

Helene COUPRIE

EPIC Workshop, Florence, 17th to 21st of May 2002

Intra-Household Decision-Making and Labour Supply:
Estimation on the British Household Panel Survey

1) Theory / Model

- Question to be researched in this work

The aim of this paper is to study microeconomics determinants of intra-household labour supply¹ decision-making. I will stress two essential aspects. On one hand, I will underline the fact that each member of the family can react differently to a state allowance, depending on whether this allowance is given to one member or the entire family. On the other hand, I can estimate the income “sharing rule” which gives an interpretation of the intra-household negotiation process. This part of the work consists in finding environmental elements or household characteristics that can have an impact on this negotiation process, this impact can be positive or negative on the balance of power between male and female in the family.

The originality of my work is to estimate a recently developed model on a British database, which has particularly interesting properties to study those two aspects. This topic is fundamental both from a theoretical and a political point of view.

¹ Box 1 in appendix reminds the reader about labour supply.

- Political Relevance....

...of understanding labour supply behaviour

The Poverty Trap

The actual political debate is oriented towards the question of the so-called “poverty trap”. The idea underlying the debate is that some individuals, because of their preferences, and because of the generous allowance system, become dependent of the providence-state, they are remaining out of the labour force, or working part-time, with low quality jobs and low incomes. The problem is these individuals do not have incentives to choose more hours of work because they would lose some state allowances. The consequence is that they are “trapped” by poverty, losing their chance to get a job with reasonable hours of work and income, poverty and exclusion make them lose their human capital and/or ability to work. This debate has already had a major impact on current fiscal reforms like the « Prime pour l’emploi » law in France or the « Welfare Family Tax Credit » in UK².

This topic essentially concerns women

In this sort of work, we are more interested in women’s attitude towards work, why? On the contrary on men, who usually search for a full-time job, females experienced a more elastic labour supply. In Europe, we observe a tendential increase in participation rates, linked with an increase in the rate of employed female in part-time work. In year 2000, nearly 1 working European female out of 3 works part-time.

Why studying women in couple?

The determinants of female labour supply are often said to be linked with a trade-off between family and work. The study of females in couple allows us to find what is the role of family in labour supply decision-making. The idea of this work is that family can have an impact through preference for non-market time (what we call leisure), but also through negotiation process between its members, we believe that the partner and his characteristics play a great role in female labour supply decision-making.

² Those reforms have the same aim : giving incentives to work, but the mean is different : the « prime pour l’emploi » is an individual allowance, whereas the WFTC is a family allowance.

...of understanding the process of negotiations inside the family

How families make their decision to consume, or to supply a certain amount of labour? Can we consider the family as a unique individual, or should we admit that a family is composed of several individuals with different tastes and interests? Usually, a household is considered as a single individual. The output is thus measured at a household level, for example: income, consumption, and well being, in the better case, variables at an individual level are recovered through equivalized scales. The idea behind equivalized scales is that a children will consume less than an adult, and two adults living together will make some scales savings (because, for example, there is just one rent to pay...). This method is widely used by governments, to analyse inequality or to calculate household's taxation... From an individual point of view, especially if we are interested in women's welfare, this way of doing is wrong because it is based on the apriori that goods and welfare are distributed equally amongst family members. The possibility of intra-household inequality is completely ignored by such approaches.

In our approach, we assume that the household's income is allocated between family members. If we admit that a household is composed with different individuals, we can imagine targeting some allowances in order to encourage certain expected results. For example, if you want to improve the quality of children, it can be better to give the allowance to the mother, because, it has been proven that their consumption structure is more oriented towards expenses for children than father's. This sort of approach is the one we should have when thinking at an economic policy, or understanding households behaviour.

- **Theoretical Relevance**

What has been written on the question?

Historically (since the 1960's), married women were studied with the same framework as single-living ones; in this case, husband's labour income is taken as her personal non-labour income. There was no interaction between household members. Then, a more elaborated model, the so-called "unitary one", rapidly became widely used. In this approach, the household is taken as a unique decision-making unit (characterised by a unique aggregated utility function), facing a unique budgetary constraint pooling the income of every family member. This unique decision-making unit can be a patriarch, which decides who is going to

consume which quantities of what, and who is going to offer which amount of work on the labour market. Of course, the patriarch can be altruistic, taking into account the well being of each member of the family. In comparison with the old one, this model authorizes interaction between spouse's inputs and outputs. For example, the husband's labour supply can depend on the woman's wage, and vice-versa. However, this model is not acceptable from a theoretical and an empirical viewpoint.

What is inadequate that prompts the researcher to research it?

On the theoretical side, this model is contrary to the background of microeconomics theory. We know, since Arrow's theorem, that we cannot generally construct an aggregate utility function (Arrow, 1951): we can't use a unique function to represent the well being of the family if it is composed of several members (who have necessary different tastes). The only way to aggregate utility functions is to have dictatorial preferences. Although some researchers have tried to find justifications for dictatorial preferences within the household³, these explanations have not satisfactorily settled the issue.

The empirical implications of the unitary model have also been widely criticised. Two results are particularly suspected: the first, which comes from the symmetry property of the Slutsky matrix⁴, imposes identical compensated cross substitution effects. This implies that the effect of woman's wage on man's labour supply will be the same that the effect of man's wage on woman's labour supply, given the household income. Individuals inside the family are thus meant to substitute a same amount of leisure against a same amount of work.

The other empirical aspect criticised (cf. Fortin B. and G. Lacroix [1997]) is the « income-pooling » property, which ensues from the use of a family budget constraint: no matter whose non-labour income rises, the effect on labour supply decision will be the same. Hence, according to the unitary model, the identity of the family allowance beneficiary should not affect labour supply.

³ See, for example Gary Becker's [1981] « rotten-kid theorem », in which, in its simplest formulation, egoistic members of the family follow the preferences of an altruistic and benefactor patriarch.

- Proposed alternative theoretical solution

What are the causal claims I am interested in?

All of these reasons encourage the researcher to construct models that can take into account individual preferences and produce less restrictive properties than the unitary model.

What is the model I propose?

In this respect, Game Theory offers promising directions for research. The family can be viewed as a negotiation place where the confrontation of individual interests leads to a « cooperative » solution of negotiations. Therefore, the issue of the negotiation is pareto-efficient, which means that the wife can't improve her utility without reducing her husband's and vice-versa. Here, each member well being is taken into account.

In this spirit, I follow Chiappori's collective models of household behaviour (cf. Chiappori [1988,1992], Bourguignon and Chiappori [1992] and Browning and Chiappori [1998]). The originality of this approach is that the negotiation process is not explicitly described which facilitates the estimation of the model. The only assumption needed is the Pareto-efficiency of the issue of the negotiation. A distribution function places the outcome of negotiations on a point of the efficiency frontier. The form of this distribution function is not described; in this sense this approach resembles a reduced form approach. The interest of this model is that we can view the negotiation process as if spouses negotiate in the first stage a « sharing rule » for income, and, in the second stage, each one takes his decision in a decentralised way, given the share of the income obtained in the first stage. The interest of Chiappori's result [1992] is that, on the basis of the observation of assignable consumption (leisure for example), we can reconstitute the shape of the derivatives of this sharing rule; hence, we can have a representation of the intra-household labour supply decision process.

- Theoretical significance of the research

Why do I like the model, in what way is my model superior to what existed in the field, how it advances our knowledge of the problem

⁴ Box 2 gives the intuition of what the Slutsky matrix is.

This model encompasses the unitary and the Nash-bargained models as special cases. As it also allows us to relax the symmetry of the Slutsky matrix and the income-pooling properties, we can test these properties against those implied by the collective framework. As a result of this model, labour supply decisions will depend on the standard substitution and income effects, plus a supplementary effect linked to intra-member negotiation via changes in the sharing rule. In particular, if we enter specifically in the distribution function each member's non-labour income, the individual labour supply decision will depend on the identity of the beneficiary of the additional exogenous income. Moreover the income sharing rule (which can be estimated up to a constant) can be used as a good instrument to analyse intra-household inequalities variations.

- Historical / Political significance of the research

What policy implications can we draw from this research, how and where can they be applied, how could it change the policy making process or policy output and outcomes

The implications of the collective model are of different orders. First, it allows us to test the validity of the usual theory: the unitary model, widely used in economic policy simulations, and, if the unitary specification is rejected, it can be used to obtain precise estimates of labour supply elasticities. Second, the household is very often the basic unity of measure for economic policies⁵. Therefore, policy makers must have an idea of the impact of some familial or individual policies on the intra-household negotiation process: some measures could change the balance of the bargaining power between spouses, which could have impacts on the expected decision of each family member and on intra-family inequalities.

2) Research Design

We suppose that the family is composed of two decision makers: a woman and a man (who are not necessarily married). Each one has a well-being function, which depends positively on his private consumption (represented by an aggregated good) and positively on his leisure time (thus negatively on hours of work supplied). Spouses negotiate their level of consumption and level of leisure, they are deciding together how many hours each member is

⁵ For example, in France, income tax is collected at the household level, given equivalence scales which are supposed to take into account household composition on individual welfare.

going to supply. We suppose that the negotiation process is cooperative. This main assumption is not so strong if couples reach efficiency. By using the fundamental second theorem of welfare, we can prove that the negotiation process can be decomposed in two decentralised process. In a first step, spouses negotiate a share of the non-labour income (this share can be negative if, for example, the couple do not have any non labour income). And in a second step, each spouse choose his consumption level and time of leisure (thus labour supply), given his share of non labour income determined in the first step. Of course, this share of non-labour income is just an interpretation of the negotiation process, we do not know if spouses really decide a share of non-labour income. The “sharing rule” is the central point of the model. If we observe labour supply behaviour of married men and women, we can deduce the share of income that has been decided by the family, up to a constant.

To implement this model we add heterogeneity terms: first, we suppose that the well-being function is different amongst individuals, depending on the sex, age, family composition, and education... Then, we add another heterogeneity term, which applies to the negotiation process: distribution factors. Those variables don't play any role in individual preferences, but they are meant to influence the threat point of each spouse in the negotiation process. Finally, as usual, wages and non-labour income are introduced in labour supply effects.

The data used in this preliminary version of the paper come from Wave 7 of the BHPS. This general survey includes a wide range of demographic, health, employment and income information. In particular, we have information about wage and work hours. In addition, we have information on the number of hours per week spent on domestic tasks. All adults in the same household are interviewed separately.

The BHPS allows a number of relatively novel research questions to be addressed. In particular, we use distribution factors which have not typically been analysed in this respect, such as the sex-ratio in the region, the labour market participation of the individual's mother, political and social opinions, and the labour market situation of the individuals at the time when they become a couple.

Figure 1 presents the distribution of hours between couple members. We clearly see that women tend to work fewer hours than their partner. Moreover, partner's labour supply clearly looks less flexible.

The Collective model requires the estimation of a joint system of labour supply on the sub-sample of couples where both members work. We consider only couples without young children, as the presence of the latter is expected to have a major influence on labour supply behaviour (Lundberg, 1988). Reduced form regression analysis yields estimates of the first derivatives of the sharing rule and labour supply elasticities. We use a semi-logarithmic form for labour supply:

$$h^f = f_0 + f_1 \ln w_f + f_2 \ln w_m + f_3 y_f + f_4 y_m + b^f s + Z^T \beta^f + \epsilon^f$$

$$h^m = m_0 + m_1 \ln w_m + m_2 \ln w_f + m_3 y_f + m_4 y_m + b^m s + Z^T \beta^m + \epsilon^m$$

We allow for contemporary autocorrelation, heteroscedasticity and endogeneity of wages and non-labour incomes.

3) A Preliminary Study on British Database

3.4.1) Impact of Heterogeneity Factors on Joint Labour Supply

Table 2 shows the regression results, as well as the estimated elasticities. The well-known negative impact of the number of children on female labour supply is found, especially if the child is under five. The number of children is not significantly correlated with male labour supply, except in the absence of young children. In this case, male labour supply falls with the number of children. The disincentive impact of the number of children likely partly results from childcare costs. Marriage significantly reduces female labour supply, even controlling for male wages and non-labour income. We attempt to explain this negative correlation in section 4.3, as there is no good *a priori* reason to suppose that married women have a greater taste for leisure than unmarried women,

The index of opinions regarding women's role in the family is strongly negatively correlated with female labour supply. This index is higher for "traditional" couples, and lower for "progressive" couples. The opinion variable may play a role either in determining women's preferences (representing a stronger preference for leisure), or on the way in which couples

negotiate their share of labour time (a division with the woman at home and the man at work being more likely in traditional families).

Ignoring the negotiation process, the estimated uncompensated wage elasticities indicate that the substitution effect is stronger than the income effect: a 10\% rise in the hourly wage would increase women's labour supply in couples by about 3\%, which accords with the range usually found in the literature. The male wage elasticities are insignificant.

3.4.2) Do Family Members Pool Their Resources? Some Fiscal Consequences

The collective model encompasses a form of the unitary model. In particular, we can test whether, as the unitary model predicts, individual labour supply consequences of a rise in a household member's non-labour income will be the same regardless of whose non-labour income increased. Such a property does not necessarily hold in the collective model, where there is bargaining and intra-household transfers. The BHPS allows us to distinguish between spouses' non-labour incomes, so we can test the income-pooling property. The coefficient estimates (all couples) of labour supply income effects and elasticities clearly reject income-pooling and the unitary model.

The implication is that the effect of a 500£ allowance will depend critically on the identity of the beneficiary. If the woman receives the allowance, she will lower her labour supply by around 10 hours per week, whereas the man will increase his labour supply by around 3 hours per week. On the contrary, if the man receives the allowance, the woman will reduce her labour supply by only 2 hours a week, and the man will reduce his by 2.5 hours per week.

3.4.3) The Impact of the Negotiation Process on Labour Supply - Looking for Distribution Factors

Collective Model Estimates

Table 3 presents estimates of the collective model with a simple sharing rule, depending on wages and incomes. The estimated sharing rule is similar both for the whole sample and for the sub-sample without young children (except for the males wage effect which becomes

insignificant). Labour supply behaviour seems coherent with microeconomic theory: the labour-leisure substitution effect is positive for women and insignificant for men. The income effect is negative and close to estimates obtained for single individuals. All these effects are obtained after controlling for the effect of household negotiation on behaviour.

Looking for Distribution Factors

Table 4 presents a number of results in the search for distribution factors to correctly specify the sharing rule. We introduce one by one the distribution factors that we suspect may influence either the threat point or bargaining power. Some of them are dichotomic. As often in the literature, we ignore the difficulty of interpretation of these variables in term of marginal effect. The impact of a potential distribution factor on the sharing rule can be identified only if it is orthogonal to the variables measuring preference heterogeneity. To see if the variable influences preferences, we estimate, in a first step, the impact of the distribution factor for single individuals (where there is no negotiation in the labour supply decision).

We first test the impact of marriage market opportunities on intra-household negotiation. With the threat point interpretation of the bargaining process, each spouse's *statu quo* is his expected utility in the case of separation. This depends on the chances of finding another partner, which can be approximated by the ratio of men to women in the region by age category. We tried a number of different sex-ratios, depending on the way in which the marriage market is supposed to be segmented: all individuals or only those living on their own; 5-year or 10-year age categories; age categories with reference to the woman's age or to the partner's age. The sex ratio turns out to be insignificant in the income sharing equation. This result therefore does not agree with that of Chiappori, Fortin and Lacroix (2001). Other potential variables such as sex mix at work are linked to hours of work, and therefore cannot be used.

We may imagine that parents' sociological status variables, as measured by the Cambridge or Goldthorpe scales, might influence the share of work in the household, because of social reproduction or because we expect more equality in some social categories. These variables, which are sometimes significant for individual labour supply, are not significantly correlated

with the negotiation process. This may be due to the difficulty of capturing a complex sociological effect with continuous variables.

Physical or psychological health variables could either represent the dependency of one spouse on the other in the case of divorce, or greater agreement amongst family members. In this case, health variables are supposed to only affect the labour supply decision-making only through the bargaining process, which is such a strong assumption. However, these health variables do not attract significant estimates in the sharing rule equation.

The degree of interest and involvement in politics and religion may also reveal information about the negotiating power. These variables do not seem to be affecting preferences (as they are insignificant in single labour supply estimates). The husband's involvement in politics and the wife's interest in religion seem to play a role in the negotiation process: they reduce the wife's share of income and increase her labour supply. The labour supply effect of these variables is open to a number of different interpretations, and these results should be confirmed on other datasets.

Finally, we test marital status as a distribution factor. We find a positive significant effect on the sharing rule. As there is no particular reason why marital status should influence leisure preferences, we consider it as a distribution factor: the choice of marriage reveals information on the negotiation process. As we suspect that this variable may be endogenous, we carried out a Hausman test. This test does not reject exogeneity.

3.4.4) Intra-household Inequality and Collective Labour Supply

Final Sharing Rule

We estimate the final sharing rule (see Table 5) by incorporating all the distribution factors detected in the last section. We then test the introduction of those factors. We find that the share of non-labour income accruing to the woman before her labour supply decision increases with man's wage (there is more total income to share, and the woman obtains a greater part of total income), her non-labour income, her spouse's non-labour income (due to a denominator effect, even though her bargaining power falls), and marital status. Her share

decreases with male political involvement and her own interest in religion. The variable measuring opinions regarding women's role in the family is not used in the sharing rule as it may well be linked with preferences, but we suspect that gender role opinions are nonetheless important determinants of household negotiation.

Intrahousehold Inequality Interpretation

The sharing rule can be used as a tool to analyse intra-household inequality. A greater share of non-labour income obtained by the woman can be interpreted as an improvement in her household bargaining position (because the threat point increases, for example). We can thus interpret marriage as a step towards a better bargaining power of women in the family. But, as the labour supply effect of income is negative, greater equality implies a greater division of tasks inside the family: women at home and men at work. This is a direct implication of the collective model of labour supply: non-labour time is interpreted as leisure, and thus the less the woman works, the better we interpret her position to be in the family. The sharing rule represents a fundamental innovation for the analysis of intra-household decision-making. Nevertheless, we need to be cautious in its interpretation for intra-household inequality, due to the strict division of time into market work and leisure. Apps and Rees (1997) and Chiappori (1997) propose an extension of the collective model to domestic production. Application of this model requires the merging of both time-use and labour force survey, which has recently been implemented on Swedish data by Aronsson, Daunfeldt and Wikstrom (2001).

3.5) Conclusion

The joint estimation of British couples' labour supply allows us to take into account explicitly household decision-making. The resulting income and wage elasticity estimates are consistent with those found in other empirical studies (e.g. Blundell and MaCurdy, 1999). We also find the usual negative correlation between number of children and female labour supply, particularly for young children.

The Income-pooling property is rejected, suggesting that models explicitly accounting for individuals' utility within the family describe the data better. This has consequences for the evaluation of fiscal policies. As an illustration, the 1999 WFTC reform changed the balance of

bargaining power within the household in disfavour of women, by transferring income from women to men. The increased generosity of the new allowance could compensate women for the weakening of their position. Thus, the final impact of the reform on female hours of work supply is ambiguous.

The collective estimate show that the share of non-labour income obtained by the woman before her labour supply decision is positively correlated with the man's wage and non-labour income. Her bargaining position is also stronger (in this sense) if she is married, if she has greater non-labour income herself, or if she is not interested in religion. On the other hand, women's bargaining power is lower in households where the man is involved in politics. These results with respect to political and religious activity are novel, and likely merit further investigation. We find that marriage market measures are insignificant in our sharing rule estimates, contrary to the hypothesis that the threat point depends positively on the chances of finding another partner in the case of separation.

The sharing rule is a useful tool for the re-examination of intra-family inequality. In the collective model of labour supply household inequality results uniquely from the share of leisure, where leisure is considered as total time minus market work. However, any inequality conclusions will likely change if we split leisure up into pure leisure and household production (cf. Apps and Rees, 1997). The current specification of collective labour supply models, with its dichotomous time use, yields limited policy conclusions. More general models, taking household production into account, will help to explain the mechanisms of household decision-making.

Appendix

Box 1: What is Labour supply?

We can view Hours Worked and Wages in the economy as the result of labour market equilibrium. In the economic analysis of the labour market, it is fundamental to study the labour supply side in order to know how many hours individuals are willing to work and for what level of wage.

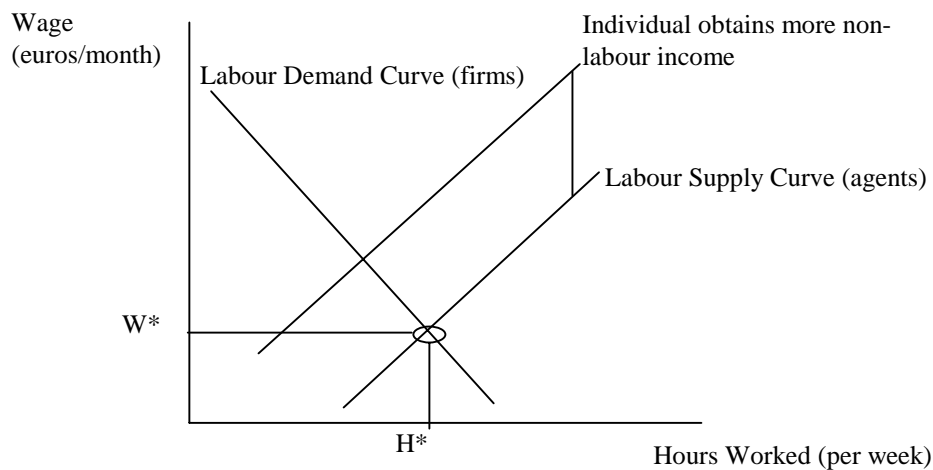


Figure 1 : A Simple Labour Market

The work presented here consists in the analysis of the supply side of the labour market. Of course we can consider several labour markets, depending on the type of job considered. On the other hand, we can encounter several labour supply curves, with different shapes, depending on individuals' characteristics: sex, age, number of children, non-labour income... For example, we often find that, if we give more non-labour income to an individual, the latter will diminish the number of hours he wants to work (the curve moves up).

Box 2: Slutsky matrix and labour-leisure substitution effect

We usually assume that individuals have a certain level of well being depending positively on the level of their consumption and the level of leisure. If an individual choose to have more leisure, in order to increase his well being, he will have to lower his working time, he will thus have less labour income to buy goods. This is the trade-off between labour and leisure. The Slutsky matrix illustrates these contradictory effects. If the hourly wage rate increases, the individual can maintain his consumption while supplying less hours of work, this is what we call the **income effect**: a wage increase implies a labour supply decrease.

However, there is second effect that plays in the opposite direction: an increase of the wage rate implies an increase in “the leisure opportunity cost”. The number of hours spent in leisure is not used as productive hours of work. They involve a loss of potential income and thus a loss of consumption. An increase of the level of wage increases the leisure opportunity cost. To obtain the same level of well being, given the income level, the individual must decrease his leisure consumption, and thus, increase his hours of work. This is what we call the **labour-leisure substitution effect** that is described in the Slutsky matrix.

One of the stakes of microeconomic labour supply study is to determine whether the substitution effect overcomes the income effect, in that case, the individual increases his labour supply when the wage increases, or the inverse.

Table 1. Descriptive Statistics, Working Couples, BHPS

Hours of Work, Hourly Wages, Evolution 1992 – 1997.

	Mean (Standard Deviation)				Male - Female Difference (Standard Deviation)	
Weekly Hours of Work	1992	Men	39.7	(11.0)	12.18	(13.39)
		Women	27.5	(7.51)		
	1997	Men	39.7	(7.05)	10.72	(12.94)
		Women	28.9	(5.69)		
Hourly Wages (in £)	1992	Men	9.26	(5.48)	3.03	(5.93)
		Women	6.22	(2.74)		
	1997	Men	10.8	(5.69)	2.83	(7.20)
		Women	7.93	(6.81)		

Other Variables, BHPS 1997.

Variable	Title	Females	Males
Y	Monthly Non Labour Income (£000's)	0.070 (0.11)	0.047 (0.14)
AGE	Age	37 (9.76)	39 (9.87)
MARIES	Married couple	76.25%	
NCH04	Number of children under 5	0.16 (0.41)	
NCH518	Number of children over 5	0.59 (0.89)	
SR	Sex-Ratio (number of men / number of women)	50.36% (0.013)	
JBMIX	As many Women as Men in the workplace	34.71%	32.70%
	More Women than Men in the workplace	57.54%	3.93%
OPFAM	Index of opinions on the woman's role in the family (+ = more traditional)	19.31 (4.24)	20.18 (4.17)
PACSSM	Cambridge Scale, social level of the father	20.51 (20.25)	17.31 (19.30)
MACSSF	Cambridge Scale, social level of the mother	13.81 (18.47)	12.35 (17.60)
MACSS0	Mother not in work (when respondent was aged 14)	32.48%	28.87%
MAJU0	Mother not in work (when respondent was aged 14): (alternative indicator)	31.10%	27.18%
VOTE1	Involved in a political party (1=yes, 2=no)	67.52%	60.83%
VOTE6	Level of Interest towards politics (1=high, 4=not at all)	2.67 (0.83)	2.39 (0.85)
AMIH	Closest friend is a man	62.36%	17.68%
OPRLG2	Level of interest in religion (1=high, 5=low)	3.93 (1.30)	4.20 (1.12)

Figure 1. Hours of Work of British Couples (BHPS, 1997)

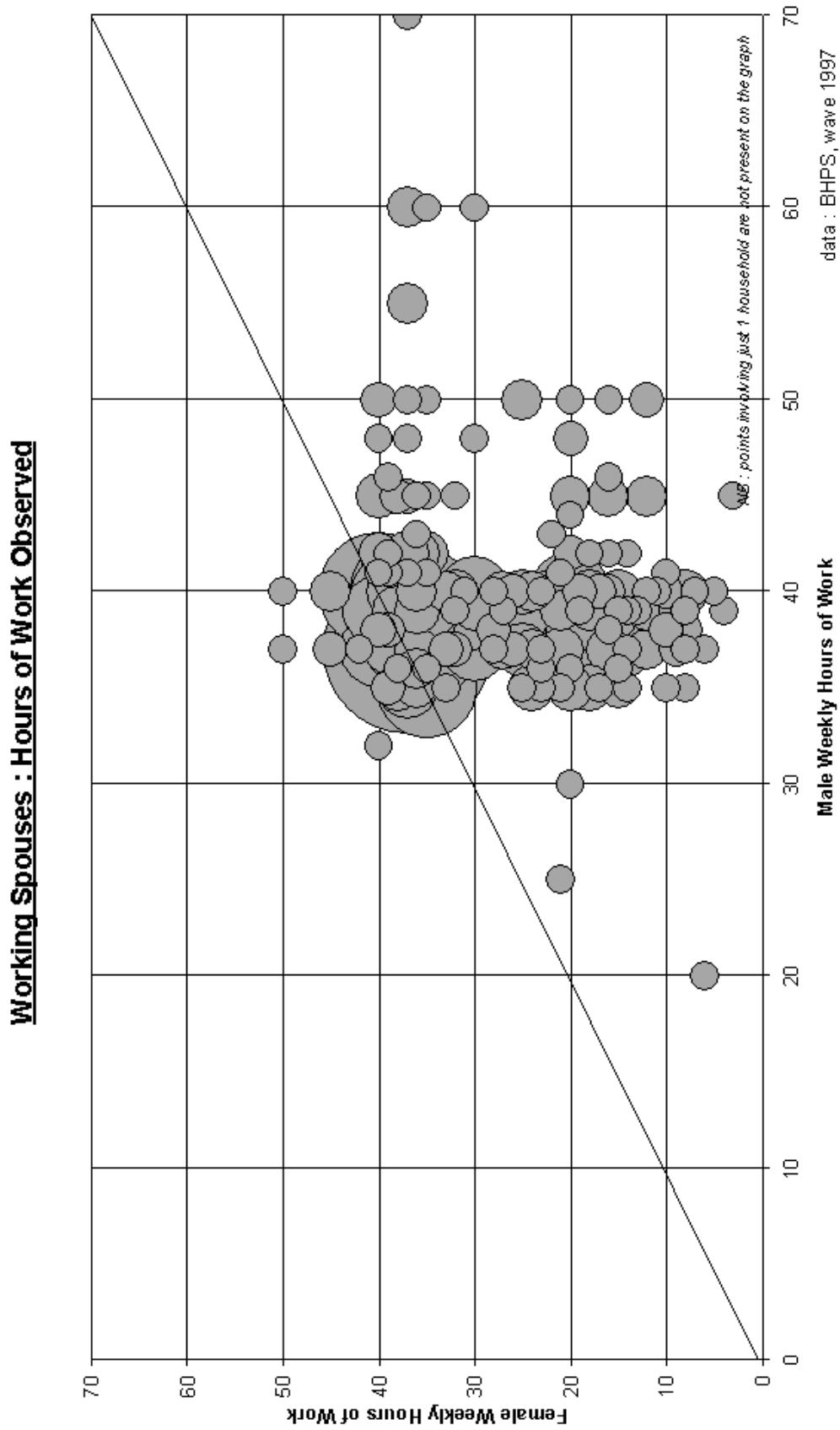


Table 2. Joint Labour Supply Estimates for British Couples¹

	ALL COUPLES		WITHOUT CHILDREN < 5	
	Women	Men	Women	Men
Constant	34.88 **	41.81 **	35.37 **	41.45 **
Woman's Hourly Wage (W_f) (£) – instrumented	9.58 **	-1.22 *	7.49 **	-0.66 NS
Man's Hourly Wage (W_m) (£) – instrumented	-3.63 **	0.68 NS	-1.41 NS	0.07 NS
Woman's Non-Labour Income (Y_f) (£000's per month) – instrumented	-19.09 **	6.47 *	-13.81 **	9.76 **
Male Non Labour Income (Y_m) (£000's per month) – instrumented	-4.33 *	-5.32 **	-4.32 *	-6.35 **
Age	-0.11 **	-0.02 NS	-0.12 **	-0.01 NS
Married	-2.02 **	-0.074 NS	-1.73 **	0.06 NS
Number of Children under 5	-5.92 **			
Number of Children over 5	-2.20 **		-3.02 **	-0.60 **
Total Number of children		-0.31 NS		
Education: Medium	1.43 **	-1.49 **	0.89 NS	-1.25 **
Education: High	0.41 NS	-1.14 **	-0.60 NS	-1.16 **
Woman's Role in the Family (opinion: + = more traditional)	-0.33 ***		-0.37 ***	
Objective Function	0.11		0.15	
Number of Observations	956		800	

Testing the Unitary Model (all couples)

Slutsky – Compensated Wage Elasticities (Hicksian)	Woman's Hourly Wage		Man's Hourly Wage	
Female Labour Supply	204.29	***	277.29	***
Male Labour Supply	19.95	NS	27.64	NS

Symmetry of the Slutsky Matrix. $H_0: e_{hf/wf}^c - e_{hm/wm}^c = 0$ t-statistic = 4.72 REJECTED ***

Income Pooling Test (See equations (6.5) and (6.6) in the Appendix):

Women. $H_0: f_3 - f_4 = 0$ t-statistic = -1.88 REJECTED *
Men. $H_0: m_3 - m_4 = 0$ t-statistic = 2.58 REJECTED **

Labour Supply Elasticities

	All Couples		Without Children < 5	
	Woman's Income	Man's Income	Woman's Income	Man's Income
Income Elasticities				
Female Labour Supply	-0.053 **	-0.010 **	-0.039 (**)	-0.009 (*)
Male Labour Supply	NS	-0.007 **	0.018 (**)	-0.010 (**)
Uncompensated Wage Elasticities	Woman's Wage	Man's Wage	Woman's Wage	Man's Wage
Female Labour Supply	0.326 **	-0.136 **	0.249 (**)	-0.482 (NS)
Male Labour Supply	-0.036 *	NS	-0.016 (NS)	-0.001 (NS)

¹ * = significant at the 10% level ; ** = significant at the 5% level ; *** = significant at the 1% level..

Table 3. Collective Labour Supply Estimates

A Simple Sharing Rule*

	All Couples	Without Children < 5
Sharing Rule	Coefficient	Coefficient
Constant (Z)	Not estimated	Not estimated
W_f	-0.017 NS	-0.006 NS
W_m	0.0313 **	0.016 NS
Y_f	1.704 ***	1.714 **
Y_m	0.420 *	0.536 *

Compensated Wage Elasticities, Given the Sharing Rule

	All Couples		Without Children < 5	
	Female Wage	Male Wage	Female Wage	Male Wage
Female Labour Supply	100 **		71.03 **	
Male Labour Supply		NS		-134.73 NS

Income Effect of Marshallian Labour Supply: dH^i/dY

	All Couples	Without Children < 5
	Non-Labour Income	Non-Labour Income
Female Labour Supply	-12.65 **	-9.02 **
Male Labour Supply	NS	12.15 (NS)

Uncompensated Wage Elasticities, given the Sharing Rule

	All Couples		Without Children < 5	
	Female Wage	Male Wage	Female Wage	Male Wage
Female Labour Supply	2.52 **		1.94 (**)	
Male Labour Supply		NS		-0.015 (NS)

* The Sharing Rule describes the non-labour income that the woman is supposed to possess just before her labour supply decision. This share is determined by negotiation between spouses, and can be negative. This is, of course, only an interpretation of the real negotiation process.

Table 4. Sharing Rule Specifications

Distribution Factor	Marriage Market Fraxis						Mother Didn't Work					
	sec-ratio	t-stat	women's job mix	t-stat	Man's Job mix	t-stat	Sex of Woman's Closest Friend	t-stat	Wife's Mother	t-stat	Husband's Mother	t-stat
Single Women Estimate	68.06	1.87 *	-0.70	-1.68 *			0.19	0.24 NS	0.71	0.90 NS		
Single Men Estimate	60.02	1.39 NS	-0.87	-2.40 **			0.28	0.33 NS	-1.49	-1.87 *		
Joint Labour Supply Coefficient (women)	0.20	0.01 NS	-0.25	-0.77 NS	-0.63	-1.92 *	0.40	0.66 NS	-0.82	-1.34 NS	-0.03	-0.05 NS
Joint Labour Supply Coefficient (man)	1.17	0.08 NS	-0.19	-1.01 NS	-0.19	-0.88 NS	-0.33	-0.92 NS	-0.21	-0.59 NS	0.34	0.83 NS
Sharing Rule Coefficient	-0.02	-0.01 NS	0.02	0.76 NS	0.06	1.65 *	-0.04	-0.65 NS	0.07	1.22 NS	0.00	0.05 NS
Distribution Factor	Father Sociological Level (Cambridge Scale)						Mother Sociological Level (Cambridge Scale)					
	Wife's Father	t-stat	Husband's Father	t-stat	Wife's Mother	t-stat	Husband's Mother	t-stat	Wife's Mother	t-stat	Husband's Mother	t-stat
Single Women Estimate	0.02	0.87 NS			-0.01	-0.33 NS			0.34	2.01 **		
Single Men Estimate	0.02	0.99 NS			0.06	2.88 **			-0.22	-1.54 ?		
Joint Labour Supply Coefficient (women)	0.02	1.08 NS	0.02	1.08 NS	0.02	1.55 ?	-0.01	-0.72 NS	-0.21	-1.65 *	0.00	0.01 NS
Joint Labour Supply Coefficient (man)	-0.02	-1.77 *	0.00	-0.04 NS	-0.01	-0.50 NS	-0.01	-0.58 NS	-0.03	-0.38 NS	0.14	2.04 **
Sharing Rule Coefficient	0.00	-1.05 NS	0.00	-1.06 NS	0.00	-1.42 NS	0.00	0.71 NS	0.02	1.48 NS	0.00	-0.01 NS
Distribution Factor	Other Engaging Variables											
	Joint Bank Account	t-stat	Difference in CSP levels	t-stat	Married Couple	t-stat						
Joint Labour Supply Coefficient (women)	-0.88	-1.32 NS	-0.02	-1.26 NS	-2.21	-2.66 **						
Joint Labour Supply Coefficient (man)	0.33	0.77 NS	0.01	0.54 NS	-0.07	-0.16 NS						
Sharing Rule	0.07	1.33 NS	0.00	1.09 NS	0.2	2.13 **						

Table 4 (continued) : Finding A Sharing Rule Specification

Distribution Factor	Physical Health Variables					Psychological Health Variables						
	Health Level (Woman)	t-stat	Health Level (Man)	t-stat	Capital Health Difference	Health Level (Woman)	t-stat	Health Level (Man)	t-stat	Capital Health Difference		
Single Women Estimate	0.61	1.00 NS				0.21	1.77 *					
Single Men Estimate	0.11	0.18 NS				-0.06	-0.32 NS					
Joint Labour Supply Coefficient (woman)	-0.06	-0.15 NS	0.20	0.48 NS	0.14	0.09	1.03 NS	0.10	0.70 NS	-0.05		
Joint Labour Supply Coefficient (man)	0.28	1.13 NS	-0.10	-0.42 NS	-0.23	-0.02	-0.39 NS	-0.06	-0.93 NS	-0.02		
Sharing Rule Coefficient	0.01	0.15 NS	-0.02	-0.47 NS	-0.01	-0.01	-1.01 NS	-0.01	-0.69 NS	0.00		
Political Variables												
Distribution Factor	vote1	t-stat	svote1	t-stat	vote6	t-stat	svote6	t-stat	Level Interest in Religion (Woman)	t-stat	Level Interest in Religion (Man)	t-stat
Single Women Estimate	-0.53	-0.65 NS			0.72	1.43 NS			0.07	0.26 NS		
Single Men Estimate	-0.60	-0.69 NS			-0.48	-0.91 NS			0.34	0.87 NS		
Joint Labour Supply Coefficient (woman)	-0.03	-0.05 NS	-1.30	-2.24 *	0.01	0.03 NS	0.10	0.31 NS	0.49	2.06 **	0.10	0.37 NS
Joint Labour Supply Coefficient (man)	-0.23	-0.56 NS	0.37	1.01 NS	-0.30	-1.29 NS	0.11	0.49 NS	0.18	1.18 NS	0.29	1.59 NS
Sharing Rule Coefficient	0.00	0.05 NS	0.11	2.00 *	0.00	-0.03 NS	-0.01	-0.31 NS	-0.04	-1.77 *	-0.01	-0.37 NS

Table 5. Sharing Rule: Preferred Specification

	All Couples	Couples Without Children < 5
Sharing Rule	Parameter	Parameter
Constant (Z)	Not estimated	Not estimated
Female Wage (W_f)	-0.014 (NS)	-0.004 (NS)
Male Wage (W_m)	0.032 (**)	0.016 (NS)
Female Non-Labour Income (Y_f)	1.610 (***)	1.625 (***)
Male Non-Labour Income (Y_m)	0.487 (**)	0.585 (**)
Married	0.159 (*)	0.177 (*)
Male not Involved in a Political Party	0.118 (**)	0.117 (*)
Female Interested in Religion	-0.042 (*)	-0.041 (NS)

Table 6. Single Individuals' Labour Supply Estimates

	ALL SINGLES		WITHOUT CHILDREN < 5	
	Females	Males	Females	Males
Constant	25.164 **	29.537 **	27.329 **	32.969 **
Hourly Wage (£)	7.311 **	4.389 **	7.098 **	3.207 **
Non-Labour Income (£000's per month)	-5.931 **	-11.863 **	-3.533 NS	-10.112 **
Age	-0.073 (NS)	0.063 NS	-0.124 **	0.052 NS
Number of Children (under 5)	-3.963 (NS)	16.395 NS		
Number of Children (over 5)	-0.357 (NS)	-7.041 **	-1.423 NS	0.639 NS
(Number of children) ²	-0.610 (NS)	1.882 NS	-1.501 **	-0.211 NS
Education: Medium	3.455 **	-2.115 NS	3.484 **	-1.016 NS
Education: High	2.068 (NS)	-1.915 NS	1.702 NS	-1.208 NS
Woman's Role in the Family (opinion + = more traditional)	-0.276 **		-0.216 **	
Number of Observations	688	387	640	379
Objective Function	0.06	0.06	0.06	0.09

Single Labour Supply Elasticities (All Couples)

	All Couples	Without Children < 5
Income Elasticities	Non-Labour Income	Non-Labour Income
Female Labour Supply	-0.027 **	-0.015 NS
Male Labour Supply	-0.022 **	-0.019 **
Compensated Wage Elasticities	Hourly Wage	Hourly Wage
Female Labour Supply	43.38 **	26.11 NS
Male Labour Supply	110.10 **	94.47 **
Uncompensated Wage Elasticities	Hourly Wage	Hourly Wage
Female Labour Supply	0.242 **	0.232 **
Male Labour Supply	0.118 **	0.086 **

References

- Apps, P.F. and R. Rees (1997), « Collective Labor Supply and Household Production », *Journal of Political Economy*, 105, 178-190.
- Becker, G. (1981) *A Treatise on the Family*, Cambridge, Mass.: Harvard University Press.
- Bourguignon, F. and P.-A. Chiappori, (1992) « Collective Models of Household Behavior », *European Economic Review*, 36, 355-364.
- Browning M. and P.-A. Chiappori (1998), « Efficient Intra-Household Allocations: a General Characterization and Empirical Tests », *Econometrica*, 66, 1241-1278.
- Chiappori, P.-A. (1988), « Rational Household Labor Supply », *Econometrica*, 56, 63-89.
- Chiappori, P.-A. (1992), « Collective Labor Supply and Welfare », *Journal of Political Economy*, 100, 437-467.
- Chiappori, P.-A. (1997), « Introducing Household Production in Collective Models of Labor Supply », *Journal of Political Economy*, 105, 191-209.
- Chiappori, P.-A., B. Fortin and G. Lacroix (2001), « Marriage Market, Divorce Legislation and Household Labour Supply ». Typescript, CREFA Université Laval.
- Fortin B. and G. Lacroix (1997), « A Test of the Unitary and Collective Models of Household Labour Supply », *Economic Journal*, 107, 933-955.
- Horney M.J. and M.B. Mc Elroy (1981), « Nash Bargained Household Decisions: Towards a generalization of the Theory of Demand », *International Economic Review*, 22, 333-349.