.13** (2.03)	5.93** (0.32)	13.75** (0.55)	3.43** (0.31)	21.55** (0.97)	3.28** (0.20)	6.25** (0.42)	2.59** (0.25)	9.78** (0.80)	7.16** (0.33)	16.01** (0.55)	3.09** (0.24)	14.11** (0.70)	10.19** (0.50)	26.19** (0.76)	4.15** (0.27)	32.07** (0.78)
WorkedFather	-0.20** (0.02)	0.08** (0.02)	-0.20** (0.03)	0.02 (0.04)	-0.04** (0.01)	0.01 (0.01)	-0.01** (0.01)	0.07** (0.02)	-0.02** (0.00)	0.02** (0.01)	-0.01** (0.01)	0.02 (0.02)	-0.08** (0.01)	0.08** (0.02)	-0.03** (0.01)	0.06** (0.02)	-0.11** (0.01)	0.01 (0.02)	-0.05** (0.01)	0.03 (0.02)
WorkedMother	0.03 (0.02)	-0.11** (0.03)			0.00** (0.01)	-0.14** (0.01)			0.01** (0.00)	-0.06** (0.01)			0.05** (0.01)	-0.14** (0.02)			0.01 (0.01)	-0.16** (0.02)		
Adjusted R ²	0.31		0.33		0.29		0.33		0.12		0.10		0.31		0.10		0.44		0.43	

Notes. Standard deviations in brackets. *:the coefficient is significant at 10%. **:the coefficient is significant at 5%.

Table 4. Fixed effects estimation

Variables	Denmark				France				Germany				Italy				Spain			
	Both work		Only the father works		Both work		Only the father works		Both work		Only the father works		Both work		Only the father works		Both work		Only the father works	
	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers												
Constant	5.56** (1.54)	7.23** (2.06)	0.89 (1.89)	1.91 (2.93)	1.08** (0.51)	4.67** (0.74)	-0.83* (0.51)	5.64** (1.24)	0.88* (0.48)	3.10** (0.96)	2.97** (0.63)	6.76** (1.66)	3.12** (0.83)	11.20** (1.36)	2.44** (0.71)	20.28** (1.33)	1.93* (1.30)	10.00** (1.86)	1.25* (0.76)	7.38** (1.50)
Ratio	0.02** (0.01)	-0.01 (0.01)	0.01 (0.02)	-0.03* (0.02)	0.01 (0.01)	-0.01 (0.01)	0.01* (0.01)	-0.03** (0.01)	0.02** (0.00)	-0.03** (0.01)	0.02** (0.01)	-0.05** (0.02)	0.01 (0.01)	-0.02** (0.01)	0.02* (0.01)	-0.08** (0.01)	0.01 (0.01)	-0.01 (0.01)	0.01 (0.01)	-0.04** (0.01)
FamilyIncome	0.01 (0.01)	0.01 (0.01)	0.00 (0.01)	-0.02* (0.01)	0.02** (0.00)	0.02** (0.01)	0.01** (0.00)	0.05** (0.01)	-0.04** (0.01)	-0.11** (0.02)	-0.05** (0.01)	-0.12** (0.04)	0.01 (0.01)	-0.01 (0.03)	0.04** (0.02)	-0.06 (0.05)	0.01* (0.00)	0.01** (0.00)	0.00 (0.00)	0.00* (0.00)
Birth	1.18 (0.93)	15.68** (1.23)	4.23** (1.42)	17.90** (2.38)	3.18** (0.47)	15.99** (0.81)	1.41** (0.40)	12.01** (1.32)	2.09** (0.40)	10.36** (0.83)	2.10** (0.40)	9.73** (1.28)	2.44** (0.50)	13.82** (0.90)	2.07** (0.35)	10.23** (1.08)	5.14** (0.83)	16.79** (1.29)	2.45** (0.47)	19.02** (1.40)
Children<16	5.10** (0.52)	8.16** (0.69)	3.56** (0.97)	8.02** (1.63)	1.49** (0.25)	4.95** (0.42)	0.83** (0.22)	5.71** (0.74)	-0.02 (0.21)	-0.25 (0.42)	-0.64** (0.22)	-3.14** (0.70)	2.44** (0.28)	4.29** (0.51)	0.98** (0.19)	2.48** (0.59)	2.07** (0.45)	4.22** (0.70)	0.92** (0.22)	6.65** (0.65)
Children<12	11.87** (0.93)	18.96** (1.23)	12.61** (1.98)	26.96** (3.35)	4.47** (0.40)	9.34** (0.69)	2.68** (0.46)	14.60** (1.51)	2.37** (0.30)	4.16** (0.61)	2.70** (0.43)	8.80** (1.37)	4.74** (0.43)	10.54** (0.77)	1.29** (0.31)	4.83** (0.98)	8.54** (0.74)	20.10** (1.14)	2.92** (0.40)	18.37** (1.21)
WorkedFather	-0.11** (0.03)	0.08** (0.03)	-0.02 (0.04)	0.02 (0.06)	-0.02** (0.01)	0.01 (0.01)	0.01 (0.01)	0.08** (0.02)	0.00 (0.01)	0.03* (0.02)	-0.01 (0.01)	0.01 (0.03)	-0.03** (0.01)	0.06** (0.02)	-0.03** (0.01)	0.04 (0.03)	-0.02 (0.02)	0.03 (0.03)	-0.01 (0.01)	0.06** (0.03)
WorkedMother	0.01 (0.03)	-0.13** (0.04)			0.03** (0.01)	-0.14** (0.02)			0.03** (0.01)	-0.02* (0.02)			0.01 (0.01)	-0.10** (0.02)			0.02 (0.02)	-0.14** (0.03)		
LM-test p	1052 (0.00)		85 (0.00)		3302 (0.00)		1085 (0.00)		79 (0.00)		158 (0.00)		1825 (0.00)		1452 (0.00)		365 (0.00)		396 (0.00)	
Hausman-test p	402 (0.00)		96 (0.00)		256 (0.00)		425 (0.00)		154 (0.00)		258 (0.00)		125 (0.00)		186 (0.00)		185 (0.00)		477 (0.00)	

Notes. Standard deviations in brackets (p-values in the tests). *:the coefficient is significant at 10%. **:the coefficient is significant at 5%.

ChildCareFather and *ChildCareMother* are estimated simultaneously in a single equation

APPENDIX

Table A1. Number of observations per wave

Observations	Denmark			France			Germany			Italy			Spain		
	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works	Total	Both work	Only the father works
1994	724	610	114	1645	1034	611	1487	902	728	2554	1203	1351	1658	602	1056
1995	654	551	103	1605	1009	596	1425	864	698	2148	1012	1136	1605	583	1022
1996	625	526	99	1521	956	565	1341	813	656	1845	869	976	1525	554	971
1997	570	480	90	1465	921	544	1320	800	646	1618	762	856	1415	514	901
1998	556	468	88	1425	896	529	1281	777	627	1581	745	836	1358	493	865
1999	510	430	80	1385	871	514	1262	765	618	1507	710	797	1325	481	844
2000	505	425	80	1331	837	494	1207	732	591	1455	686	769	1285	467	818
2001	437	368	69	1305	821	484	1113	675	545	1421	670	751	1259	457	802
Total	4581	3859	722	11682	7346	4336	10436	6327	5109	14129	6657	7472	11430	4153	7277

Table A2. Fixed effects estimation (instrumental variables)

Variables	Denmark				France				Germany				Italy				Spain			
	Both work		Only the father works		Both work		Only the father works		Both work		Only the father works		Both work		Only the father works		Both work		Only the father works	
	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers	Fathers	Mothers
Constant	18.60*	25.41	8.03	-8.28	-8.88**	-17.36**	-3.76	-32.7**	5.55**	27.39**	2.68**	6.25**	-6.51	-38.52**	-1.01	9.33	-18.15	-8.51	-4.87	33.63*
	(14.67)	(18.92)	(11.51)	(19.28)	(3.64)	(6.53)	(3.13)	(11.28)	(0.90)	(1.98)	(0.46)	(0.92)	(10.44)	(19.10)	(4.97)	(15.44)	(11.95)	(18.15)	(5.76)	(17.64)
Ratio	0.02**	-0.01	-0.01	-0.04**	0.02*	-0.01*	0.01*	-0.06**	0.02**	-0.03**	0.02**	-0.05**	0.01	-0.03**	0.02*	-0.08**	0.01	-0.01	0.01	-0.04**
	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)	(0.00)	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
FamilyIncome	-0.01	0.01	0.00	-0.02**	0.02**	0.03**	0.01**	0.08**	-0.05**	-0.14**	-0.04**	-0.11**	0.01	0.02	0.04**	-0.05	-0.01*	0.01**	0.01	-0.01*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.00)	(0.01)	(0.00)	(0.02)	(0.01)	(0.02)	(0.01)	(0.04)	(0.02)	(0.03)	(0.02)	(0.05)	(0.01)	(0.00)	(0.01)	(0.01)
Birth	0.81	15.20**	4.33**	17.75**	3.31**	16.19**	1.63**	15.28**	4.21**	3.25**	2.10**	9.73**	2.57**	14.02**	2.06**	10.20**	5.26**	16.92**	2.48**	18.88**
	(1.03)	(1.34)	(1.44)	(2.41)	(0.50)	(0.87)	(0.47)	(1.86)	(1.52)	(1.02)	(0.40)	(1.28)	(0.52)	(1.03)	(0.35)	(1.09)	(0.85)	(1.32)	(0.47)	(1.43)
Children<16	5.42**	8.31**	3.81**	7.65**	1.89**	5.60**	0.83**	5.55**	-0.37*	-1.91**	-0.64**	-3.14**	2.48**	4.09**	0.97**	2.44**	2.05**	4.19**	0.83**	7.05**
	(0.56)	(0.71)	(1.06)	(1.78)	(0.32)	(0.59)	(0.23)	(0.89)	(0.23)	(0.49)	(0.22)	(0.70)	(0.29)	(0.58)	(0.19)	(0.59)	(0.47)	(0.72)	(0.23)	(0.72)
Children<12	11.52**	18.58**	12.32**	27.56**	4.20**	8.90**	2.44**	10.96**	1.67**	0.81	2.70**	8.80**	4.77**	10.05**	1.25**	4.69**	8.85**	20.89**	3.06**	17.78**
	(1.01)	(1.30)	(2.05)	(3.56)	(0.44)	(0.77)	(0.53)	(2.10)	(0.34)	(0.74)	(0.43)	(1.37)	(0.45)	(0.90)	(0.32)	(1.00)	(0.81)	(1.24)	(0.42)	(1.29)
WorkedFather	-0.64**	0.43	-0.20	0.24	-0.02	0.15	-0.07	0.94**	-0.10**	0.62**	-0.25**	0.55**	-0.06	1.15**	-0.05	0.30	-0.23	0.08	-0.13	0.52
	(0.28)	(0.36)	(0.28)	(0.48)	(0.09)	(0.17)	(0.08)	(0.30)	(0.02)	(0.05)	(0.05)	(0.20)	(0.21)	(0.40)	(0.12)	(0.37)	(0.27)	(0.40)	(0.12)	(0.39)
WorkedMother	0.26	-0.22			0.26**	-0.35			0.15**	-0.08**			0.16	-0.02			0.20	-0.39		
	(0.24)	(0.32)			(0.12)	(0.23)			(0.06)	(0.03)			(0.14)	(0.27)			(0.19)	(0.29)		

Notes. Standard errors in brackets. *:the coefficient is significant at 10%. **:the coefficient is significant at 5%.

WorkedFather and *WorkedMother* are both instrumented by their respective average hours worked, by each occupation, by gender and by year.

ChildCareFather and *ChildCareMother* are estimated simultaneously in a single equation