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Sayyid Salman RIZAVI, Catherine SOFER

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Sayyid Salman Rizavi
&
Catherine Sofer

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Abstract

The effects of women's strong investments in career and their relative positions on the household division of labor, particularly the share of male partners in household work, constitute important but somehow unaddressed issues. We use the French Time Use Survey, focusing on couples where both partners participate in the labor market, to build indicators of strong female investment in career, and look into the possible effect on the gender division of labor, particularly the male share of household work. We show that though a better relative position of the woman in the labor market increases her husband's share of household work, there is no role reversal in the division of labor.

Introduction

Now that an increasing number of time use surveys are available in more and more countries, international comparisons show that a new norm of division of labor between men and women seems to be emerging. Women's participation rate in the labor market, low in most countries at the beginning of the 20th century (Marchand & Thélot, 1991, Sofer, 2005), especially concerning salaried work, strongly increased during the second half of the century. Today, though, despite massive participation of women in the labor market in most developed countries, the sharing of time among men and women between market work and household work is still highly differentiated by gender (Goldschmidt-Clermont and Pagnossin-Aligisakis, 1995, Rizavi and Sofer, 2008). In particular, women in Europe spend roughly between 60 and 70% of their working time doing household work and between 30 and 40% working in the market, while men devote between 55% and 65% of their working time to market work and thus between 35% and 45% only in household work, with a total working time generally higher for women than for men (Winquist, 2004). Though it could be thought

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that observed differences between men and women in variables such as wages might explain, at least partly, why women invest less than their partner/companion in the labor market and more in the family (Becker, 1981, Lundberg and Startz, 1983, Coate and Loury,1993), the gender division of labor still remains a mystery, at least for an economist: education, wages, or other measurable variables are found to have a very small impact, if any, upon the sharing of household work (Hersch & Stratton, 1994, Anxo & Kocoglu, 2002, Aronsson et al, 2001, Rapoport and Sofer, 2005, Kalenkoski Ribar and Stratton 2009). Note that this result by itself might seriously challenge the often made assumption of Pareto-optimality of household decision making, notably in "collective" models (Chiappori, 1988, 1992, 1997, Aps and Rees, 1997).

The figures mentioned above are average values for households whose adult members are aged from 20 to 74 years. What has been already shown is that partners/companions whose wives participate in the labor market do more household work than those whose wives remains at home (Chadeau and Fouquet, 1998), which is not really surprising, of course. What we want to look at is whether we can explain, at least partly, why some couples have a less "traditional " division of labor and what variables, if any, are likely to drive this. The aim of this paper is to look more in depth at the sharing of work, including household work within the household. More precisely, we know from the studies cited above that looking at education and wages alone will not give the results we are looking for; we try to identify, in a first stage, couples in which wives strongly invest in their professional lives. We identify these women using several criteria: they are spending relatively more time than their 'type of women' in the market; or they have achieved a better occupational status than their 'type of women'; or they have a higher wage than their 'type of women', where 'type of women' can be subgroups of women on the basis of identical educational levels or the same occupational status. Finally, we compare women with their partners to identify women with higher salaries, higher educational levels, or better occupational status than their partners. As will be explained below, we tried several definitions of one's "group" or 'type of women'. We use these variables separately as well as together while building an index of a strong professional investment. Then, in a second stage, we study, conditional on wives' strong investment in professional life, how partners spend their time, especially their time working at home. Do these households deviate from the "norm", i.e. show evidence of a more egalitarian division of domestic labor, in the sense that they share time spent in household work more equally? Do partners in that case do more household work than average, or do a larger share of household work? Or does the household rather rely on external help? Finally, as the decision making

process implies all choices related to market and household work made simultaneously by both partners (this is true not only for collective models including household work, as in Apps and Rees, 1997, 1999, Chiappori, 1997, but also for most other models including those where the final allocation is possibly not optimal), all the choices mentioned above become endogenous.

To do this, we use the latest available French Time Use Survey, the 1998-1999 Enquête Emploi du temps run by the INSEE.

In the first section we describe a few stylised facts related to the gender division of labor. In a second section, we describe the data used in the estimations, and then suggest different indicators of women's strong investment in professional life and later construct an index for this. In a third section, we estimate men's amount and share of household work using these indicators, as well as the index previously defined. In the last section, we estimate a complete model of simultaneous equations of market and household work considering both partners and adding equations for the choice of a strong investment of the wife in a career and any possible external help for household work. The estimation is done by the full information maximum likelihood method.

1- The gender division of labor within the household: A few stylised facts

The first table we present comes from a report of the European Commission (Winqvist, 2004). The authors report from Time Use Surveys run in a similar way in different countries. The information is especially reliable as the surveys include a diary by (at least) one member of each household interviewed. The diary describes the use of time in ten minute chunks. The surveys described here were run in ten European countries between 1998 and 2002; Belgium (BE), Germany (DE), Estonia (EE), France (FR), Hungary (HU), Slovenia (SI), Finland (FI), Sweden (SE), United Kingdom (UK) and Norway (NO). The survey methods used follow very closely the guidelines on harmonised European time use survey published in September 2000. Therefore, the results can be considered comparable.

The different domestic tasks recorded are now standard in time use surveys and are described in Appendix 1.Let us look first at the sharing of household work, then at that of total work.

1.1 The gender division of household work

The sharing of household work appears in table 1 below, which gives the time spent in domestic tasks by men and women aged 20 to 74 of the different countries mentioned.

The table shows that the sharing of domestic work between men and women is remarkably stable among the different countries included in the survey: the women's share of household

work is between 60 % and 2/3 of the total. Within this range, countries are more or less egalitarian: especially Sweden and, slightly behind, other Nordic countries (Norway and Finland) and Belgium, are the countries where sharing is the most equal. Conversely, France is the country where inequality is highest (with men doing only 34% of all domestic work).

Table 1. Total Domestic work of persons aged 20 to 74 in 10 EU countries

	BE	DE	EE	FR	HU	SI	FI	SE	UK	NO
Hours and minutes per day										
Total	3.36	3.17	4.01	3.28	3.5	3.5	3.08	3.06	3.18	3.04
Women	4.32	4.11	5.02	4.30	4.57	4.57	3.58	3.42	4.15	3.47
Men	2.38	2.21	2.48	2.21	2.39	2.39	2.16	2.29	2.18	2.22
Share of total time spent by women and by men %										
Women	63	64	64	66	65	65	63	60	65	62
Men	37	36	36	34	35	35	37	40	35	38
Proportion of people who spent any time on the activity, % per day										
Total	94	92	93	89	92	90	94	95	93	95
Women	97	97	98	97	97	97	98	98	97	98
Men	90	88	87	81	86	82	90	92	88	93

Source: Winqvist, 2004 Table 5.1

This unequal sharing, based on relevant data in the same survey, also corresponds to a strong specialization among domestic tasks, with women specializing in laundry and cooking, for example, and men in repairs. Only a few tasks, like shopping and gardening, are shared quite equally. Also note the differences between countries in the total number of hours spent on domestic tasks, with much more time spent in eastern countries (Estonia, Slovenia and Hungary) than in Nordic Countries, where it is the lowest.

The situation becomes worse when we consider time devoted to child care only. The comparison for 6 countries is made in Table 2 below. In any of the countries considered here, women spend a larger share of the time in child care when children are aged 0-9 years. This remains true when both parents are employed.

One reason for this, as we are going to see below, is that, on average, women spend fewer hours in the market than men. Part time work is very common among mothers of young children, particularly in countries like Sweden and the United Kingdom. This can be seen in Table 3 below, which shows the sharing of each type of work between men and women.

Table 2. Time spent by parents with children aged up to 9

	DE	SI	FI	SE	UK	NO
	Hours and minutes per day					
All parents						
Total	5:37	5:14	6:21	6:06	7:03	5:24
Women	6:58	6:09	7:57	7:10	8:35	6:19
Men	4:06	4:07	4:24	4:56	5:10	4:22
Employed parents						
Total	3:58	5:02	5:35	5:56	6:19	5:10
Women	6:00	5:55	7:08	7:01	7:44	6:04
Men	4:46	4:05	4:18	4:50	5:09	4:20

Note: Time spent with children aged up to nine living in the same household was measured with a separate diary column. 'Being together' covered doing things together, or just being in the same place or room as the child. Sleeping time was excluded.
Minor differences in the measurement of time spent with children occurred in countries that limit accurate cross-national comparisons; for example, in the United Kingdom being together covered being in the same house, which may have resulted in over-reporting. This table includes parents with children aged up to 9.

Source: Winqvist, 2004, Table 5.14

1.2. The gender division of total work

Table 3. Gainful and domestic work of persons aged 20 to 74

	BE	DE	EE	FR	HU	SI	FI	SE	UK	NO
	Hours and minutes per day									
Women										
Gainful work	1:53	1:52	2:27	2:17	2:19	2:42	2:33	2:53	2:24	2:38
Domestic work	4:32	4:11	5:02	4:30	4:57	4:57	3:56	3:42	4:15	3:47
Total work	6:25	6:03	7:29	6:47	7:16	7:39	6:29	6:36	6:39	6:25
Men										
Gainful work	3:15	3:20	3:35	3:48	3:34	3:54	3:48	4:11	4:10	4:04
Domestic work	2:38	2:21	2:48	2:21	2:39	2:39	2:16	2:29	2:18	2:22
Total work	5:53	5:41	6:23	6:09	6:13	6:33	6:04	6:41	6:29	6:26
	BE	**DE**	**EE**	**FR**	**HU**	**SI**	**FI**	**SE**	**UK**	**NO**
	Shares of gainful and domestic work, %									
Women										
Gainful work	29	31	33	34	32	35	39	44	36	41
Domestic work	71	69	67	66	68	65	61	56	64	59
Total work	100	100	100	100	100	100	100	100	100	100
Men										
Gainful work	56	59	56	62	57	60	63	63	65	63
Domestic work	44	41	44	38	43	40	37	37	35	37
Total work	100	100	100	100	100	100	100	100	100	100

Note: < Gainful work > includes hours worked in first and second jobs, overtime, work brought home, training during working hours, and business trips. < Working hours > do not include lunch breaks and daily travel to and from work. < Domestic work > includes work done for own household. Source: Winqvist, 2004

Table 3 shows that, although women work more hours at home, men work longer hours in the market, often even twice as much as women, as in Belgium, Germany, or the U.K. However, almost everywhere women spend more time than men in total work: more than one extra hour on average in eastern countries (Slovenia, Estonia and Hungary), nearly 45 minutes more in France. Only very few countries show a more equal division of labor: Norway with a difference between men and women of 1 minute, Sweden, which is the only country in the list (and probably the only one in the world) where men work slightly more than women. It can also be noted that domestic work represents between 56 % to slightly more than 70 % of women's total work while the corresponding figures for men are 35 % to 45 % of total work spent at domestic work. Note that these figures do not support the hypothesis of an equal leisure consumption for men and women (Burda, Hamermesh and Weil, 2007).

In spite of the now massive participation of women in the labor market, the gender division of labor, though it generally does not imply complete specialization, still remains highly differentiated by gender. Is it only a result obtained on average, possibly due to average differences in women's and men's wages, for example? Or are usual economic variables of little help in explaining this phenomenon?

2- Data and methodology

2.1. The data

The French Time-Use survey (Enquête Emplois du temps) is the survey used for France in the previous tables. It is this survey that we use here for the empirical work. It was conducted by INSEE in 1998-99 and aimed at measuring daily activities as precisely as possible. It was conducted in successive stages throughout the year, so as to avoid seasonal effects. On the day of the survey, the respondents wrote down their activities, indicating the time spent on each activity, according to 10-minute time periods. Several activities could be performed at the same time; in this case, two activities are listed, one being considered as the main activity and the other as secondary. All household members above 15 were surveyed.

The survey includes:

- A base of 8,186 households, of which 7,460 are complete (i.e. in which all household members filled in a time use booklet and an individual questionnaire);
- A base of 20,370 individuals, among whom 16,442 are at least 15-years old;

- A base of activities, containing one observation per completed booklet line, with 316,097 observations. 144 different types of activities are listed. They have been regrouped on the basis of activities of the same type by INSEE. The list of the activities which are used here is given in Appendix 1. Here, as is usually found in the literature, only the main activities have been retained.

Table 4. Description of the sample of 1737 couples (French time use survey 1998)

Variable	Observations	Mean (weighted)	Standard Deviation
Male hourly wage	1520	62.244	36.255
Female hourly wage	1561	53.150	34.929
Male monthly wage	1523	10913.500	5775.131
Female monthly wage	1573	7641.064	4112.082
Ratio of monthly wage (M/F)	1447	1.893	2.732
Ratio of male to female hourly wage	1435	1.382	1.026
Employment in labor market in minutes per day (men)	1737	293.546	248.478
Employment in labor market in minutes per day (women)	1737	237.665	227.451
Time spent in household work in minutes per day (men)	1737	158.655	142.826
Time spent in household work in minutes per day (women)	1737	259.282	157.652
Difference in household working minutes (male minus female)	1737	-100.628	179.312
Ratio of household working minutes per day (male/female)	1737	0.926	1.733
Number of children up to 3 years of age	1737	0.128	0.351
Number of children from to 3 to 15 years of age	1737	1.209	1.068
Age of Male	1737	41.343	8.983
Age of female	1737	39.239	8.777
Percentage according to different dummy variables			
Education		**Female**	**Male**
Without diploma/CEP/DFEO		17.16	18.6
BEPC,CAP,BEP		38.23	43.75
BAC (general and technical)		15.83	12.61
Bac+2 and Greater		28.79	25.04
Percentage of individual (females) identified by possible indicators of investment in career			
	0 = No	**1 = Yes**	

Diploma >husband	67.01	32.99
Wage >husband	78.58	21.42
Status >husband	88.72	11.28

We select a sub-sample where we include the couples where both partners work in the labor market. Both couples with and without children are included.

Table 4 above gives a brief statistical description of the sample of couples where both partners[1] participate in labor market activities. It also includes a distribution of the sample across one of the indicators of strong female investment in career, namely a better labor market position relative to her partner (using wage, diploma and job status). Note that a non-negligible proportion of women in our sample do have a higher diploma (1/3 of them) and/or a higher monthly wage (1/5 of them) and/or a higher job status (more than 1/10 of them).

2.2. Methodology: Indicators of womens' investment in career

In order to develop the indicators in the shape of dummy variables that indicate strong female investment in career, keeping in mind the limitations of the Time Use Survey, we identified some factors that, in any way, may reflect the fact that a woman invests strongly in her career. They can, alternatively, be: working more, having higher labor income, and having better occupational status than their reference group/person. Another factor may be a comparison with her partner on the basis of educational level, employment status, or wages. The reference groups may be of three types: the first based on education levels, the second based on respective occupational status or type of profession, the third on the woman's partner.

The survey used here reports the monthly salaries of all individuals in the sample. Women with higher investment in career may be earning more than their 'type' in each of the respective reference groups based on educational levels, occupational status, or partner, as classified below.

Also, women who strongly invest in career may have the tendency even before starting career, and hence may already have invested in the shape of attaining higher education levels than their reference group/person.

The following indicators were developed based on the above mentioned idea. We further dropped from the tables those which were never significant in the regressions.

[1] either married or living as a couple …

1. More work/education: We classified women by distributing them into four different levels of education, corresponding to the highest diploma obtained. The four levels used were 'without diploma'/CEP/DFEO, BEPC/CAP/BEP, BAC (general and Technical), and BAC+2 and greater, all based on the French education system. They would roughly correspond to: no diploma, professional diploma or high school, graduate level, college and above (post graduate level). In each sub-group we identified women who are in the top quartile according to their working time in each of their respective educational sub-groups. These women were assigned a value '1' in the dummy variable 'More work/education'.

2. High wage/education: Based on the above classification of women by their education levels, we identified women who earn a monthly wage placing them in the top quartile in each sub-group of education. They are assigned a value '1' in the dummy variable 'High wage/education'.

3. Higher status/education: It may be thought that women strongly investing in their career may be in higher relative position when compared to the sub-group having the same education level. This indicator was never significant, and hence was dropped from the tables.

4. More work/status: By status we mean the occupational status identified by the variable *'position professionnelle de l'emploi'*. Initially, the variable identifies five different levels of status (from unqualified blue collar to manager –cadre supérieur, profession libérale-), to which we added a sixth category for independent work. After this re-grouping, we identified women who fall in the top quartile of working time in each respective sub-group of occupational status.

5. ***High wage/status:*** Based on the above classification of women by occupational status, we identified women who earn a monthly wage placing them in the top quartile in each sub-group of occupational status. They are assigned a value '1' in the dummy variable 'High wage/status'.[2] The three last indicators consider the partner as the reference person. Here, as each of these indicators implies a higher cost of time to the woman as compared to the man, as well as better bargaining power, we would expect a higher investment of the male partner in household work, at least compared to hers.

6. Higher education than the life partner: A dummy was developed to identify women who have a higher education level than their life partner.

[2] Note that there is no correlation between a value of 1 for any of these variables and the women's age: belonging to the top quartiles of the distribution is hence not automatically or mainly driven by professional experience.

7. Higher wage than the life partner: Another dummy was developed to identify women who earn a higher monthly wage than their life partner.

8. Better occupational status than the life partner: Finally, a dummy indicates whether the woman has a higher occupational status than her partner.

2.3. Initial results

We ran simple regressions including the above indicators one by one to see which of them show any significance in determining household work of men or the difference in the household work of both partners or the ratio of household work of both partners. The following table presents a summary of the OLS results where we only show the coefficients of the indicators and not the full results. The detailed results of these regressions can be seen in the appendix.

The results in Table 5 show that the only variable not significant is 'Status by education' which, as a consequence, we do not consider while developing the women's index of investment in career. The variables on Wage by Status, higher education than the partner, or higher salary than the partner are always significant. The others, with the exception of 'Status by education', are significant in at least two cases.

Table 5: Summary of results: OLS estimations including Indicators of woman's investment in career □

Dependent Variable:	Household work of man in minutes per day	Household work difference (man - woman) in minutes per day	Household work ratio (man/woman) in minutes per day
Work by Status	-5.53	31.86 ***	0.191 **
Work by Education	-15.83 *	25.02 **	0.185 *
Wage by Status	15.53 *	37.58 ***	0.295 ***
Wage by Education	-0.15	31.65 ***	0.201 *
Status by Education	-11.07	1.06	0.04
higher education	18.33 ***	36.75 ***	0.229 **
Better employment status	28.13 ***	39.72 ***	0.235
Higher wage	17.56 ***	39.99 ***	0.321 **
Composite Index	4.77 *	19.93 ***	0.11 ***

** significant at 10%; ** significant at 5%; *** significant at 1%*

□ Here, only the coefficients of the indicators are reported. Full results can be seen in the appendix. These estimations are based on OLS results presented in the appendix in detail.

The Table also shows results for a composite index we built. The next section shows how we developed the index.

2.4. Developing the index

The index is based on all the significant indicators in Table 5. A score of one is given for each indicator if the value of the binary indicator selected is one. Adding the scores give an index value of zero to seven. As the number of observations in the index values above four was too low, we added them to show a score of four. The final index ranges from zero to four where a higher value shows a greater intensity of investment in career. The index has been used as an initial test in Table 5 given in the previous section as a determinant of household work of men and is found to be significant.

Table 6 below shows the average household work for women and men according to the values of various indicators including the composite index.

Table 6: Average household work by indicators of women's investment in career

Indicators	Woman		Man	
	0	**1**	**0**	**1**
Education > partner	268.7	252.7	153.9	169.6
Status > partner	265.0	248.3	158.0	186.8
Wage > partner	265.0	238.8	161.3	173.2
Wage by Status	269.5	237.5	160.0	165.2
Wage by Education	272.3	226.2	163.9	152.8
Work by Status	277.0	236.9	164.1	156.5
Work by Education	275.2	228.1	165.2	146.0
Index	**Woman**		**Man**	
0	304.5		152.2	
1	262.8		159.7	
2	259.3		160.7	
3	236.8		165.8	
4	220.5		162.5	

The table shows that the average household work of men is never greater than that of women in any case. In the case of women, it is clear that, in all cases, the average household work of women declines as the indicator value is unity and also gradually declines with increasing values of the composite index. For men, we find that their average of household work tends to increase with an increasing index value, but the increase is not monotonic. Moreover, in some cases the decrease is very small so that it is not necessarily significant. In spite of the increase

in men's average household work and decrease in that of women, it can be clearly seen that average household work by men never reaches the amount provided by women in any case, which indicates that the data never give any evidence of role reversal even if women are very strongly investing in career.

Table 7 provides the ordered probit estimate of the index of strong female investment in career. We find that the number of children, as expected, plays an important role in determining the chances of women being strong investors in career, as in both children less than 3 and from 4 to 14 the coefficients are negative and significant. Living in a rural area has a significant negative effect. The male to female hourly wage ratios show that women are less likely to invest in career as the wage of the husband relative to his wife's increases. But this result might be linked, at least partly, to the definition of the index. A high level of education also has a significant positive impact upon women's investment in career. Another variable that is included here is 'help'. This binary variable shows the existence of any kind of external help available to the household for household work, including the possibility of help from children aged 15 and over within the household.

The results of the ordered probit estimation show that if there is any help available in the household, the woman is more likely to invest in her career. But, of course, this variable could, at least partly, be endogenous, as strong investors in career are more likely to use external help, especially paid help.

Table 7: Ordered Probit Results for Index of women's investment in career

Dependent Variable: Index of investment in career		
Number of Children<=3		-0.251 ***
Number of Children 3 to 14		-0.15 ***
Age (Female)		0.006 ***
Rural household		-0.125*
Education dummy variables for men	**no diploma /CEP/DFEO**	reference
	BEPC,CAP,BEP	-0.088
	BAC (Gen & Tech)	0.024
	Bac+2 and Greater	-0.349 ***
Log of ratio of hourly wage (m/f)		-0.619***
Help		0.247***
Observations		1736

* significant at 10%; ** significant at 5%; *** significant at 1%

3- Estimations and results

Here, we present a 2SLS estimation of the household work of both partners in the household, later moving to describing and estimating the maximum likelihood model.

3.1: 2SLS estimation

Table 8 is a 2SLS simultaneous estimation of household work of men and women. It helps us to see the impact of the index of women's investment in career upon the household work of both men and women. The results are straightforward. Both the children below and above 3 years of age (up to age 14) do increase the household work of both partners. This increase is much higher for the mother than for the father; at least three times greater than for him in case the household has children below three.

Table 8: 2SLS Simultaneous estimation of household work of men and women

	Equation 1 - *Dependent Variable: Household Work of Man*	**Equation 2 - *Dependent Variable: Household Work of Woman***
Children < 3	**38.22 *****	**110.44 *****
Children 3-14	**10.73 *****	**22.45 *****
Age (Man)	**0.60**	
Age (Woman)		**1.41 *****
Rural	**18.44 ****	**13.08**
BEPC,CAP,BEP (Man)	**15.43 ***	
BAC (Gen & Technical) - (Man)	**16.16**	
Bac+2 and Greater - (Man)	**-1.65**	
BEPC,CAP,BEP (Woman)		**-14.33**
BAC (Gen & Technical) - (Woman)		**-19.35**
Bac+2 and Greater - (Woman)		**-34.76 *****
Week Day	**-67.08 *****	**-36.13 *****
Index	**4.74 ***	**-14.17 *****
Constant	**140.73 *****	**241.55 *****

****Significant at 1%, ** Significant at 5%, * Significant at 10%*

These results also show that men in rural households tend to do more household work; 18.44 minutes, on the average, greater than for men living in urban households. The coefficient in

case of women is also positive, though not significant. Men who have a low education level tend to do more housework, while women with the highest education level tend to do less household work, even keeping the index value constant.

The coefficients of index are significant both for men and women. As expected from Table 6 above, they are significantly positive for men and negative for women, with a higher impact for women. These results confirm the figures of Table 6 (with "other things being equal") and will be confirmed again in our later results.

3.2: Maximum likelihood model

We now present a model which was estimated by full information maximum likelihood method. The model reflects the simultaneity of the decisions taken in the household concerning the different types of labor of both its members. We have included equations for household work and labor market work along with equations for the index of investment in career and an equation to capture the effect of any possible help available to the partners for household work from an external source or from the children within the household. The first equation represents the index of women's investment in career; the second figures any external help received for household work. Equations 3, 4 & 5 are related to household work of both partners and to the man's market work respectively.

$$I = \begin{cases} 0, \\ 1, \\ 2, \\ 3, \\ 4 \end{cases} \qquad \text{I = Index of female career investment} \qquad (1)$$

$$H = \begin{cases} 0, \\ \text{or} \quad H = 1 \text{ for help available for household work} \\ 1 \end{cases} \qquad (2)$$

$$TD_f = \boldsymbol{\alpha}_{fs}\boldsymbol{X}_f \qquad \text{household work of women} \qquad (3)$$

$$TD_m = \boldsymbol{\alpha}_{ms}\boldsymbol{X}_m \qquad \text{household work of men} \qquad (4)$$

$$TM_m = \boldsymbol{b}_m\boldsymbol{Y}_m \qquad \text{market work of men} \qquad (5)$$

where $\boldsymbol{\alpha}_{is}$ ($i = f, m$) and $\boldsymbol{b}_{\boldsymbol{m}}$ are the parameter vectors, $\mathbf{X}_i$ ($i = f, m$) and $\boldsymbol{Y}_{\boldsymbol{m}}$ are the vectors of individual specific characteristics and household-specific productivity factors.

Let g* be a criterion function associated with the intensity of the woman's investment in career:

$$g^* = \gamma' \mathbf{Z} + u_1,$$

where $\mathbf{Z}$ is a vector of household-specific characteristics and woman's characteristics which are assumed to influence her choice of a career.

The index function can then be written as:

$$I = \begin{cases} 0, \text{ if } g^* \leq \kappa_1, \\ 1, \text{ if } \kappa_1 < g^* \leq \kappa_2, \\ 2, \text{ if } \kappa_2 < g^* \leq \kappa_3, \\ 3, \text{ if } \kappa_3 < g^* \leq \kappa_4, \\ 4 \text{ if } g^* > \kappa_4, \end{cases}$$

where k_1,k_2,k_3 and k_4 are unknown parameters to be estimated.

Similarly let h* be a criterion function associated with the help available to the couple for household work as defined earlier:

$$h^* = \eta' Y + u_2,$$

The index function can then be written as:

$$H = \begin{cases} 0, \text{ if } h^* \leq 0, \\ \text{and} \\ 1 \text{ otherwise} \end{cases}$$

The system becomes:

$$I = \begin{cases} 0, \text{ if } g^* \leq \kappa_1, \\ 1, \text{ if } \kappa_1 < g^* \leq \kappa_2, \\ 2, \text{ if } \kappa_2 < g^* \leq \kappa_3, \\ 3, \text{ if } \kappa_3 < g^* \leq \kappa_4, \end{cases}$$

4 if $g^* > \kappa_4$

$$H = \begin{cases} 0, \text{ if } h^* \leq 0, \\ \text{and} \\ 1 \text{ otherwise} \end{cases}$$

and

$$TD_f = \alpha_{fs} X_f$$

$$TD_m = \alpha_{ms} X_m$$

$$TM_m = b_m Y_m$$

The error terms u_1, u_2, u_3, u_4, u_5 follow a 'penta-variate' standard normal distribution with zero mean and a positive semi-definite covariance matrix $\boldsymbol{\Sigma}$ (the variance of error term of equation describing the qualitative variables I and H are normalised to 1, ($Var(u_1) = Var(u_2) = 1$):

$$\sum = \begin{bmatrix} 1 & \sigma_{12} & \sigma_{13} & \sigma_{14} & \sigma_{15} \\ \sigma_{12} & 1 & \sigma_{23} & \sigma_{24} & \sigma_{25} \\ \sigma_{13} & \sigma_{23} & \sigma_3^2 & \sigma_{34} & \sigma_{35} \\ \sigma_{14} & \sigma_{24} & \sigma_{34} & \sigma_4^2 & \sigma_{45} \\ \sigma_{15} & \sigma_{25} & \sigma_{35} & \sigma_{45} & \sigma_5^2 \end{bmatrix}$$

with $\sigma_{ij} = \text{cov}(u_i, u_j)$, I, j=1, 2, 3, 4, 5 and $i \neq j$; $\sigma_i^2 = Var(u_i)$, $i = 3,4,5$

The log likelihood and further derivations can be found in appendix 3. The model is estimated by full information maximum likelihood method. This method allows estimating simultaneously the ordered and continuous parts of the model in order to provide consistent standard errors. No restrictions are imposed on the variance structure.

In the estimates, two specifications were adopted (models 1 and 2). The difference in these two specifications is that the first model contains the education variables of man and woman in the relevant equations. We also keep the log of hourly wages of man and woman and the non-wage income as independent variables in all equations. Model 2 includes dummies for different values of index of women's investment in career as independent variable in all equations except the index itself. Note that the index equation works as a substitute to the women's labor market equation so that the same class of variables used in the index equation are found as independent variables in the labor market equation of man, some of them being

gender specific. We include the number of rooms in the household as an identifying variable for the 'help' equation.

Table 9 presents the estimation results of the full information maximum likelihood estimation of the model. The estimation is simultaneous and hence takes into account the interrelationships between the decisions within the household. Let us notice first, that, as usual, few variables have an impact upon the market work of men, like age and age-squared, found to have a small significant positive effect in case of age, at a decreasing rate. Also, both men and women spend significantly more time in household work on weekends which is obvious. This holds true in both specifications. Looking at the index equation in both specifications, the results obtained in our previous estimations are confirmed here: the coefficients of women's education levels, as we may expect, are positive and significant, showing that more educated women are more likely to invest more in their career. On the other hand, we find that higher male hourly wages decrease the probability of women investing more in their career. In both specifications, the number of children of any age has a negative impact on the intensity of women's investment in career. Also, a strong investment in one's career is positively correlated with age, which may have to do with children being less time consuming when they are older. Again, these results stand for both specifications. Women's education, as we expected, plays an important role in her tendency to be career-oriented. In both specifications, the chances of being career-oriented are greater for more educated women as compared to women with no diploma. The estimation results of the Help equation show, as expected, that the number of rooms has a positive impact upon getting external help. Also, children of all ages have a positive significant effect on having external help, which makes sense[3]. Interestingly enough, it can be seen that, though the man's wage has no significant impact, the woman's wage does have a strong positive significant impact upon external help. It seems that, if for any reason, the household makes use of external help for household work, then it is the woman who has to pay for it.

[3] Childcare has been excluded from the tasks performed in the definition of Help, though.

Table 9: Maximum likelihood estimation of household model with help											
		Model 1					Model 2				
Dependent variable → Independent Variables ↓		Index	Help	Household work-woman	Household work-man	Labor market work-man	Index	Help	Household work-woman	Household work-man	Labor market work-man
Log of hourly wage -man		-0.5998 ***	0.1111		7.37	-14.31	-0.5724 ***	0.2409 *			-14.29
Log of hourly wage -woman		0.6333 ***	0.3513 ***	-33.88 ***		12.90	0.6085 ***	0.0645			14.77
Log of ratio of hourly wage (Man/Woman)				-19.7535 *	-12.80						
Non-wage revenue		0.00002 ***	0.00004 **	-0.0033 ***	-0.0009	0.0002	0.00003 ***	0.00003			-0.001
Number of Children up to 3 years		-0.3252 ***	0.5997 ***	124.79 ***	42.74 ***	1.08	-0.3266 ***	0.6862 ***	110.89 ***	46.44 ***	0.97
Number of Children 4 to 15 years		-0.2057 ***	0.1853 ***	32.09 ***	13.22 ***	-7.12	-0.2083 ***	0.2549 ***	24.13 ***	15.78 ***	-7.31
Age- Woman		0.1010 ***	-0.0043	0.61			0.1148 ***	-0.0417	2.57		
Age woman squared		-0.0013 ***	0.0002	0.02			-0.0013 ***	0.0006	-0.01		
Age- Man					1.68	11.31 *				1.37	10.67 *
Age Man squared					-0.008	-0.14 *				-0.01	-0.13 *
Number of rooms in household			0.0948 **					0.0830 **			
Weekend				62.9 ***	69.34 ***	-315.05 ***			62.01 ***	70.00 ***	-314.99 ***
Woman's Education	Less then BEPC, CAP, BEP	Reference		Reference			Reference				
	BEPC,CAP,BEP	0.3766 ***		-24.84 **			0.4605 ***				
	BAC (Gen & Technical)	0.7749 ***		-22.33			0.7846 ***				
	Bac+2 and Greater	0.5977 ***		-29.61 **			0.6692 ***				
Man's Education	Less then BEPC, CAP, BEP				Reference	Reference					Reference
	BEPC, CAP, BEP				19.6 *	-18.28					-4.17
	BAC (Gen & Technical)				21.61	-34.16 *					-19.33
	Bac+2 and Greater				-2.63	9.03					5.21
Dummies based on index value (I) of woman's investment in career	I = 0							Reference	Reference	Reference	Reference
	I = 1							0.38 *	-35.49 **	23.02	-11.55
	I = 2							0.69 **	-42.85 **	35.30 *	-19.87
	I = 3							0.62	-72.24 ***	48.67 **	-22.03
	I = 4							1.25 **	-90.23 **	61.27 **	-13.49
Constant			-1.3462	295.32 ***	28.73	196.00		- 0.68	158.60 ***	39.978	207.36 *
threshhold-1		1.80 ***					1.97 ***				
threshhold-2		2.42 ***					2.59 ***				
threshhold-3		3.00 ***					3.17 ***				
threshhold-4		3.52 ***					3.68 ***				

* significant at 10%; ** significant at 5%; *** significant at 1%

Let us now turn to the results for household work. In both specifications, the household work of both men and women increases with an increase in the number of children but the increase in women's household work is quite larger than that of men. Particularly, for younger children of age below three, the increase in women's household work is two and a half to three times more than that of men, depending on the specification of the model. This is consistent with results usually found and also confirms our own result obtained earlier in the 2SLS model. In the first specification, the effects of an increase in the level of education are clearly negative in the woman's equation: the more educated she is the less household work she performs. But, conversely, they are merely positive in the man's equation, though generally insignificant. Looking at the impact of wages, it can be seen that our results strongly argue against the usual assumption of cost minimizing in household production. In the men's equation of household work, male wages as well as the ratio show up insignificant. In the women's equation, female wages do have a negative significant impact upon women's household work, but the ratio parameter, though significant, gets a "wrong" sign: the more her partner earns relative to her, the less household work she performs, when controlling for her wage. Hence, we do find, as most often found in other studies, that the division of household work does not seem to be driven mainly (if at all) by efficiency. Except of course if one adds ad hoc assumptions about a difference in men's and women's household productivity, or in their disutility for household work. Excluding wages as well as education variables and considering the index dummy variables instead, we can see in the second specification that the values of index does not show any significance in the labor market equation of men, as the men's labor supply is normally found not to be much elastic. Also, for the household work of women, we find that with each further step of the ladder of the index, they reduce their household work significantly. This reduction gradually increases from 35 to 90 minutes per day of household work with reference to having a score of zero on the index. On the other hand, men gradually but significantly increase their household work as their wives move higher on the ladder. This increase is from 23 to 61 minutes with reference to zero value of the index. We find that this increase in household work is always less than the decrease in women's household work, although the difference in not much in cases the values of index are below 3. As the descriptive statistics show that, on average, the difference in man's and woman's household work is above 100 minutes per day, this decrease in women's household work and corresponding increase in men's household work is never likely to produce a role reversal. It seems that the decrease in the household work of women who invest a lot in their careers is never compensated by an equal or greater increase in household work by men. This continues

to keep the household work gender specific in a traditional sense where women specialize more in household work and men in the market. One possible reason of this may be that, as the intensity of women's investment in career increases, the housework is substituted partially by men and partially by some kind of help, either paid or from elder children in the household as mentioned above.

4. Conclusion

The effect of women's strong investment in career on the household division of labour, particularly the share of the male partner in household work, is an important but somehow unaddressed issue. This paper uses the French Time Use Survey to identify the indicators of strong female investment in career, focusing on working couples and identifying women who strongly demonstrate a tendency to invest in career. We also look into the possible effect on the gender division of labour, particularly the male share of household work. The couples in which both partners participate in the labour market were selected and the possible indicators of strong female investment in career were identified. Some indices based on the identified indicators were also developed and tested for the possible influence on the gender division of labour within the household.

The woman's investment in her career has been estimated simultaneously with household work performed by both partners, market labor supply of the male partner, and using an external help for household work. The results show that women's tendency to invest in career is strongly affected by usual variables such as the presence of children in the household (with a negative impact) and by age and her education level. We find that, as women's tendency to invest in her career increases, women gradually decrease their share in the household work which is substituted not only, to some extent, by men's household work but by any kind of help available to the household, external or from children within the household. The fact that the index values show significance not only in the men's and women's household work but also in the help equation indicates this. We show that woman's investment in career does increase her partner's household work and decreases hers but the sharing of work within the household seems to be non-egalitarian. Hence, gender roles remain traditional in the sense that women continue to do the major part of household work even though they participate in the labor market with a strong intensity. In a first model including wages and education level,

we show that wages give interesting results: first, neither his own wage, nor the wage ratio, seems to have any impact upon the man's amount of household work. Moreover, though the woman's wage does have the expected (in theory) negative impact upon her household work, the more he earns relative to her, the less household work she performs. It seems that, when she earns a higher wage, instead of minimizing costs in the sharing of household between partners, the household will merely turn to external help, which her wage will pay for, if necessary. These results really seem to be difficult to reconcile with any efficiency assumption in household production. Finally, we show in a second model that a woman's investment in career does increase her partner's household work and decreases hers. But even when women are especially active in their professional life, they still work more at home than their partners do, i.e. the sharing of work within the household seems to be neither egalitarian, nor efficient. Hence, gender roles remain traditional in the sense that women continue to do the major part of household work even though they participate in the labor market with a strong intensity.

A further development of this study would be to replicate it using data on time use of other countries where we are able to know the amount of household and labour market work of both partners in the household. This would permit comparing the effect of investment in career by women on men's household work across countries.

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Appendix 1

Description of domestic tasks

The different domestic tasks recorded, now standard in time use surveys, are described here.

Domestic activities include all activities around:

- food and drink: preparation (cutting, cooking, making jam), presentation (laying the table), kitchen and food clean-up (washing up)
- housework: interior cleaning, clothes activities (laundry, mending, sewing, knitting, repairing and maintaining textiles), storing interior household items and tidying
- interior maintenance and repair of house and vehicles: repairing, water and heating upkeep
- Household management: financial (bills, inventory ...)
- shopping
- childcare: physical and medical care, reading, talking with and listening to children, homework help, picking up/dropping off children, playing and leisure with children
- care for household adults
- care for animals and pets
- lawn, garden and houseplants

Appendix 2

Important Variables in the data set

Child<3	**Number of children below 3 years old**
Child 3-15	**Number of children from 3 to 15 years old**
Rural	**Dummy for Rural area residence (1=Rural residence)**
Age F	**Age of women of the household**
Normal Day	**1= Monday to Friday**
More work/diploma	**Dummy; '1' means that the female works higher than the mean + standard deviation of her subgroup by diploma**
High wage/diploma	**Dummy; '1' means that the female earns a monthly wage more than the mean + standard deviation of her subgroup by diploma**
More Work/position	**Dummy; '1' means that the female works higher than the mean + standard deviation of her subgroup by professional position of employment**
High wage/position	**Dummy; '1' means that the female earns a monthly wage more than the mean + standard deviation of her subgroup by professional position of employment**
Diploma>partner	**Dummy; female has earned a higher diploma than her partner**
Wage>partner	**Dummy; female earns a higher monthly wage than her partner**
Position>partner	**Dummy: Indicates that the female is in a better occupational status as compared to her partner**
Dedu1-Dedu4	**Dummy variable for education levels (1= no diploma /CEP/DFEO, 2= BEPC,CAP,BEP, 3= BAC (Gen & Tech), 4= Bac+2 and Greater.** **They would roughly correspond to: no diploma, professional diploma or high school, graduate level, college and above (post graduate level).**
Daid71	**The household receives some kind of regular external aid for housework**
Index	**Please see the appendix on the next page**
help	**This is a dummy variable that includes any unpaid help available to the partners for household work, including the help available from children within the household.**

Appendix 3

The maximum likelihood function described in section 3.2 corresponding to the system of five equations can be given as:

$$L = \prod_{I=0,H=0} P(u_1 < k_1 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 \le 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=1,H=0} P(k_1 - \boldsymbol{\gamma}_i'\mathbf{Z}_i \le u_1 \le k_2 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 \le 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=2,H=0} P(k_2 - \boldsymbol{\gamma}_i'\mathbf{Z}_i \le u_1 \le k_3 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 \le 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=3,H=0} P(k_3 - \boldsymbol{\gamma}_i'\mathbf{Z}_i \le u_1 \le k_4 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 \le 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=4,H=0} P(u_1 > k_4 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 \le 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=0,H=1} P(u_1 < k_1 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 > 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=1,H=1} P(k_1 - \boldsymbol{\gamma}_i'\mathbf{Z}_i \le u_1 \le k_2 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 > 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=2,H=1} P(k_2 - \boldsymbol{\gamma}_i'\mathbf{Z}_i \le u_1 \le k_3 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 \le 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=3,H=1} P(k_3 - \boldsymbol{\gamma}_i'\mathbf{Z}_i \le u_1 \le k_4 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 > 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

$$\times \prod_{I=4,H=1} P(u_1 > k_4 - \boldsymbol{\gamma}_i'\mathbf{Z}_i, u_2 > 0, u_3 = TD_f - \boldsymbol{\alpha}_f \mathbf{X}_f, u_4 = TD_m - \boldsymbol{\alpha}_m \mathbf{X}_m, u_5 = TM_m - \beta_m Y_m)$$

By using the method described in Green (2000), we found the conditional mean and variance vector for u_1 and u_2 conditional of u_3, u_4 and u_5 of this penta-normal distribution given below.

The covariance matrix given above can be partitioned as follows:

$$\Sigma_{11} = \begin{bmatrix} 1 & \sigma_{12} \\ \sigma_{12} & 1 \end{bmatrix}, \quad \Sigma_{12} = \begin{bmatrix} \sigma_{13} & \sigma_{14} & \sigma_{15} \\ \sigma_{23} & \sigma_{24} & \sigma_{25} \end{bmatrix}$$

$$\sum_{21} = \begin{bmatrix} \sigma_{13} & \sigma_{23} \\ \sigma_{14} & \sigma_{24} \\ \sigma_{15} & \sigma_{25} \end{bmatrix} \quad \text{and} \quad \sum_{22} = \begin{bmatrix} \sigma_3^2 & \sigma_{34} & \sigma_{35} \\ \sigma_{34} & \sigma_4^2 & \sigma_{45} \\ \sigma_{35} & \sigma_{45} & \sigma_5^2 \end{bmatrix}$$

Then the mean and variance can be derived as

$$\mu = \mu_1 + \sum_{12} \sum_{13}^{-1} (x_2 - \mu_2)$$

and $$\sigma^2 = \sum_{11} - \sum_{12} \sum_{22}^{-1} \sum_{21}$$

where μ_1 and μ_2 are vectors containing zeros as the means of errors are assumed to be zero.

After derivation and manipulation, we get the following estimations of mean and variance of both the errors of the index equation (μ_I and σ_I^2) and the help equation (μ_H and σ_H^2):

Let $\rho_{ij} = \rho(u_i, u_j)$ where $i \neq j$ and i,j = 1 to 5

Also let $d = 1 + 2\rho_{34}\rho_{35}\rho_{45} - \rho_{35}^2 - \rho_{35}^2 - \rho_{45}^2$

then

$$\mu_I = \left(\frac{1}{d}\right) * \left[\left(\frac{u_3}{\sigma_3}\right) \left(\rho_{13}\left(1-\rho_{45}^2\right) + \rho_{14}\left(\rho_{35}\rho_{45} - \rho_{34}\right) + \rho_{15}\left(\rho_{34}\rho_{45} - \rho_{35}\right)\right) \right.$$

$$+ \left(\frac{u_4}{\sigma_4}\right) \left(\rho_{14}\left(1-\rho_{35}^2\right) + \rho_{13}\left(\rho_{35}\rho_{45} - \rho_{34}\right) + \rho_{15}\left(\rho_{34}\rho_{35} - \rho_{45}\right)\right)$$

$$\left. + \left(\frac{u_5}{\sigma_5}\right) \left(\rho_{15}\left(1-\rho_{34}^2\right) + \rho_{13}\left(\rho_{34}\rho_{45} - \rho_{35}\right) + \rho_{14}\left(\rho_{34}\rho_{35} - \rho_{45}\right)\right) \right]$$

The variance is as follows:

$$\sigma_I^2 = 1 - \left(\frac{1}{d}\right) * \left\{ \rho_{13}^2\left(1-\rho_{45}^2\right) + \rho_{14}^2\left(1-\rho_{35}^2\right) + \rho_{15}^2\left(1-\rho_{34}^2\right) \right.$$
$$- 2\left(\rho_{13}\rho_{14}\rho_{34} + \rho_{13}\rho_{15}\rho_{35} + \rho_{14}\rho_{15}\rho_{45}\right)$$
$$\left. + 2\left(\rho_{13}\rho_{14}\rho_{35}\rho_{45} + \rho_{13}\rho_{15}\rho_{34}\rho_{45} + \rho_{14}\rho_{15}\rho_{34}\rho_{35}\right) \right\}$$

Similarly for the help equation,

$$\mu_H = \left(\frac{1}{d}\right) * \left[\left(\frac{u_3}{\sigma_3}\right) \left(\rho_{23}\left(1-\rho_{45}^2\right) + \rho_{24}\left(\rho_{35}\rho_{45} - \rho_{34}\right) + \rho_{25}\left(\rho_{34}\rho_{45} - \rho_{35}\right)\right) \right.$$

$$\left. + \left(\frac{u_4}{\sigma_4}\right) \left(\rho_{24}\left(1-\rho_{35}^2\right) + \rho_{23}\left(\rho_{35}\rho_{45} - \rho_{34}\right) + \rho_{25}\left(\rho_{34}\rho_{35} - \rho_{45}\right)\right) \right.$$

$$+\left(\frac{u_5}{\sigma_5}\right)\left(\rho_{25}\left(1-\rho_{34}^2\right)+\rho_{23}\left(\rho_{34}\rho_{45}-\rho_{35}\right)+\rho_{24}\left(\rho_{34}\rho_{35}-\rho_{45}\right)\right)\Bigg]$$

The variance is as follows:

$$\sigma_H^2 = 1-\left(\frac{1}{d}\right)*\left\{\rho_{23}^2\left(1-\rho_{45}^2\right)+\rho_{24}^2\left(1-\rho_{35}^2\right)+\rho_{25}^2\left(1-\rho_{34}^2\right)\right.$$
$$-2\left(\rho_{23}\rho_{24}\rho_{34}+\rho_{23}\rho_{25}\rho_{35}+\rho_{24}\rho_{25}\rho_{45}\right)$$
$$\left.+2\left(\rho_{23}\rho_{24}\rho_{35}\rho_{45}+\rho_{23}\rho_{25}\rho_{34}\rho_{45}+\rho_{24}\rho_{25}\rho_{34}\rho_{35}\right)\right\}$$

As we need the probabilities for a trivariate normal distribution for the conditional maximum likelihood problem, we use the equation given by Rose and Smith (1996, 2002) which is as follows:

$$P(u_3,u_4,u_5)=\frac{e^{-\frac{w}{2(\rho_{34}^2+\rho_{35}^2+\rho_{45}^2-2\rho_{34}\rho_{35}\rho_{45}-1)}}}{2\sqrt{2}\pi^{\frac{3}{2}}\sqrt{1-(\rho_{34}^2+\rho_{35}^2+\rho_{45}^2)+2\rho_{34}\rho_{35}\rho_{45}}}$$

where

$$w=u_3^2(\rho_{45}^2-1)+u_4^2(\rho_{35}^2-1)+u_5^2(\rho_{34}^2-1)$$
$$+2\left[u_3u_4(\rho_{34}-\rho_{35}\rho_{45})+u_3u_5(\rho_{35}-\rho_{34}\rho_{45})+u_4u_5(\rho_{45}-\rho_{34}\rho_{35})\right]$$

Appendix 4

OLS regression with binary indicators of women's strong investment in career

New Table: OLS Regression Results (binary indicators of female investment in Career)																	
Dependent Variable:		**Household work of man in minutes per day**								**Household work difference (man - woman) in minutes per day**							
		1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Children<3		39.99***	38.49***	43.64***	42.96***	39.81***	39.87***	39.89***	42.40***	-72.70***	-73.75***	-71.47***	-71.05***	-74.58***	-75.65***	-70.67***	-75.01***
Children 3-15		9.44***	9.48***	11.87***	11.75***	9.72***	10.12***	10.21***	12.01***	-13.56***	-14.66***	-15.70***	-15.02***	-16.02***	-15.65***	-15.23***	-15.51***
Rural		18.51**	20.33**	19.11**	19.23**	20.04**	21.20**	19.76**	19.89**	8.23	8.52	10.67	11.34	7.82	10.07	7.31	10.24
Age-man		0.91*	0.90*	0.86*	0.98*	1.00**	1.10**	0.7	0.95*								
Normal day		-71.83***	-71.79***	-68.97***	-67.55***	-71.01***	-71.04***	-73.17***	-67.93***	-6.6	-5.22	-7.63	-7.46	-6.23	-5.68	-7.56	-5.76
Man's education dummy: reference to No education or < BEPC,CAP,BEP																	
BEPC/CAP/BEP		17.67*	18.74*	17.77*	18.32*	14.64	22.10**	11.76	17.88*	27.23**	25.99*	26.02**	26.91**	27.41**	38.41***	22.10*	27.69**
BAC (Gen & Technical)		18.31	23.70*	18.26	22.38	15.31	27.37*	13.03	20.67	33.69*	33.56*	30.67*	36.65**	33.86*	46.73***	27.86	37.37**
Bac+2 and Greater		-5.76	-4.56	-5.1	-5.12	-9.78	4.84	-12.37	-6.95	37.92**	32.52**	30.46**	31.08**	33.53**	52.83***	29.60**	34.53**
Log of Man's hourly salary		5.11	5.93	2.77	4.64	6.54	4.55	12.47	9.65								
Log of ratio of hourly salary(man/woman)										-15.98*	-15.88	-6.17	-6.7	-13.37	-7.34	-7.38	2.71
Dummy variables: woman in top quartile in subgroups of Status / education.	**Work by Status**	-5.53								31.86***							
	Work by Education		-15.83*								25.02**						
	Wage by Status			15.53*								37.58***					
	Wage by Education				-0.15								31.65***				
	Status by Education					-11.07								1.06			
Dummy variables: Woman with reference to partner	**Higher Education**						18.33**								36.75***		
	Better Employment Status							28.13**								39.72**	
	Higher Salary								17.56*								39.99***
Constant		127.29***	124.70***	126.72***	116.85***	124.82***	105.19***	104.92***	94.94**	-101.08***	-92.31***	-94.46***	-94.58***	-85.32***	-110***	-86.67***	-97.91***
Observations		1475	1489	1437	1444	1506	1520	1494	1444	1428	1435	1428	1435	1428	1435	1417	1435

* significant at 10%; ** significant at 5%; *** significant at 1%;

NEW Table: OLS Regression Results (single indicators and index of female investment in Career)												
Dependent Variable:		**Household work ratio (man/woman) in minutes per day**								**Estimates with the Index**		
		1	2	3	4	5	6	7	8	**household work**	**household work difference**	**household work ratio**
Children<3		-0.282**	-0.281*	-0.299**	-0.295**	-0.302**	-0.286*	-0.293**	-0.294**	40.28***	-68.59***	-0.27*
Children 3-15		-0.025	-0.019	-0.037	-0.022	-0.04	-0.027	-0.035	-0.025	10.82***	-12.43***	-0.01
Rural		-0.025	0.037	-0.004	0.056	-0.028	0.047	-0.03	0.05	21.56***	12.34	0.06
Age-man		0.002	0.004	-0.002	0.0002	0.001	0.005	0.001	0.003	0.91*		0.002
Normal day		0.04	0.079	0.031	0.065	0.041	0.076	0.036	0.075	-71.51***	-7.5	0.07
Man's education dummy: reference to No education or < BEPC,CAP,BEP												
BEPC/CAP/BEP		0.042	0.035	0.023	0.034	0.043	0.117	0.019	0.047	16.21	29.36**	0.05
BAC (Gen & Technical)		0.135	0.266	0.1	0.279	0.143	0.356*	0.113	0.293	21.61	36.38**	0.28
Bac+2 and Greater		0.127	0.107	0.067	0.09	0.108	0.238	0.082	0.121	-4.58	41.55***	0.15
Log of Man's hourly salary										6.24		
Log of ratio of hourly salary(man/woman)		-0.029	-0.03	0.05	0.038	-0.012	0.025	0.028	0.118		2.28	0.08
Dummy variables: woman in top quartile in subgroups of Status / education.	**Work by Status**	0.191**										
	Work by Education		0.185*									
	Wage by Status			0.295***								
	Wage by Education				0.201*							
	Status by Education					0.04						
Dummy variables: Woman with reference to partner	**Higher Education**						0.229**					
	Better Employment Status							0.235				
	Higher Salary								0.321**			
Index										4.77*	19.93***	0.11***
Constant		0.778**	0.694**	0.959***	0.840***	0.897***	0.547	0.920***	0.665**	109.26 ***	-130.63 ***	0.56 *
Observations		1428	1435	1428	1435	1428	1435	1417	1435	1520	1435	1435

* significant at 10%; ** significant at 5%; *** significant at 1%;