Intra-family time allocation to housework - French evidence

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Abstract

We analyse new time diary data from France to explore the relationship between economic variables and husbands' share of housework time. Consistent with both bargaining and specialization models of the family, we find that the greater the husband's share of labor income, the lower his share of housework time; the greater the wife's market hours, the lower his housework time, but the larger his share of housework time. Treating market work as endogenous substantially lowers the size of these estimates, but they remain statistically significant. A parsimonious specification based on the specialization model generates estimates for housework share wage elasticities. The own wage elasticity of wives' housework is -0.3 and the elasticity of husbands' housework share with respect to wives' wages is +0.25.

JEL-Codes: D13, J12, J13, J16

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1   Introduction

Hersch (1991a, 1991b) shows that time spent on housework has a negative impact on wages for women but not necessarily for men. Hersch and Stratton (1994) examine the division of time among employed spouses in the U.S., finding an inverse relationship between husband's share of housework time and own earnings and workplace hours. Beblo (1999) reports similar findings for Germany. In both of these latter two studies, however, market hours or share of market hours worked is used as an exogenous determinant of housework time. This paper examines the housework allocation of French couples and verifies the robustness of results to the endogeneity of market work.

If Becker's (1991) model of household specialization is correct, there may be a vicious cycle where women's relatively low wages lead to more specialization in home production that, in turn, keeps their earnings power low. This suggests that a shock to the system leading to higher wages, for example, can also be self-reinforcing in a virtuous cycle that leads to less specialization in home production, and future increases in earning power. Alternatively, one might think of that model as depicting a system with two equilibriums for married women, a low-wage, high home production equilibrium, and a high-wage, low home production equilibrium.

Cooperative bargaining models of the family are also consistent with such a vicious or virtuous cycle. Higher wages for women imply a better outside alternative should a marriage dissolve (Manser and Brown 1981, McElroy and Horney 1981) or a better inside alternative in a separate spheres bargaining outcome (Lundberg and Pollack 1995, 1996); in either model, higher wages raise the woman's threat point, improving her bargained utility in the marriage; she is more likely to reduce home production, increase home consumption time (leisure), and/or invest in market-related human capital (Carlin 1991).

This paper examines the same topic for France and compares findings with studies examining such issues in Germany and the U.S. As we point out in the next section of the paper, the specialization and bargaining models have the same sign predictions for our main variables of interest. Hence we do not test the specialization model against the bargaining models. Such a test would require information from another data source that could be matched with these data. In future work, we hope to identify critical variables which could have different implications across these models, as in Carlin (1991).

We have three main contributions. The first is to add to the cross-country evidence on the relationships between labor income, market work hours, and education, by spouse, on husband's and wife's share of housework-relationships that are consistent with both specialization and bargaining models of the family, but are differently interpreted by them. The second is to provide evidence from time diaries, a rich and more accurate, resource for time use analysis, but which requires care in estimation and interpretation. The third is to test the robustness of our results to the potential endogeneity of market work in the housework time equations.

This is the first study on this issue we know of that takes advantage of time diary information rather than relying on survey responses based upon recall. Hersch and Stratton were forced to rely on a survey question in the Panel Study of Income Dynamics (PSID) about the amount of time spent cooking, cleaning and doing other work around the house in an average week. This measure may, of course, be subject to recall error, and it is difficult to assign a direction to the

bias; it may be overestimated or underestimated. Only in one of the years was the wife asked directly about her hours of housework time, so the recall problem is compounded, at times, by lack of direct knowledge. As any measurement error is in the dependent variable, it inflates the variances of OLS estimates. There is some risk that the measurement error in home production time might be correlated with one or more of the independent variables like wages or number and age of children. If so, then OLS estimators would be biased. In this study, we have the advantage of recent time diary data on time use; such data reduces measurement error.

2   Models for intra-family time allocation to housework

What model of family decision-making should guide our empirical analysis? The collective model of labor supply with home production, introduced by Chiappori (1997), assumes that both spouses maximize their own utility functions facing fixed prices and market wages. If home-produced and market-produced goods and services are perfect substitutes, the optimal allocation of time between spouses can be recovered from observed behavior. But if home-produced and market-produced goods are not perfect substitutes, in home-cooked and consumed meals, or with child care, for example, then severe identification problems arise. This is especially due to the endogeneity of the price of home-produced commodities. (Chiappori 1997, Apps and Rees 1997). More importantly, our ability to estimate a model of collective labor supply with these data would be limited by the relative scarcity of accurate information on household expenditures and home-produced goods.

We rely, instead, on insights from specialization and cooperative bargaining models of the family to explain the intra-family allocation of time. Along the line developed by Hersch and Stratton (1994) and Beblo (1999), we analyze the determinants of the gender division of housework by estimating three equations. The three dependent variables are, respectively, the husband's share of housework, the husband's and the wife's time spent on housework. The regression based on the husband's share of housework time relates most closely to the household's time allocation decision, but the other equations are necessary to identify whether an increase in the husband's share of housework, for example, is due to an increase in his time or a decrease in his wife's time devoted to housework.

We consider four specifications. The first model is in the spirit of the earlier studies. We enter wives' and husbands' market hours as exogenous variables determining husband's share of housework, along with other socio-economic control variables. Little justification for this approach is given in the studies by Hersh and Stratton or Beblo. But hierarchical models of time allocation have been suggested (Brown and Lankford 1992) where the market work allocation is a first order decision with other decisions made conditional on that allocation.[9] One might justify this approach by viewing the household as optimizing within a life-cycle context where the lifetime path of hours of work and fertility is chosen based on the expected path of lifetime wages, human capital and wealth accumulation. This optimization results in a preferred combination of work hours for both spouses and number of children at any point in time. This

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[9]   See Brown and Lankford (1992) and Carlin (2001) for empirical evidence interpreted as favoring a sequential rather than a simultaneous time allocation model for hours devoted to volunteer work. Both studies analyze time diary data and interpret their findings as being consistent with a hierarchical decision model where time devoted to market work is determined initially, and hours devoted to volunteer work are conditioned on the market work decision.

implies that, when working with cross-section data as in our study, one is confronted with an optimally selected set of work hours and number of children that are not necessarily closely related to current wage rates. Remaining time allocation choices, including ones about volunteer time or how many hours of housework each spouse should perform, would then be made conditional on this allocation of work hours and the number and age of children present in the household. In this view, decisions about housework time allocation are second order decisions and work hours and children might be considered exogenous determinants of such allocations.

Nevertheless, even if this hierarchical view is correct, one might argue that the market work time allocations are correlated with the error term in the home production equation, perhaps through an omitted variable such as relative preference for market over home-produced goods or ability at home production tasks. So, in our second model, we predict market work for both spouses with a Tobit model, and use predicted market work as explanatory variables in the home production time equations.[10]

Both of these models, however, may seem puzzling to those familiar with the home production/specialization models of Becker (1991) and Gronau (1986), where the wage as the shadow-price of time, plays such an important role. If one accepts the home production model of Becker/Gronau, then market work and home production time are jointly determined, based on the relative shadow price of time of both spouses. Market work cannot be an exogenous determinant of housework time or share of housework time. In the first two models, the wage rate itself is absent. So our third model is comparatively sparse, in the spirit of the Gronau (1986) and Becker (1991) models of home production, and returns the focus to the wage rates of husband and wife. Here we only include, as explanatory variables, socio-economic control variables, household non-labor income, and the predicted wages for husband and wife. In all of these specifications, we control for number and age of children, cohort effects, dwelling in a home rather than an apartment, and urban residence.

Our final model, with results reported in Appendix 2, incorporates a double hurdle model (Cragg 1971) to predict hours of market work for both husbands and wives. This is advisable when using time diary data because we get two kinds of zeros in the data for market work. The normal kind of zero is a behavioral zero; the household has decided that the wife should not work, for example. But we also may get zeros which are due to transitory effects; the wife works, but she is ill on the day in question and does not work. The double-hurdle approach is meant to control for both types of censoring. (See Anxo et al (2002) or Carlin and Flood (1997) for further explanation.) In Appendix 1 we report on the robustness of the results from model 2 to the omission of education and child variables.

Other control variables. Which explanatory variables are suggested by the three models of the family we are considering? Becker's (1991) model of the family predicts that benefits from specialization lead to a pattern of time allocation where one member of the household will specialize in home production and the other in market work. Even a small difference in wages makes this choice efficient. Furthermore, even if each spouse is facing the same market wage, childbearing and the complementarity between the bearing and rearing of children may lead to

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[10] In the first stage, reduced form equations for market work, housework, and child care were each estimated with a Tobit model. In the second stage, the structural models were estimated as Tobit models, using the endogenous predicted values of market work as right-hand side variables. For example, female housework had, as explanatory variables, the predicted values for female and male market work.

the acquisition of different skills that would make it optimal for women to specialize in home production and men in the labor market.

Cooperative bargaining models of the family include those introduced by Manser and Brown (1981) and McElroy and Horney (1981), and the more recent separate spheres bargaining model of Lundberg and Pollak (1995, 1996). These cooperative bargaining models analyze the implications of decisions in a long-term relationship, such as marriage, in which transaction costs are significant. In the Nash Bargaining Solution utilized by McElroy and Horney, the bargaining position of each spouse is related to the disagreement outcome. If the couple cannot agree to a mutually acceptable division of the gains to marriage, the marriage dissolves and both spouses are left with their single state utility. This alternative comprises the "threat point" for each spouse. Anything that changes the likely single state (post-divorce) utility of husbands and wives alters the division of the gains to marriage even if divorce is not being currently contemplated. As men, on average, have higher earnings, their post-divorce state is likely to be relatively better, at least as far as pecuniary matters are concerned.[11] Hersch and Stratton (1994) emphasize that the higher earning male will be better able to afford the purchase of market substitutes for home production. If so, they will have systematically higher threat points and will tend to acquire more of the gains from marriage; that would be consistent with a lower share of housework, for example. Anything that systematically changes the post-divorce utility of men and women changes the threat point and affects the division of the gains to marriage.

The innovation of Lundberg and Pollak's separate spheres bargaining model is to identify the threat point with a non-cooperative allocation of time and goods where the husband determines the direction of his resources to obtaining home produced and market produced goods and services in traditional male spheres; the wife does the same for her sphere of influence. Such an allocation, with separate spheres of home production and consumption is considered to be less productive than a fully bargained one, so that the threat point is, again, in the interior of the household's production/consumption set. They argue that, for most couples, divorce is not a realistic threat point but some kind of non-cooperative continuing marriage is. In this framework, a higher wage provides higher income for the traditionally male household pursuits, moving the separate spheres threat point in the direction favoring the husband so that the cooperative allocation benefits him more. Again this would be consistent with a lower share of housework for the male.

These bargaining models give a possible explanation for an observed lower share of housework being performed by the higher wage husband. In the remainder of the paper, we will refer to these models collectively as bargaining models when it is unnecessary to distinguish between them. When distinguishing between them, we will refer to the McElroy and Horney model as the cooperative bargaining model and to the Lundberg and Pollak model as the separate spheres bargaining model.

Both Becker's specialization model and the cooperative bargaining models suggest certain explanatory variables for the spousal allocation of time, but the interpretation of their impact will vary. The individual with relatively high earnings may be expected to devote less time to housework, either because he or she has a comparative advantage in market work (specialization)

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[11] See Peters (1986) for U.S. evidence from the 1970s supporting this view. See Carlin (1991) for direct evidence on the effect of divorce settlement generosity on time allocation within households. Carlin provides evidence that women in states with more generous divorce settlements tended to invest more in market human capital, allocating more time to work and education.

or because she or he has a higher threat point (bargaining). Both approaches suggest including the wage rates of both spouses as explanatory variables. The survey, however, collected data on labor income, not wage rates. Wage rates are derived by dividing labor income by hours. Wage rates for all, whether they work in the market or not, can then be predicted using techniques introduced by Heckman (1979). Hence, in these data, there is likely to be less measurement error in labor income than in wage rates. So, in the first two models, we use the *husband's share of labor income*, as a proxy for the relative spousal wage rate. As the relative spousal wage is a potential wage ratio, this proxy is imperfect. For example if one of the spouses does not work then the share of labor income will overstate the other spouse's relative wage. In other regressions not reported here, we used a different variable to measure the relative spousal wage rate, and substituted that for *husband's share of labor income* in the first two models. We constructed the variable by dividing predicted male wage rate by the sum of the predicted male wage and the predicted female wage. The results reported below for the first two models are robust to this change. By the same arguments as above, *husband's share of labor income* should be inversely related to his share of housework. In these models, we control for husband's and wife's hours of market work; changes in the husband's share of labor income more directly reflect changes in his wage relative to his wife's. In the third model, we use predicted wage rates.

We control also for *total household income* in the first two models. We assume there is an inverse relationship between household income and the time spent by each spouse in housework because the household with higher income may more readily substitute market-purchased goods for home-produced commodities. This implication is orthogonal to the specialization and bargaining models. The higher the level of household income, the lower the time devoted to housework by both spouses. If one views the changes in total household income as a proxy for changes in non-labor income, the division of housework could be altered as well, but even then, the direction would be ambiguous. The specialization model predicts that higher non-labor income would lead to an increase in leisure, a normal good, for both spouses. But the increase in leisure could be through a reduction in market work or a reduction in home production, or in both. In the bargaining models, an increase in non-labor income expands the household's utility possibilities frontier but, in the absence of information about the division of the non-labor income in the event of disagreement, has no necessary effect on the relative threat points of husband and wife. For the third model, we compute a non-labor income measure, essentially total household income minus labor income of the husband and wife. The results for the first two models, which are reported below, are robust to the substitution of non-labor income for total household income.

The implications of including market hours of the spouse are ambiguous. If husband and wife are substitutes in home production, then an increase in one spouse's market work hours will increase the other spouse's home production time. If husband and wife are complements in home production, then the reverse effect occurs. An increase in a spouse's market time decreases the other spouse's home production time. Hence the impact on the gender division of housework labor is also ambiguous.

Inclusion of own market work hours in the housework hours model is a straightforward quantity constraint. It reduces total hours available for all other activities. Analogous to the income effect in consumption analysis, if time devoted to housework is a normal good, we would expect the allocation to housework to go down when time to market work goes up.

Educational attainment potentially affects the spouses' allocation of time between market and home production through two channels. Education directly affects earning opportunities. In the

specialization framework, this influences the individual spouse's comparative advantage; in both bargaining models, the wage influences the spousal threat point. For this channel, both the specialization model and the bargaining models imply that the higher the differential in education between husband and wife, the greater the degree of specialization and/or the greater the disparity in the division of housework by gender. The second channel suggests that educational attainment can proxy for attitude. Beblo (1999) and Hersh and Stratton (1994) suggest that education may be positively related to egalitarian household values. If so, then highly educated households would tend to have a more equal distribution of housework time by gender. Because we separately control for relative wage or husband's share of labor income, the empirical effect of the first channel should be dominated by the second channel.

The educational variables utilized in the estimation measure three levels of attainment. The lowest educational level consists of compulsory elementary school, or less, and brief vocational training; the intermediate level requires the completion of either higher vocational training or upper secondary school (Lycée, high school, etc.). The high attainment level includes individuals with college or university degrees. The intermediate level is the omitted reference category in the estimation.

Children affect the time spent on housework and the gender division of household labor directly (more home production is needed) and indirectly through any gender-differentiated impact on earnings and on the bargaining process. In the specialization view, the woman's childbearing role generates a comparative advantage in child rearing, so the wife will spend more time in home production, will invest less in certain kinds of human capital, and be more likely to experience periods of low market work attachment. In the McElroy and Horney bargaining model, the presence of additional children will affect the disagreement outcome if the presence of children alters the single state utility of the spouses. For example, in the event of divorce, custody is more likely to be awarded to the mother. If there is some probability that financial support for the children from the father would either be inadequate or irregularly received, then the wife's bargained utility outcome in the intact household is harmed. (See Beller and Graham (1993) for U.S. evidence from the 1980s.) With the separate spheres bargaining model, the presence of additional children makes it more difficult for the woman to support herself and her children in the separate spheres equilibrium. Hence the threat point moves in favor of the husband in both cases, and he takes on a smaller share of housework. The presence of additional young children is expected to increase total time devoted to home production and reduce the male's share.

For all of these models, the impact of children on housework and its allocation by gender will depend both on the number and age of children. Furthermore, the direct impact of children on housework might be inversely related to their age if the child's share of housework performed increases with age. There are four dummy variables for children: the number of children less than three years old, aged between four and six years, aged seven to twelve years, and thirteen to seventeen years. The omitted reference category is having no children.

Again we must face the question of endogeneity. Parallel to our earlier argument, we view family planning as one of the big negotiations between couples that results in expected time paths for children and careers. The actual allocation that shows up at a particular point in time, however, depends on the stage of this planned path that the couple finds themselves on. The negotiated agreement for what to do when the child is 18 months old is likely to be very different from the negotiated time allocation when the child is 18 years of age. Hence, even though family planning decisions are bound up with decisions about career paths, the *realization* of the expected family

planning decision at the time of the survey/interview should have an exogenous impact on time allocations. Mroz's (1987) finding that endogeneity of children was a second order concern in married women's labor supply, provides some support for our maintained hypothesis that children are exogenous in the home production time equations. Furthermore, the data offer no good instruments for fertility. There is no information about family background, for example. As it turns out, the main findings are robust to the elimination of the number and age of children from the estimation. (See appendix 1) This is the same approach as that taken by Hersh and Stratton (1994); maintain the assumption of exogeneity of children but test the robustness of the results to inclusion and exclusion.

We follow Beblo (1999) by including the age difference between husband and wife (*Ageh – Agew*) in the first two models of the housework equations. Beblo argues, from a non-cooperative bargaining model introduced by Bolin (1997), that a dominant spouse can obtain a first-mover advantage by determining his allocation to market work and housework first, essentially restricting the choices of the subordinate partner. If the husband is older than the wife, he has decided first about his human capital investment and the extent of his participation in the labor market. Alternatively, the first-mover advantage could be independent of relative age if cultural values suggest the priority of the husband's career as "breadwinner." Since husbands in our sample are, on average, 2.5 years older than their wives, the non-cooperative bargaining model implies a negative impact of this age difference on his housework and a positive one on his wife's housework. The larger the age differential, the more unequal is the gender division of work.[12] Including this variable provides a test of the relevance of such non-cooperative bargaining models for time allocation in continuing marriages.

In order to capture the notion of changing social norms, we introduce a cohort variable, the average age of the couple. Older couples are expected to have a more traditional gender division of labor so the cohort variable is expected to have a negative effect on the husband's share of housework. We also control for home residence; couples living in a house are expected to devote more total hours to housework than those living in an apartment. A control variable, living in a large city, is also included to reflect the greater availability of substitutable market goods and services in urban areas.

3 Estimation method

As indicated earlier, we estimate separate equations for husband's share of housework, husband's hours and wife's hours of housework. To control for the fact that some individuals do not report housework, a Tobit model is used for the estimation.

(1) Structural equation:
$$y_i^* = x_i \beta_1 + \varepsilon_i$$

(2) Threshold equation:
$$y_i = y_i^* \text{ if } y_i^* > 0 \text{, and}$$

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[12] Ideally we would like to include information reflecting age when married. If a 37-year old man marries a 29-year old woman, there would be a bigger age difference than for a couple where a 26-year old man married a 20-year old woman. Yet it is more likely that the 29-year old woman has already made important career decisions, which might tend to offset the *first mover advantage* of the older male. Unfortunately, these data do not provide this information.

$$y_i = 0 \text{ otherwise.}$$

The estimated parameters have no natural interpretation. To get interpretable results, we use marginal effects. These marginal effects are based on

(3) $$E(Y) = \Phi(h)[X\beta + \sigma\{\phi(h)/\Phi(h)\}]$$

The marginal effect is then defined as the derivative of $E(Y)$ with respect to the variables in X, with all effects evaluated at the sample means of X.

When we allow for the potential endogeneity of both own and spouse's market work as jointly determined with housework time, we first estimate a reduced form labor supply model with a Tobit model. Age and its square, predicted wage, number and age of children, and residence in a large city are the independent variables in the estimation. We use the predicted values of own and spouse's market work from this regression as right-hand side variables in the structural model of housework time. Because we are using daily time diary data, there are instances where someone who usually works is absent from work on the day of the diary. Hence there are more zeros than normal. We estimate a double-hurdle model to check the robustness of the estimates.

The double-hurdle model is described as:

(4) $$y_i^* = x_{1i}\beta_1 + u_i, \qquad u_i \sim N(0, \sigma^2);$$

(5) $$d_i^* = x_{2i}\beta_2 + v_i, \qquad v_i \sim N(0,1), \text{ i=1,2,...,n;}$$

(6) $$d_i = 1 \text{ if } d_i^* > 0, \text{ otherwise } d_i = 0;$$

(7) $$y_i = d_i \max(y_i^*, 0).$$

The unobserved latent variable is y_i^*, desired hours of market work, and y_i is the recorded variable, actual hours of market work. The model also has an unobserved latent variable, d_i^*, representing binary censoring due to faulty reporting or other random events, with d_i its corresponding recorded variable, whether the individual works or not.[13]

4 The data

The data for this study come from a 1999 time diary survey for France. This data set is a representative sample of the French population and the levels of the variables are comparable with other national statistics for French families. The interviews took place from February 1998 to February 1999. The diary days are randomly distributed across days of the week for both men and women. In the main body of the text, we refer to the results obtained when we aggregate the time diary information into a synthetic week. However, the main results are robust to an alternative procedure. Instead of aggregating to a week, we simply used the 24-hour diary and included a dummy taking the value one if the day falls on the weekend and zero otherwise.

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[13] The model corresponds to equations (5) and (6) in Cragg (1971). Other recent applications of this model include Blundell and Meghir (1987), Carlin and Flood (1997), and Anxo et al. (2002).

To construct a time diary, participants are interviewed extensively, on randomly selected days throughout the year, about their time use during the previous 24-hour day. Thomas Juster and Frank Stafford (1991) report on a number of validity tests carried out in 1975-76 on an early time use study for the U.S. Those tests suggest that the time diary method is much more accurate than survey questions asking for typical time use, and a little more accurate than using an electronic paging device to randomly activate the recording of a time use activity when the signal is received. (Presumably there would also be more worry about a subject altering their planned routine when they know, in advance, that their paging device may record their activity at any time.) It is about as accurate, and much cheaper, than asking respondents to provide a detailed account of a randomly selected one-hour period. Klevmarken (1999a, 1999b) provides more recent discussions concerning the comparative accuracy of time diary studies. Hence this time diary data should reduce the possibility of bias due to measurement error in the dependent variable. Carlin and Flood (1997) report on the significant difference found in Swedish data concerning the effect of young children on male labor supply when they use time diary rather than survey data.

The measure of housework we have is also more precisely defined. Housework includes cooking; dishwashing and cleanup; laundry washing, drying and cleaning; cleanup and maintenance within the house; cleanup, repair and other maintenance outside the house including yard work; purchasing; and bookkeeping and household management. This broader definition means the results in our study are not susceptible to the criticism that the full range of household chores may not be represented in the definition of housework. Furthermore, it is relatively easy to alter the definition of housework to include or exclude various categories as a robustness check. The main results reported below are robust to the exclusion of categories like gardening and shopping, for example.

We have chosen to focus this paper on housework time and have excluded childcare time from our measure of housework; we view childcare time as a human capital investment activity that is different in nature from housework and is deserving of separate study. We note, however, that the main results reported below for the effects of income, wages, hours of work and education are fully robust to the inclusion of childcare time in the housework variable. (Results are available from authors.)

There is a potential difficulty with the time diary data. It is more expensive to gather this information than ordinary survey data so one must trade sample size off against the number of interviews of a given respondent. In the French data used here, the sample size is about 3,033 married or cohabiting couples between the ages of 18 and 64, but there is only one interview. The single interview can be a very serious problem for labor supply studies, requiring special attention. (Carlin and Flood 1997) The problem is less severe for housework where the problem of a random, zero observation on the day in question is less likely. We allow for this censoring by using a Tobit specification. For some couples we will get an inaccurate picture; perhaps a housewife would, typically, do 6 hours of housework but on the particular day involved, she was away visiting relatives, and only did one hour of housework. Conversely, her husband, who ordinarily just does one half hour, winds up doing two hours of housework. But, over a large enough sample, this random variation should even out, and we get a good picture of the actual division of housework between husbands and wives, on average.

Table 1   Sample characteristics (means and percentages), couples aged 18 to 64 years.

Variables	Means or Percentage
Age, male	43.6
Age, female	41.0
Number of individuals in the household	3.4
Number of children	1.32
Educational attainment, male	
- Low (%)	68
- Medium (%)	12
- High (%)	21
Educational attainment, female	
- Low (%)	64
- Medium (%)	14
- High (%)	22
Big cities (%)	41
House owners (%)	63
Labor force participation rate, male (%)	82
Labor force participation rate, female (%)	63
Paid work, weekly hours, male	35.4
Housework, weekly hours, male	14.1
Paid work, weekly hours, female	21.2
Housework, weekly hours, female	28.8
Husband's share of market work (%)	65
Husband's share of housework (%)	30
Number of observations	3033

Source: Time use data 1999 (daily average values scaled up to weekly totals).

The 3,033 observations constitute a relatively large sample by the standards of time diary studies, but it is smaller than many household surveys. The sample may not be large enough to offset some of the multi-collinearity between husband and wife education or between average age of the couple and the age and number of children, resulting in fewer significant estimates for these control variables. (The correlation matrix is available from the authors.)

Table 1 presents the sample characteristics for these French households. The majority of couples fall between the ages of 30 and 49 years, and there are 1.32 children per household. Slightly more than 20 percent of the husbands and wives have a college or university education; about two-thirds of the samples have a low education, compulsory elementary school or less, possibly with some brief vocational training. Forty percent live in big cities and about three-fifths own their own home.

Labor force participation rates for husbands are higher than those for their wives, 82 percent compared to 63 percent. French husbands allocate about 35 hours per week to work for pay and 14 hours to housework. French wives allocate about 21 hours per week to work for pay, and 29 hours to housework. Part-time labor force participation is more common for married women. The total weekly hours spent on paid work and housework for French men is 49.5, while for French

women, the total is 50.0 hours. The figures for husband's share of market work, housework, and labor income tell a similar story. The French husbands account for almost two-thirds of the household's market work hours and about 56 percent of the household's total income, including non-wage income. They also account for about 30 percent of the couple's housework time.

5 Results

We first report the results where we have treated market work allocations as exogenous variables in the housework regressions. But market work hours are likely to be endogenous; the results taking endogeneity into account are considered in the discussion of Table 3 below. The marginal effects evaluated at the sample means are reported in Table 2. The results are largely as predicted, except that husband's share of labor income is neutralized by the market hour variables, with no statistically significant effects. Increases in the wife's market hours would decrease her housework and increase the housework hours of her husband, resulting in a higher share for her husband. A 50 percent increase in her market hours from an average of 21 hours per week to about 32 hours per week would reduce her housework hours from about 29 to about 24.5 hours per week; husbands increase their housework hours from an average of 14 to about 15 hours per week. As a result, husband's share of housework climbs by about 4 and a half percent, a statistically significant increase from about 30 percent to almost 35 percent.

Increases in the husbands' market work hours have the opposite effect. A 20 percent increase in his work hours, from an average of 35.4 to 42.5 hours per week, would increase his wife's housework by about a half-hour per week, but his contribution to housework would fall by about two hours per week. Overall, his share of housework would drop by about 3.5 percentage points, on average, from 30 percent to 26.5 percent.

With this specification, education of the wife matters, as wives with low education work more hours in the home, and the husbands of wives with high education work more hours in the home. Overall, husbands of wives with high education perform a higher share of housework. Number and age of children has little effect except that having a very young child (0 to 3 years old) in the house significantly reduces the wife's share of housework as more time is devoted to child care. The small associated increase in husband's hours of housework is sufficient to result in a significant increase in his share. Older couples devote more time to housework, with wives raising their hours more for each extra year so that husband's share drops by a very small amount which is, nonetheless, statistically significant.

House dwellers do more housework, as expected, with the husband's share rising. Residence in a big city allows wives to drop their housework hours by about an hour per week; neither the husbands' hours nor their share changes significantly because of this.

As indicated earlier, these results are based on a synthetic week; we also compared the results from the first column of Table 2 with a set of results using the 24 hour diary (unaggregated) with a dummy for the weekend. The results are fully robust with respect to sign, significance and size. The gender division of labor does seem to be slightly more unequal during the weekend. These results are available from the authors. It could be argued that childcare time should be included in the category, housework. To check robustness, we re-estimated this equation with childcare time added to the housework time as the dependent variable. The parameter estimates were identical to the first decimal place and, in all cases but one, to the second decimal place. These results are available from the authors. Next we turn to the question of whether the parameter estimates are

robust to the use of an instrumental variables technique that controls for the possible endogeneity of market hours of work.

Table 2   Determinants of housework shares for French couples, treating own and spouse's market work as exogenously determined. (Marginal effects)

Independent variables	Mean	Husband's share	Husband's housework hours	Wife's housework hours
			Dependent variables	
Household total income	16.8[a]	-0.00[b]	-0.02	-0.05***
Husband's share of labor income	0.56	0.02	0.59	0.64
Wife's market work hours (predicted)	21.2	0.004*	0.08*	-0.40*
Husband's market work hours (predicted)	35.4	-0.005*	-0.30*	0.07*
Education				
- Low, husband	0.68	-0.00	0.33	0.84
- High, husband	0.21	0.00	-0.55	-0.56
- Low, wife	0.64	-0.01	-0.15	3.04*
- High, wife	0.22	0.03**	1.80**	0.71
Number of children				
- Aged 0-3	0.18	0.03***	0.86	-2.90*
- Aged 4-6	0.16	-0.02	-0.40	0.02
- Aged 7-12	0.28	-0.01	0.30	0.67
- Aged 13-17	0.24	-0.01	0.38	2.66***
Couple's average age	42.3	-0.001*	0.05***	0.28*
Age difference	2.5	0.00	-0.03	-0.02
House dwellers	0.63	0.05*	3.99*	1.83**
Big city	0.41	0.01	0.11	-0.84*

* Statistically significant at the 0.01 level; ** at the 0.05 level and *** at the 0.10 level.

Source: Time use data 1999.

Table 3 contains the estimated marginal impact of the explanatory variables on housework hours and husband's share when we treat market hours of work as endogenous. The results are largely robust, but there are some differences. When household income is high, controlling for labor income, French couples devote less time to housework, but only the wife's reduction is statistically significant, and it is not a large effect in practical terms. A 100% increase in monthly income from 16,800 FF per month to 33,600 FF per month would result in a decrease in the wife's hours from about 29 to about 28. As the husband's hours also drop, by a smaller and

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[a]   Monthly income in thousands of French francs, before taxes in this and all subsequent tables.

[b]   All insignificant marginal effects are rounded to two decimal places. When the effect is 0.0049 or smaller, in absolute value, it is entered as 0.00, either with no sign (to indicate a positive value) or with a negative sign (to indicate a negative value).

statistically insignificant amount, there is essentially no change in the husband's share of housework.

The estimated coefficients for predicted market work hours are much smaller than those for actual market hours, but they are still statistically significant. Apparently the endogeneity of market work was biasing the coefficient estimates upward in ordinary least squares. A 50 percent increase in wives' market hours from an average of 21 to an average of 32 would reduce wives housework by about two-thirds of an hour, and would have no partial effect on husbands' housework share. A 20 percent increase in husbands' work hours from 35.4 to about 42.5 would reduce husbands' housework by a little less than two-thirds of an hour, and would lower his predicted share of housework by about an hour and a half. The effects are as predicted, and are statistically significant, but they are small in practical terms. So, these key estimates are robust to the endogeneity correction we have employed only in terms of significance, not in absolute value.

The education results observed earlier prove robust, although they are slightly stronger in this specification. A change in the wife's education from medium to low education increases wives' housework hours by about 3 and a third hours per week, on average, with no significant effect on husbands' housework or husbands' share of housework. A change in the wife's education from medium to high raise husbands' hours of housework by 2 and a quarter hours, on average, raising their share by 4 percentage points. These results tend to support the channel where education raises the wage, affecting either comparative advantage or the threat point. There is no need to bring in the idea that better educated households have more egalitarian values. Symmetric effects for husband's education are smaller and not statistically significant. Any increased sharing of housework in more highly educated French households is apparently not due to egalitarian values, *per se*, but to economic incentives connected to specialization and/or bargaining. There are now no significant effects of the number and age of children apart from the increase in wives' housework when older children and teenagers are present in the household. The cohort effect is still significant and is larger now. Among couples whose average age is ten years above the mean, the wives spend 4 and a half hours per week more on housework while husbands spend an hour more, with their share falling by 2 percentage points. There is still no support for age difference as an indicator of first-mover advantage. Dwelling in a house still increases housework more for the husband than the wife, with husbands' housework increasing by more than 3 hours compared to a less than 2 hour per week increase for wives; husbands' share increases by 4 percentage points on average. Residing in a big city reduces wives' housework by a little over an hour, but the husbands' housework is essentially unaffected, so husbands' housework share does not change by a significant amount.

These results are largely robust to the exclusion of education and child variables as explanatory variables and to the use of a double-hurdle model to predict market work hours. Appendix 1 consists of a table with results for this model (market work hours endogenous), but with education and child variables omitted. Child variables may be jointly determined with market hours, and education, through its correlation with the wage rate, is used to predict market work hours. The results are generally robust to these deletions. Husbands' share of labor income is still negatively related to their share of housework, and wives' predicted market hours still have a negative effect on their own housework, and a positive effect on husbands' share of housework, significant now. On the other hand, the husband's predicted hours of market work no longer are found to have a significant negative effect on his own housework hours and share of housework.

Table 3   **Determinants of housework shares for French couples, treating own and spouse's market work as endogenously determined, Tobit system. (Marginal effects)**

Independent variables	Mean	Husband's share	Husband's housework hours	Wife's housework hours
		Dependent variables		
Household total income	16.8	-0.001**	-0.13*	-0.19*
Husband's share of labor income	0.56	-0.09*	-3.20*	8.31*
Wife's market work hours (predicted)	21.2	0.00	0.00	-0.06*
Husband's market work hours (predicted)	35.4	-0.002*	-0.09*	0.04
Education				
- Low, husband	0.68	-0.00	-0.42	-0.61
- High, husband	0.21	-0.00	-0.96	-0.86
- Low, wife	0.64	-0.02	-0.43	3.36**
- High, wife	0.22	0.04*	2.28*	0.10
Number of children				
- Aged 0-3	0.18	0.01	0.76	-0.37
- Aged 4-6	0.16	-0.02	-0.57	0.59
- Aged 7-12	0.28	-0.01	-0.05	1.13***
- Aged 13-17	0.24	-0.02	0.15	2.86*
Couple's average age	42.3	-0.002**	0.10*	0.44*
Age difference	2.5	0.00	0.01	0.03
House dwellers	0.63	0.04*	3.28*	1.84*
Big city	0.41	0.01	0.06	-1.27*

* Statistically significant at the 0.01 level; ** at the 0.05 level and *** at the 0.10 level.

Source: Time use data 1999.

Appendix 2 reports on the results for model two when a double hurdle model is used to predict market work in a first stage regression rather than Tobit. The results are also broadly robust to this variation. Household income is negatively related to housework and to the husband's share while husband's share of labor income is negatively related to own housework and his share of housework and positively related to the wife's housework hours. Fewer of the direct (predicted) market work hours effects are still significant; an increase in the husband's predicted market hours raises his wife's housework hours substantially.

Before comparing these endogeneity-corrected findings to the earlier ones for the U.S. and Germany, consider the results, in Table 4, when we use the empirical model guided primarily by the Becker/Gronau home production model. As indicated earlier, the implications of the bargaining models are similar for the variables we are considering here.

Husband's predicted wage has no significant effect, but increases in the wives' predicted wage reduce their housework hours and raise husbands' share. The own (predicted) wage elasticity of wives' housework is –0.3, and the elasticity of husbands' share of housework with respect to the

wife's (predicted) wage is 0.25. A ten percent increase in wives' predicted wage lowers their housework hours by about 3 percent, and raises the husband's housework share by about 2 and a half percent. The household nonlabor income has a marginally significant effect in the expected direction, but the practical effect is small. The wives' housework hour elasticity with respect to nonlabor income is –0.01, while that for husbands' housework hours and husbands' share is –0.02. A ten percent increase in non-labor income would reduce wives' housework by about one percent, while husbands' housework and husbands' share of housework would both fall by about 2 percent.

Table 4   Determinants of housework shares for French couples (Becker/Gronau models).

	Dependent variables		
Independent variables	**Husband's share**	**Husband's housework hours**	**Wife's housework hours**
Household nonlabor	-0.002(-0.02)**	-0.09(-0.02)**	-0.07(-0.01)*
Male wage (predicted)	-0.00	-0.01	-0.01
Female wage (predicted)	0.001(0.25)*	0.01	-0.09(-0.3)*
Number of children			
- Aged 0-3	0.00	1.03	1.37*
- Aged 4-6	-0.03*	-0.73	1.80**
- Aged 7-12	-0.03*	-0.45	2.16*
- Aged 13-17	-0.04*	-1.23**	3.60*
Couple's average age	0.00	0.22*	0.51*
House dwellers	0.03*	2.60*	1.68*
Big city	-0.00[a]	-0.77	-1.44*

Education and market work hours excluded as endogenous, but number and age of children included as exogenous. (Main entries are marginal effects; items in brackets are estimated elasticities.)
* Statistically significant at the 0.01 level; ** at the 0.05 level and *** at the 0,10 level.

Source: Time use data 1999.

Among the control variables, number and age of children is now more important, with husbands' housework hours steady when older children are in the household, or even diminishing for each teen in the household. Wives' hours of home production increase steadily with the number of children in each category, but the increase is largest for the older categories. Cohorts that are ten years older have the wife doing about 5 hours more housework per week, and husbands doing about 2 hours extra, with the result that husbands' share is essentially steady. The results for house dwellers and big city are robust, with the house dweller effects slightly dampened and the big city effect slightly larger.

There are no significant effects for the age difference variable in any of the specifications. Beblo's hypothesized age difference link, as a measure of first mover advantage, finds little support here. For now, it appears that there is more likely to be an age-invariant first mover advantage to French males in career commitment, or no first-mover advantage.

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[a]   All insignificant marginal effects are rounded to two decimal places. When the effect is 0.0049 or smaller, in absolute value, it is entered as 0.00, either with no sign (to indicate a positive value) or with a negative sign (to indicate a negative value).

6 Comparisons

In Tables 5 and 6, we compare our main findings, with similar specifications, with those for Germany (Beblo 1999) and the United States (Hersch and Stratton 1994). Table 5 uses the Tobit specifications we emphasize in the discussion and Table 6 provides an even closer comparison by using an ordinary least squares (OLS) specification that we argue is not correct. However, it has the advantage of providing a comparison across the three countries using essentially the same econometric specification. The variables listed are those that are common, or roughly in common, across the studies. Before proceeding with this comparison note that the first two columns of Table 5 allow us to compare our results between the model where labor market hours is treated as exogenous (column 1) and endogenous (column 2).

The main differences are in the effects of household total income and husband's share of labor income, which change from insignificant in column 1 to negative significant findings in column 2, consistent with other studies. On the other hand, wife's market work hours no longer has a significant positive impact on husband's share of housework once the endogeneity is allowed for. Still, the pattern of results is broadly consistent with the expected findings, as suggested by the household specialization and bargaining models. In the discussion below, statements about the French results refer to the endogeneity corrected results in column two, unless there is a specific reference to *OLS* results.

There is broad agreement in the findings across the three countries. Increases in household income and in the husband's share in producing labor income tend to reduce his hours of housework. Increases in the wife's market work hours tend to increase or have no significant effect on her husband's share of housework, and increases in a husband's market work or his share of market work hours tends to reduce his share of housework time. With an ordinary least squares specification for France, the income effects are not significant, but the work hour effects of husband and wife are identical to the German effects.

If better-educated families have more egalitarian values, then, controlling for the husband's share of labor income, husbands with high education should perform a greater share of housework. The U.S. and German evidence supports this but the French evidence does not. This is true for the OLS specification as well. The effect of wife's education is also consistent across studies when significant; increases in wife's education, as a proxy for wage rate, tend to be associated with an increased share of housework for the husband, either a bargained response to the increased self-sufficiency of the wife within or after the marriage, or an efficient redistribution of housework consistent with lower potential gains to specialization.

The demographic variables had somewhat less consistent effects across countries. The presence of children either had no significant effect or tended to reduce the male's share of housework, although the husband's share increased in the U.S. for the category, children aged 7 to 12 years. The couple's average age has a negative impact on husband's share of housework in France, as in Germany and the U.S. The difference in spouse's ages, a proxy for "first-mover" advantage in non-cooperative bargaining was not tested with the U.S. data, while it reduced husbands' housework share in Germany, and had no effect in France.

Table 5   Determinants of husband's share of housework time in France, Germany and the United States.

Explanatory Variables	France Time Diary Tobit	France Time Diary Tobit IV	Germany Survey OLS	USA Survey OLS
Household combined income	o	-	-	-
Husband's share of labor income	o	-	-	-
Wife's market work hours	+	o	+	
Husband's market work hours	-	-	-	
Husband's share of market hours				-
Education:				
Husband, less than high school	o	o		-
Husband, more than high school	o	o		+
Wife, less than high school	o	o		o
Wife, more than high school	+	+		+
Husband's years of education			+	
Wife's years of education			+	
Children:				
- Age 0-3	+	o		o
- Age 4-6	o	o		o
- Age 7-12	o	o		+
- Age 13-17	o	o		-
Child dummy			-	
Couple's average age	-	-	-	-
Husband's age minus wife's age	o	o	-	

+   positive   -   negative   o   not significant

Source: Time use data 1999.

The estimated parameters in Table 6 with the common, if less preferred, ordinary least squares estimates for the determinants of husbands' share of housework shows that fewer of the hours and labor income variables have significant effects in France.

Among those that are significant at conventional levels, the effects are smaller in size, often by a dramatic factor. The market work hour effects, for example, are about one-third as large in these French results as they are in the German results. The significant estimated parameter for couple's average age is about one-third the size of the same parameter for Germany which is, in turn, much smaller than that estimated for the U.S. The one exception to this general impression is that the negative effect of the wife having a low education appears larger, in absolute value, in France than in the U.S. It would appear that, in general, these economic factors play a somewhat smaller role in French intra-household time allocation.

The cross-country effects of income, work hours and education are largely consistent with the bargaining and specialization models of the family; the precise explanation of the reason behind those effects differs across the models.

Table 6   Determinants of husband's share of housework time in France, Germany and the United States with an OLS specification.

Explanatory Variables	France Time Diary OLS	Germany Survey OLS	USA Survey OLS
Household combined income	-0.000(0.17)	**-0.00003(3.0)**	**-0.0000(2.03)**
Husband's share of labor income	0.014(1.24)	**-0.11(5.5)**	**-0.2(8.60)**
Wife's market work hours	**0.004(28.73)**	**0.011(11.0)**	---
Husband's market work hours	**-0.005(40.46)**	**-0.017(17.0)**	---
Husband's share of market hours	---	---	**-0.11(4.14)**
Education			
Husband, less than high school	0.003(0.29)	---	**-0.029(3.82)**
Husband, more than high	0.004(0.36)	---	**0.38(7.45)**
Wife, less than high school	**-0.018(1.78)**	---	-0.005(0.67)
Wife, more than high school	**0.017(1.45)**	---	**0.02(4.04)**
Husband's years of education	---	**0.004(4.0)**	---
Wife's years of education	---	**0.008(8.0)**	---
Children			
- Age 0-3	0.007(0.70)	---	0.004(1.02)
- Age 4-6	-0.006(0.62)	---	0.004(1.02)
- Age 7-12	-0.008(1.03)	---	**0.007(2.65)**
- Age 13-17	-0.012(1.52)	---	**-0.02(5.38)**
Child dummy	---	**-0.023(3.8)**	---
Couple's average age	**-0.001(1.88)**	**-0.0027(9.0)**	**-0.03(5.77)**
Husband's age minus wife's age	-0.000(0.36)	**-0.023(3.8)**	---

absolute value of t-statistics in parentheses; bold entries are significant at 0.10 level or better

Source: Time use data 1999.

7   Conclusions

We find that, in France, as in the U.S. and Germany, husband's housework time allocation and, especially, his share of housework, responds to changes in economic variables. The greater his share of labor income (and hence, the higher his relative wage), the lower his share of housework; the greater the wife's market hours, the lower his housework time, but the larger his share of housework; and the greater the wife's education, the greater her husband's share of housework.

When we employ a model that provides a closer test of the Becker/Gronau home specialization model, we find solid support. The cross-wage elasticity on husband's share of housework is positive. For every 10 percent increase in the wife's wage, the husband's share of housework increases by 2.5 percent. There is also a negative own wage elasticity of housework for married women. For every 10 percent increase in the wife's wage, her own housework hours tend to fall by 3 percent. These are inelastic but sizeable effects.

These effects are consistent with both economic models. In the bargaining model, the changes in earning power, market hours and education all generate changes in the threat point, either

external or internal to a continuing marriage, and move the bargained allocation of time in the direction found in the empirical results. In the specialization model, increases in the wife's labor income, market hours, and education would all tend to reduce the gains to the wife specializing in home production, and move the time allocation in the direction found in the empirical results.

We find no support for Beblo's *first-mover advantage* argument in the housework time allocation results. Future work with other data sets and particular institutional rules governing within-marriage or post-marriage welfare of husbands and wives may provide further evidence for distinguishing between the specialization and bargaining models. This is important, as the interpretation of the empirical results for policy recommendations sometimes changes significantly, depending on which model one adopts. In the meantime, both these models provide a useful framework for investigating many empirical questions about the influence of economic variables on the intra-family allocation of time. Focusing on one model or the other may make particular insights easier to see. Carlin (1991) gains insights from bargaining models to investigate the impact of changing no fault divorce laws in the U.S. on time allocation to work, study and child care. Here we have used insights from the specialization model to refocus attention on (1) the potential endogeneity of market work in housework equations; and (2) the relative wage rates of husband and wife as important empirical determinants of time allocation to home production tasks in France.

Appendix 1 **Determinants of housework shares for French couples, treating own and spouse's market work as endogenously determined; education and child variables deleted. (Marginal effects)**

		Dependent variables		
Independent variables	Mean	Husband's share	Husband's housework hours	Wife's housework hours
Husband's share of labor income	0.56	-0.002**	-0.09**	-0.07***
Wife's market work hours (predicted)	21.2	0.001*	0.01	-0.09*
Husband's market work hours	35.4	-0.00	-0.01	-0.01
Couple's average age	42.3	0.00	0.22*	0.44*
Own house	0.63	0.02**	2.45*	2.21*
Big city	0.41	0.00	-0.73	-1.51**

* Statistically significant at the 0.01 level; ** at the 0.05 level and *** at the 0.10 level.

Source: Time use data 1999.

Appendix 2: **Determinants of housework shares for French couples, treating own and spouse's market work as endogenously determined; market work time predicted with double-hurdle model. (Marginal effects)**

		Dependent variables		
Independent variables	Mean	Husband's share	Husband's housework hours	Wife's housework hours
Household total income	16.8	-0.002*	-0.18**	-0.20*
Husband's share of labor income	0.56	-0.09*	-3.34*	8.60*
Wife's market work hours (predicted)	21.2	0.00	0.04	-0.02
Husband's market work hours (predicted)	35.4	-0.00	-0.00	0.06*
Education				
- Low, husband	0.68	-0.00	-0.47	-0.70
- High, husband	0.21	-0.01	-0.99	-0.38
- Low, wife	0.64	-0.03**	-0.52	3.64*
- High, wife	0.22	0.04*	2.06**	-0.63
Number of children				
- Aged 0-3	0.18	0.01	1.09	0.95
- Aged 4-6	0.16	-0.03**	-0.72	1.37**
- Aged 7-12	0.28	-0.02**	-0.28	1.71*
- Aged 13-17	0.24	-0.03*	-0.76	2.95*
Couple's average age	42.3	0.00	0.22**	0.45*
Age difference	2.5	0.00	0.07	-0.05
Own house	0.63	0.04*	2.92*	1.61*
Big city	0.41	0.01	-0.34	-1.53*

Statistically significant at the 0.01 level; ** at the 0.05 level and *** at the 0.10 level.

Source: Time use data 1999.

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